PUREWater Soquel

FINAL

PURE WATER SOQUEL ENGINEERING REPORT

PREPARED FOR

SOQUEL CREEK WATER DISTRICT

MARCH 2023



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Pure Water Soquel Engineering Report

Soquel Creek Water District

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Pure Water Soquel Engineering Report

Table of Contents

List of Figures ix

List of Tables xii

List of Abbreviations xvii

Section 1: Executive Summary 1-1

1.1 Report Overview 1-1

1.2 PWS Project Overview 1-1

1.2.1 PWS Project Partners 1-2

1.2.2 PWS Project Goals 1-2

1.2.3 Public Outreach 1-2

1.2.4 Independent Advisory Panel 1-3

1.2.5 Technical Advisory Committee 1-3

1.3 Regulatory Requirements 1-3

1.4 Source Wastewater 1-3

1.4.1 Sewershed Description 1-3

1.4.2 Raw Wastewater Characteristics 1-4

1.4.3 Wastewater Source Control 1-5

1.5 Project Facilities 1-6

1.6 Secondary Effluent Water Quality 1-10

1.7 Collaboration with the Santa Cruz NPR Project 1-10

1.8 Purified Water Quality 1-11

1.9 Pathogenic Microorganism Control 1-12

1.10 Hydrogeologic Setting 1-13

1.10.1 Groundwater Sustainability Plan 1-15

1.10.2 Basin Groundwater Model 1-15

1.10.3 Groundwater Quality 1-15

1.11 Groundwater Recharge Impacts 1-16

1.12 Response Retention Time 1-17

1.13 Contingency Plan 1-17

1.14 Monitoring and Reporting Program 1-18

1.15 General Operations Plan 1-20

1.16 Technical, Managerial and Financial Capacity 1-20

1.16.1 Technical Capacity 1-20

1.16.2 Managerial Capacity 1-21

1.16.3 Financial Capacity 1-21

Section 2: Project Overview 2-1

2.1 Purpose of the Engineering Report 2-1
2.2 Background 2-1
2.3 Project Participants 2-2
2.4 PWS Project Development and Supporting Activities 2-4
2.5 Public Outreach 2-7
2.6 Independent Advisory Panel 2-9
2.7 Technical Advisory Committee 2-10
2.8 Environmental Compliance 2-10
2.9 Project Goals 2-11
Section 3: Regulatory Requirements 3-1
3.1 Requirements for Public Health Protection 3-1
3.1.1 General GRRP Requirements 3-1
3.1.2 Pathogenic Microorganism Control and Multiple Barrier Requirements for GRRPs 3-3
3.1.3 RRT Requirements for GRRPs 3-5
3.1.4 Control Zones for GRRPs 3-5
3.1.5 Recycled Water Contribution and Diluent Water Requirements for GRRPs 3-5
3.1.6 TOC Requirements for GRRPs 3-6
3.1.7 Nitrogen Requirements for GRRPs 3-6
3.1.8 Other Recycled Water Quality Requirements for GRRPs 3-7
3.1.9 Monitoring Well Requirements for GRRPs 3-8
3.1.10 Provisions for Alternatives 3-8
3.2 Requirements for Environmental and Water Quality Protection 3-9
3.3 SWRCB Requirements 3-12
3.3.1 Antidegradation Policy 3-12
3.3.2 SWRCB Recycled Water Policy 3-12
3.4 Federal Requirements for Groundwater Replenishment Projects 3-13
Section 4: Source Wastewater 4-1
4.1 Sewershed Description 4-1
4.2 Raw Wastewater Characteristics 4-3
4.2.1 Flow Characteristics 4-3
4.2.2 Wastewater Quality 4-4
4.2.3 Influent Water Quality 4-4
4.2.4 Priority and Other Trace Pollutants 4-6
4.3 Wastewater Source Control 4-9
4.3.1 Existing Industrial Pretreatment Program 4-9
4.3.2 City's Sewer System Ordinance 4-9
4.3.3 SCCSD Industrial Pretreatment Program 4-12
4.3.4 Permitted Industrial Dischargers in the SC WWTF Sewershed 4-12
4.3.5 Compliance with Groundwater Recharge Regulations for Enhanced Source Control 4-16
4.4 SC WWTF 4-18

4.4.1 Collection System 4-18
4.4.2 Wastewater Treatment Processes 4-18
4.4.3 Permit Limits 4-23
Section 5: PWS Project Facilities 5-1
5.1 PWS Project Overview 5-1
5.2 Facilities at the SC WWTF Site 5-5
5.2.1 Existing SC WWTF Overview 5-5
5.2.2 Santa Cruz Tertiary Treatment Facility Site Overview 5-6
5.2.3 Source Water Pump Station 5-9
5.2.4 Source Water Strainers 5-9
5.2.5 Non-Potable Reuse Facilities 5-10
5.2.6 Chemical Storage and Delivery Systems 5-10
5.3 AWPF at the Chanticleer Site 5-11
5.3.1 AWPF Overview 5-11
5.3.2 Chloramine Residual Boost System 5-15
5.3.3 Ozone 5-15
5.3.4 Membrane Filtration 5-22
5.3.5 Reverse Osmosis 5-29
5.3.6 Advanced Oxidation Process 5-35
5.3.7 Post Treatment Stabilization 5-38
5.3.8 Chemical Storage and Delivery Systems 5-40
5.3.9 AWPF Residual Management 5-54
5.3.10 Sanitary Lift Station 5-54
5.3.11 RO Concentrate 5-55
5.3.12 Purified Water 5-56
5.4 SWIP Wells 5-57
5.5 Monitoring Wells 5-62
Section 6: Secondary Effluent Water Quality 6-1
6.1 Constituents with Maximum Contaminant Levels 6-1
6.2 Lead and Copper 6-5
6.3 Constituents with NLs 6-6
6.4 Total Organic Carbon 6-7
6.5 Total Nitrogen 6-7
6.6 Other Priority Pollutants 6-8
6.7 Other Constituents of Emerging Concern 6-10
6.8 SWRCB Recycled Water Policy 6-12
6.9 Other Monitored Constituents 6-13
Section 7: Collaboration with The Santa Cruz NPR Project 7-1

Section 8: Purified Water Quality 8-1
8.1 Introduction 8-1
8.2 Compliance with Title 22 8-2
8.2.1 Constituents with Primary MCLs 8-2
8.2.2 Constituents with sMCLs 8-4
8.2.3 Lead and Copper ALs 8-4
8.2.4 Constituents with NLs 8-4
8.2.5 Total Organic Carbon 8-5
8.2.6 Total Nitrogen 8-6
8.2.7 Other Priority Pollutants and CECs 8-6
8.3 Compliance with Basin Plan Requirements 8-6
8.3.1 General Narrative Objectives 8-7
8.3.2 Drinking Water Standards 8-7
8.3.3 Water Quality Objectives for Agricultural Water Supplies 8-7
8.3.4 Numerical Water Objectives 8-9
8.4 Compliance with SWRCB Recycled Water Policy 8-9
Section 9: Pathogenic Microorganism Control 9-1
9.1 Advanced Water Purification Facility 9-1
9.1.1 Membrane Filtration 9-1
9.1.2 Reverse Osmosis 9-4
9.1.3 UV-AOP 9-5
9.2 Underground Retention Time 9-6
9.3 Pathogen LRV Summary 9-6
Section 10: Hydrogeologic Setting 10-1
10.1 Groundwater Basin and Regional Hydrogeology 10-1
10.1.1 Geologic Setting 10-1
10.1.2 Basin Hydrostratigraphy 10-3
10.1.3 Basin Hydrology 10-3
10.1.4 Land Use and Water Use 10-7
10.1.5 Seawater Intrusion 10-7
10.1.6 Groundwater Sustainability Plan 10-9
10.1.7 Basin Groundwater Model 10-10
10.2 SWIP Well Area Hydrogeology 10-10
10.2.1 SWIP Well Area Hydrostratigraphy 10-10
10.2.2 Groundwater Elevations 10-15
10.3 Water Budget 10-18
10.4 Groundwater Quality 10-19
10.4.1 Ambient Groundwater Quality 10-20
10.4.2 Anthropogenic Groundwater Contamination 10-21
10.5 Water Rights 10-24

10.6 Drinking Water Wells in PWS Project Area 10-25
Section 11: Groundwater Recharge Impacts 11-1
11.1 Hydrogeological Analyses 11-1
11.1.1 Groundwater Modeling Scenarios 11-2
11.1.2 Groundwater Elevation Contours and Flow Directions in Baseline and PWS Scenarios 11-5
11.1.3 Simulated Groundwater Flow for Baseline Scenario 11-5
11.1.4 Simulated Groundwater Flow for PWS Scenario 11-6
11.2 Recycled Water Contribution to Aquifer Zones and Water Supply Wells 11-15
11.2.1 MODPATH Setup for Particle Tracking based on Basin Model 11-15
11.2.2 MODPATH Results for Spatial Extent of Recharged Purified Water 11-16
11.2.3 Estimates of Purified Water Contribution to Wells and Aquifer 11-19
11.3 Underground Retention Time 11-21
11.3.1 Retention Time Estimates Using Refined Particle Tracking 11-21
11.3.2 Retention Time Estimates Using Analytical Equations 11-25
11.4 Drinking Water Well Control Zones 11-28
11.5 Anti-Degradation Assessment 11-37
11.5.1 Assimilative Capacities 11-37
11.5.2 Geochemistry Effects 11-40
11.5.3 Impacts on Contaminant Plumes 11-43
11.5.4 Maximum Benefit Analysis 11-43
11.5.5 Groundwater Quality Effects Summary 11-45
Section 12: Response Retention Time 12-1
12.1 Proposed RRT Concept 12-1
12.1.1 Time Necessary to Test Water Quality and Obtain Results 12-2
12.1.2 Time Necessary to Coordinate with Regulatory Agencies 12-5
12.1.3 Time Necessary to Provide an Alternative Safe Source of Drinking Water 12-5
12.2 Proposed RRT 12-7
Section 13: Contingency Plan 13-1
13.1 SC WWTF Upset 13-1
13.2 Tertiary Treatment Facility Upset 13-2
13.3 AWPF Upset 13-2
13.4 Power Failure 13-3
13.5 Alternative Water Source 13-4
Section 14: Monitoring and Reporting Program 14-1
14.1 General Monitoring Provisions 14-1
14.1.1 Monitoring Locations 14-1
14.1.2 Flow 14-5
14.1.3 Sampling and Laboratory Analyses 14-5
14.2 AWPF Feedwater Monitoring 14-7

14.3 Treatment Process Performance Monitoring 14-7
14.3.1 MF Treatment Monitoring for Pathogen Control 14-8
14.3.2 RO Treatment Monitoring for Pathogen Control 14-8
14.3.3 UV-AOP Treatment Monitoring for Pathogen Control 14-9
14.3.4 Summary of Pathogen Control Monitoring 14-9
14.3.5 UV-AOP Treatment Performance Monitoring 14-9
14.4 Purified Water Monitoring 14-9
14.4.1 Total Organic Carbon and Total Nitrogen Compliance Monitoring 14-11
14.4.2 Regulated Contaminants Monitoring 14-11
14.4.3 Contaminants with Notification Levels Monitoring 14-11
14.4.4 Remaining Priority Toxic Pollutants Monitoring 14-11
14.4.5 Recycled Water Policy CECs and Surrogates 14-24
14.4.6 Non-Potable Recycled Water Monitoring 14-26
14.5 Groundwater Monitoring 14-26
14.5.1 Background Monitoring 14-43
14.5.2 Operational Monitoring 14-45
14.6 Records and Reporting 14-52
14.6.1 Monitoring Reports 14-52
14.6.2 Annual Report 14-52
14.6.3 Engineering Report Update 14-53
14.7 Preliminary Tracer Study Approach 14-53
Section 15: General Operations Plan 15-1
15.1 Inter-Facility Coordination 15-2
15.2 Operation Optimization Plan 15-3
15.3 TTF and AWPF System Communication and Controls 15-5
15.3.1 Automation and Controls 15-5
15.3.2 Planned Reliability and Redundancy 15-6
15.3.3 Treatment Robustness 15-8
15.4 Operational Strategies, Monitoring, and Diversion of Off-Specification Water 15-9
15.4.1 AWPF Operational Strategies 15-10
15.4.2 SWIP Well Operational Strategies 15-21
15.5 Notification Procedures 15-21
15.6 Training 15-22
15.7 AWPF Preliminary Staffing Plan 15-23
Section 16: Technical Managerial and Financial Capacity 16-1
16.1 Background 16-1
16.2 Technical Capacity 16-1
16.2.1 Consolidation Feasibility 16-2
16.2.2 System Description 16-2
16.2.3 Certified Operators 16-3

16.2.4 Source Capacity Assessment 16-4
16.2.5 Operations Plan 16-4
16.2.6 Training 16-5
16.3 Managerial Capacity 16-5
16.3.1 Ownership 16-5
16.3.2 Water Rights 16-6
16.3.3 Governance and Organizational Structure 16-6
16.3.4 Emergency Response 16-6
16.3.5 Policies 16-8
16.4 Financial Capacity 16-8
16.4.1 Budget Projections/Capital Improvement Plan 16-9
16.4.2 Budget Controls and Audits 16-10
Section 17: References 17-1
Appendix A: Public Hearing Documentation ..... A
Appendix B: City of Santa Cruz Wastewater Treatment Plant Pretreatment Program 2021 Annual Report ..... B
Appendix C: Process Flow Diagrams and Process and Instrumentation Diagrams C
Appendix D: MF Approval Letters ..... D
Appendix E: Pure Water Soquel Phase 2 Modeling Report ..... E
Appendix F: Final Phase II Potential Injection Aquifer Geochemical Characterization Report ..... F
Appendix G: Final Phase III Potential Injection Aquifer Geochemical Characterization Report ..... G
Appendix H: Tracer Study Preliminary Plan ..... H
Appendix I: Injection Well Site Typical Process and Instrumentation Diagram I

List of Figures

Figure 1-1. Average daily influent wastewater flows from 2015-19 1-4
Figure 1-2. PWS facilities 1-8
Figure 1-3. PWS overall process flow diagram 1-9
Figure 1-4. Seawater intrusion risk in Basin 1-14
Figure 1-5. Project flow schematic with monitoring points 1-19
Figure 2-1. PWS facilities 2-6
Figure 4-1. Water and sanitation service areas 4-1
Figure 4-2. Average daily influent wastewater flows 4-3
Figure 4-3. SC WWTF average annual influent flows 4-4
Figure 4-4. City sanitary sewer system 4-19
Figure 4-5. SCCSD collection area 4-20

Figure 4-6. City of SC WWTF schematic 4-21
Figure 4-7. SC WWTF site plan 4-22
Figure 5-1. PWS facilities overview 5-3
Figure 5-2. PWS process flow diagram 5-4
Figure 5-3. Annual average daily secondary effluent flow by hour discharged to Monterey Bay 5-5
Figure 5-4. TTF layout 5-7
Figure 5-5. PWS Conveyance and TTF pipe routing and facilities at SCWWTF 5-8
Figure 5-6. Chanticleer AWPF basic process flow schematic 5-12
Figure 5-7. Chanticleer site layout (not to scale) 5-13
Figure 5-8. Chanticleer main process layout 5-14
Figure 5-9. As-built diagram for TLC SWIP well 5-59
Figure 5-10. As-built diagram for Willowbrook SWIP well 5-60
Figure 5-11. As-built diagram of Monterey SWIP well 5-61
Figure 5-12. Conceptual design for monitoring wells 5-63
Figure 7-1. Engineering report organization 7-2
Figure 10-1. Aquifer and aquitard distribution in Santa Cruz Mid-County Basin and cross-section locations (adapted from MGA, 2019) 10-2
Figure 10-2. Santa Cruz Mid-County Basin Hydrostratigraphic cross-section, A-A' (MGA, 2019) 10-4
Figure 10-3. Santa Cruz Mid-County Basin Hydrostratigraphic cross-section, B-B' (MGA, 2019) 10-5
Figure 10-4. Surface water features in Santa Cruz Mid-County Basin (adapted from MGA, 2019) 10-6
Figure 10-5. Seawater intrusion risk in the Santa Cruz Mid-County Basin 10-8
Figure 10-6. Location of cross-sections in Project area 10-12
Figure 10-7. Cross-section A-A' based on Basin model layer elevations 10-13
Figure 10-8. Cross-section B-B' based on Santa Cruz Mid-County Basin model layer elevations 10-14
Figure 10-9. Groundwater elevation contours in Purisima A and AA-unit, fall 2019 10-16
Figure 10-10. Groundwater elevation contours in Purisima BC-unit, fall 2019 10-17
Figure 10-11. Geotracker sites near Project area, 2018 10-22
Figure 10-12. Location of SWIP wells, Municipal production wells, and identified private wells 10-27
Figure 11-1. Schematic PWS pumping and recharge distribution 11-3
Figure 11-2. Simulated baseline (no recharge at SWIP Wells) groundwater elevations (ft msl) in Purisima BC unit, September 30, 2025 11-7
Figure 11-3. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima A unit, September 30, 2025 11-8
Figure 11-4. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima BC unit, September 30, 2047 11-9

Figure 11-5. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima A unit, September 30, 2047 11-10
Figure 11-6. Simulated PWS groundwater elevations (ft msl) in Purisima BC unit, September 30, 2025 11-11
Figure 11-7. Simulated PWS groundwater elevations (ft msl) in Purisima A unit, September 30, 2025 11-12
Figure 11-8. Simulated PWS groundwater elevations (ft msl) in Purisima BC unit, September 30, 2047 11-13
Figure 11-9. Simulated PWS groundwater elevations (ft msl) in Purisima A unit, September 30, 2047 11-14
Figure 11-10. MODPATH particle tracking in Purisima BC unit, end of water year 2047 11-17
Figure 11-11. MODPATH particle tracking in Purisima A unit, end of water year 2047 11-18
Figure 11-12. Refined particle tracking results in Purisima BC unit (Layer 5) 11-23
Figure 11-13. Refined particle tracking results in Purisima A unit (Layer 7) 11-24
Figure 11-14. Primary and secondary well construction control zones for TLC SWIP well in Purisima BC unit 11-30
Figure 11-15. Primary and secondary well construction control zones for TLC SWIP well in Purisima A unit 11-31
Figure 11-16. Primary and secondary well construction control zones for Willowbrook SWIP well in Purisima A unit 11-32
Figure 11-17. Primary and secondary well construction control zones for Monterey SWIP well in Purisima A unit 11-33
Figure 11-18. Hydrogeologic Cross-section for TLC SWIP Well and Pine Tree Lane MWC Well 11-34
Figure 11-19. Hydrogeologic Cross-section for Willowbrook SWIP Well and Abbey Rd. Well 11-35
Figure 11-20. Classification of constituents and potential mobility 11-41
Figure 13-1. Diversion points at SC WWTF and Chanticleer AWPF 13-1
Figure 14-1. PWS project flow schematic with monitoring points 14-2
Figure 14-2. Proposed background (blue circle) monitoring wells 14-44
Figure 14-3. Monterey SWIP well travel time contours and potential monitoring well locations 14-46
Figure 14-4. Willowbrook SWIP Well travel time contours and potential monitoring well locations 14-48
Figure 14-5. TLC SWIP well travel time contours and potential monitoring well locations (Purisima A Unit) 14-50
Figure 14-6. TLC SWIP well travel time contours and potential monitoring well locations (Purisima BC Unit) 14-51
Figure 15-1. AWPF facility startup timeline 15-2

List of Tables

Table 1-1. Range of Historical SC WWTF Influent Water Quality during 2015-19 Timeframe 1-5
Table 1-2. Summary of Water Quality Objectives 1-11
Table 1-3. Pathogen Log-Reduction Credit Summary 1-12
Table 2-1 Pure Water Soquel Project Participants 2-2
Table 3-1. Summary of Existing Beneficial Uses of Water in the Pure Water Soquel Project Area 3-10
Table 3-2. Water Quality Objectives for Agricultural Water Use 3-11
Table 4-1. City Landfill Wastewater Discharge Monitoring Requirements 4-2
Table 4-2. Historical SC WWTP Influent Flows (mgd) 4-3
Table 4-3. Historical SC WWTF Influent TOC 4-4
Table 4-4. Historical SC WWTF Influent TSS 4-5
Table 4-5. Historical SC WWTF Influent Calculated BOD 4-5
Table 4-6. Historical SC WWTF Influent NH_3-N 4-5
Table 4-7. Historical SC WWTF Influent NO_3-N 4-5
Table 4-8. Historical SC WWTF Influent PO_4 4-5
Table 4-9. SC WWTF Influent Inorganic Priority and Other Trace Pollutants (2015-2019) 4-6
Table 4-10. SC WWTF Influent Detected Organic Priority and Other Trace Pollutants (2015-2019) 4-7
Table 4-11. SC WWTF Influent ND Organic Priority Pollutants (2015-19) 4-8
Table 4-12. SC WWTF Sewershed Commercial and Industrial Users Inventory 4-13
Table 4-13. SC WWTF Industrial Users Inventory 4-14
Table 4-14. SC WWTF Sewershed Local Limits 4-15
Table 4-15. Current SC WWTF NPDES Effluent Limitations for Conventional Pollutants 4-23
Table 4-16. SC WWTF Toxic Pollutants Effluent Limitations for Protection of Marine Aquatic Life 4-24
Table 4-17. SC WWTF Toxic Pollutant Limitations for Protection of Human Health 4-25
Table 4-18. SC WWTF NPDES Percent Removals 4-27
Table 4-19. Ocean Plan Receiving Water Standards 4-27
Table 4-20. NPDES Bacteria Daily Maximum Density 4-28
Table 5-1. Summary of Treatment Strategy 5-5
Table 5-2. TTF Descriptions 5-6
Table 5-3. Summary of TTF Design Capacities 5-9
Table 5-4. SWPS Design Criteria 5-9
Table 5-5. Source Water Strainers Design Criteria 5-10
Table 5-6. Sodium Hypochlorite Storage and Feed System Design Criteria 5-10

Table 5-7. AWPF Process Flow Summary 5-15
Table 5-8. Ozone Influent Water Quality 5-16
Table 5-9. LOX Storage Tank Design Criteria 5-17
Table 5-10. LOX Vaporizers Design Criteria 5-17
Table 5-11. GOX Filters and Pressure Control Design Criteria 5-17
Table 5-12. Ozone Generator Design Criteria 5-18
Table 5-13. Nitrogen System Design Criteria 5-18
Table 5-14. Ozone Generation Cooling System Design Criteria 5-19
Table 5-15. Ozone Dissolution System Design Criteria 5-19
Table 5-16. Off-Gas Destruct System Design Criteria 5-20
Table 5-17. Ozone Contact Tank Design Criteria 5-21
Table 5-18. MF Influent Water Quality 5-22
Table 5-19. MF System Filtrate Water Quality Goals 5-22
Table 5-20. MF Feed Tank Design Criteria 5-23
Table 5-21. MF Feed Pumps Design Criteria 5-23
Table 5-22. MF Automatic Strainers Design Criteria 5-24
Table 5-23. MF Racks Design Criteria 5-25
Table 5-24. MF Backwash System Design Criteria 5-26
Table 5-25. MF Air Scour Design Criteria 5-26
Table 5-26. Compressed Air System Design Criteria 5-27
Table 5-27. MF CIP System Design Criteria 5-28
Table 5-28. Assumed RO Influent Water Quality 5-29
Table 5-29. RO System Permeate Water Quality Goals 5-30
Table 5-30. RO Feed Tank Design Criteria 5-30
Table 5-31. Low Pressure RO Transfer Pumps Design Criteria 5-30
Table 5-32. Cartridge Filter System Design Criteria 5-31
Table 5-33. High Pressure RO Feed Pumps Design Criteria 5-31
Table 5-34. RO System Design Criteria 5-32
Table 5-35. RO CIP System Design Criteria 5-33
Table 5-36. RO Flush System Design Criteria 5-34
Table 5-37. UV-AOP Feed Water Quality 5-35
Table 5-38. UV-AOP Water Quality Goals 5-36
Table 5-39. Oxidant Feed System Design Criteria 5-36
Table 5-40. UV Light System Design Criteria 5-37

Table 5-41. Post Treatment Stabilization Influent Water Quality....5-38
Table 5-42. Post Treatment Stabilization Water Quality Goals....5-39
Table 5-43. Decarbonation Tower Design Criteria....5-39
Table 5-44. Sodium Hypochlorite Storage and Feed System Design Criteria....5-40
Table 5-45. Sodium Bisulfite Storage and Feed System Design Criteria....5-43
Table 5-46. Citric Acid Storage and Feed System Design Criteria....5-45
Table 5-47. Sodium Hydroxide Storage and Feed System Design Criteria....5-46
Table 5-48. Sulfuric Acid Storage and Feed System Design Criteria....5-49
Table 5-49. Anti-Scalant Storage and Feed System Design Criteria....5-51
Table 5-50. Hydrogen Peroxide Storage and Feed System Design Criteria....5-52
Table 5-51. Calcium Chloride Storage and Feed System Design Criteria....5-53
Table 5-52. Summary of Residual Flows to ROC Wet Well....5-54
Table 5-53. Summary of Residual Flows to Sewer....5-54
Table 5-54. Sanitary Lift Station Design Criteria....5-55
Table 5-55. Sanitary Lift Station Wet Well Design Criteria....5-55
Table 5-56. ROC Wet Well Design Criteria....5-55
Table 5-57. ROC Pipeline Design Criteria....5-56
Table 5-58. PWPS Design Criteria....5-56
Table 5-59. Purified Water Tank Design Criteria....5-57
Table 5-60. Purified Water Pipeline Design Criteria....5-57
Table 5-61. Planned Monitoring Well Location Characteristics....5-62
Table 6-1. Constituents with Primary MCLs....6-2
Table 6-2. Constituents with sMCLs....6-5
Table 6-3. Lead and Copper....6-5
Table 6-4. Constituents with NLs....6-6
Table 6-5. TOC....6-7
Table 6-6. Total Nitrogen....6-8
Table 6-7. Other Organic Priority Pollutants....6-8
Table 6-9. Recycled Water Policy Constituents....6-13
Table 6-10. Other Monitored Constituents....6-13
Table 8-1. Summary of Water Quality Objectives....8-1
Table 8-2. Inorganic Primary MCL Exceedances in SC WWTF Secondary Effluent....8-3
Table 8-3. Secondary MCL Exceedances in SC WWTF Secondary Effluent....8-4
Table 8-4. Notification Level Exceedances in SC WWTF Secondary Effluent....8-5

Table 8-5. Maximum NDMA Concentration Through the AWPF from M1W's Piloting (Trussell 2016) 8-5
Table 8-6. Guidelines for Interpretation of Quality of Water for Irrigation 8-8
Table 8-7. Water Quality Objectives for Agricultural Water Use 8-8
Table 8-8. Recycled Water Policy Constituents 8-10
Table 8-9. Bioanalytical Screening Tool Equivalency Agonists and MTLs 8-10
Table 9-1. RO LRV Determination 9-4
Table 9-2. UV Dose Requirements (mJ/cm2) for Log Inactivation Credit 9-5
Table 9-3. Pathogen Log-Reduction Credit Summary 9-7
Table 10-1. Aquifer and Aquitard Units of Santa Cruz Mid-County Basin 10-3
Table 10-2. Santa Cruz Mid-County Basin Groundwater Budget Summary, 2010-15 (MGA, 2019) 10-19
Table 11-1. Model Layers and Hydrostratigraphic Units 11-2
Table 11-2. PWS Scenario Pumping and Recharge Redistribution by Well 11-4
Table 11-3. Volumes of Purified Water Recharged and Particle Distribution Used in MODPATH 11-15
Table 11-4. Estimated Total Amount of Purified Water Captured at Wells through end of Water Year 2047 11-20
Table 11-5. Fate of Purified Water through End of Water Year 2047 by Aquifer Unit 11-21
Table 11-6. Estimates of Retention Times Based on Analytical Equations for Retention Times Beyond 36 Months 11-26
Table 11-7. Estimates of Retention Times Based on Analytical Equations to Evaluate Range of Recharge Rates at SWIP Wells 11-27
Table 11-8. Estimates of Retention Times for Range of Recharge Rates at SWIP Wells 11-27
Table 11-9. Relevant Groundwater Quality Objectives and Existing and Historical Concentrations 11-38
Table 11-10. Salt and Nutrient Mass Totals and Assimilative Capacities 11-39
Table 11-11. Assimilative Capacity Usage Projection (2023–32) 11-39
Table 11-12. Estimated Effects on Production Well Salinity After Beginning of Capture 11-40
Table 11-13. Phase II Geochemical Characterization Laboratory Analysis 11-40
Table 12-1. Acute Parameters and Concentrations at which RRT Response Protocol Is Initiated 12-2
Table 12-2. Routine Monitoring Details for Acute Parameters in Purified Water 12-2
Table 12-3. Expedited Monitoring Details for Acute Parameters in Purified Water 12-3
Table 12-4. Summary of Estimated Underground Retention Times for Monitoring for RRT Compliance 12-3
Table 12-5. Summary of Longest Time Required to Identify and Confirm a Water Quality Problem 12-4
Table 12-6. Summary of Proposed Response Retention Time 12-8
Table 12-7. Comparison of Response Retention Times to Underground Retention Times 12-9
Table 14-1. Summary of Monitoring Stations 14-3
Table 14-2. Summary of Proposed Compliance Monitoring Program for Pure Water Soquel Project 14-4

Table 14-3. PWS Project Source Water Monitoring 14-7
Table 14-4. Pathogenic Microorganism Control for Groundwater Recharge 14-8
Table 14-5. Purified Water Monitoring Plan 14-10
Table 14-6. Inorganic Chemicals with Primary MCLs 14-12
Table 14-7. Radionuclides with Primary MCLs 14-13
Table 14-8. Organic Chemicals with Primary MCLs 14-14
Table 14-9. DBPs with Primary MCLs 14-17
Table 14-10. Lead and Copper ALs 14-17
Table 14-11. Acute Contaminants for RRT Compliancea 14-17
Table 14-12. Constituents and Parameters with sMCLs 14-18
Table 14-13. Chemicals with NLs 14-19
Table 14-14. Remaining Priority Toxic Pollutants 14-21
Table 14-15. Recycled Water Policy Constituents of Emerging Concern and Surrogates for Groundwater Recharge Reuse via Subsurface Applications 14-24
Table 14-16. Summary of Constituents in Groundwater Monitoring Program 14-26
Table 14-17. Primary Maximum Contaminant Levels (MCLs) 14-27
Table 14-18. sMCLs 14-34
Table 14-19. Priority Toxic Chemicals Not Previously Listed a,b 14-36
Table 14-20. Constituents with NLs 14-40
Table 14-21. Additional Parameters 14-42
Table 14-22. Proposed Monitoring Wells for Background and Operational Monitoring 14-43
Table 15-1. OOP Preliminary Table of Contents 15-4
Table 15-2. SC WWTF, AWPF and Wellfield Process Equipment Redundancies and Routine Maintenance Activities 15-7
Table 15-3. AWPF and Aquifer Treatment Process Robustness through Multiple Treatment Mechanisms 15-8
Table 15-4. Constituents of Concern Targeted by the Different Treatment Processes in the Overall Treatment Train 15-9
Table 15-5. SWPS Operating Levels 15-12
Table 15-6. Critical control point monitoring for the AWPF 15-13
Table 15 7. MF CCP monitoring for the AWPF 15-15
Table 15-8. RO CCP monitoring for the AWPF 15-17
Table 15-9. UV-AOP CCP monitoring for the AWPF 15-20
Table 15-10. SC WWTF, AWPF and Wellfield Process Equipment Redundancies and Routine Maintenance Activities 15-22
Table 16-1. SqCWD's values and culture 16-5

List of Abbreviations

AC	alternating current
AF	acre foot/feet
afy	acre-foot/feet per year
AGR	agricultural supply
AhR	aryl hydrocarbon receptor
ALs	action levels
AOP	advanced oxidation process
APN	assessor's parcel number
ASR	aquifer storage and recovery
ASTM	American Society of Testing Materials
ATS	Automatic Transfer Switch
AWPF	advanced water purification facility
AWT	advanced water treatment
Basin	Santa Cruz Mid-County Groundwater Basin
Basin Model	Santa Cruz Mid-County Groundwater Basin model
Basin Plan	Water Quality Control Plan for the Central Coastal Basin
BC	Brown and Caldwell
bgs	
BMPs	Best Management Practices
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
BODR	Basis of Design Report
$CaCO_3$	calcium carbonate
CAF	combined lamp aging and fouling
CBOD	calculated biochemical oxygen demand
CCPs	critical control points
CCR	California Code of Regulations
CDD	chlorinated dibenzodioxin
CDF	chlorinated dibenzofuran
CDPH	California Department of Public Health
CECs	contaminants of emerging concerns
CEQA	California Environmental Quality Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CFU	colony-forming unit
CIP	Capital Improvement Program
CIP	clean-in-place
City	City of Santa Cruz
CIU	Categorical Industrial User
CIWQS	California Integrated Water Quality System
cm	centimeter(s)
COPs	critical operational points
CPVC	chlorinated polyvinyl chloride
CWD	Central Water District
DBPs	disinfection byproducts
DDT	dichlorodiphenyltrichloroethane
DDW	Division of Drinking Water
DFA	Division of Financial Assistance
DLR	detection limit for reporting
DNQ	Detected, but Not Quantified
DoD	Department of Defense
DWR	Department of Water Resources
EC	electrical conductivity
EIR	Environmental Impact Report
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
ERP	Emergency Response Plan
ER-α	estrogen receptor-α
eSMRs	Electronic Self-Monitoring Reports
FAT	full advanced treatment
FOG	fats, oils, and grease
FRP	fiber reinforced plastic
ft	foot/feet
ft^2	square foot/feet

g/mol	gram-mole
gal	gallon(s)
gfd	gallon(s) per square foot per day
GFOA	Government Finance Officers Association
GOX	gaseous oxygen
gpd	gallon(s) per day
gph	gallon(s) per hour
gpm	gallon(s) per minute
GRRP	groundwater reuse replenishment projects
GSP	Groundwater Sustainability Plan
H	high
HH	high-high
HA-HCl	hydroxylamine-hydrochloride
HAA5	haloacetic acids
HCH	hexachlorocyclohexane
HDPE	high density poly ethylene
HMI	Human Machine Interface
HMX	cyclotetramethylene tetranitramine
I/O	input/output
IAP	Independent Advisory Panel
in	inch(es)
IND	industrial service supply
IPR	indirect potable reuse
kV	kilovolt(s)
kW	kilowatt(s)
L	low
lb/day	pound(s) per day
LL	low-low
LLL	low-low-low
LOX	liquid oxygen
LRL	lab reporting limit
LRV	log-reduction value
LSI	Langelier Saturation Index
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
LUFT	leaking underground fuel tanks
M	million
M&A	Montgomery & Associates
M1W	Monterey One Water
Max	maximum
MBAS	methylene blue active substances (foaming agents)
MCLs	maximum contaminant levels
MDL	Method Detection Limit
MECs	measured environmental concentrations
Med	median
MF	membrane filtration
mg/L	milligram(s) per liter
MGA	Santa Cruz Mid-County Groundwater Agency
mgd	million gallons per day
MIBK	methyl isobutyl ketone
min	minute(s)
MIT	membrane integrity testing
mJ/cm^2	millijoule(s) per square centimeter
mL	milliliter(s)
ML	Minimum Level
mm	millimeter(s)
MPN	most probable number
MRP	Monitoring and Reporting Program
msl	mean sea level
MT	minimum thresholds
MTBE	methyl-t-butyl ether
MTLs	monitoring trigger levels
MUN	municipal and domestic water supplies
MW	maintenance wash
MWMP	Meteoric Water Mobility Procedure
N	nitrogen
N/A	not applicable
nBAF	nitrifying biological aerated filtration
ND	non-detected
NDEA	N-Nitrosodiethylamine
NDMA	N-Nitrosodimethylamine

NDPA	N-Nitrosodi-n-propylamine
ng/L	nanogram(s) per liter
NH_3-N	ammonia-nitrogen
NLs	notification levels
NMOR	N-Nitrosomorpholine
NO_2-N	nitrite-nitrogen
NO_3-N	nitrate-nitrogen
NPDES	National Pollutant Discharge Elimination System
NPR	non-potable reuse
NS	insufficient samples
NSF	National Science Foundation
NTU	Nephelometric Turbidity unit
NWRI	National Water Research Institute
O&M	operations and maintenance
OCWD	Orange County Water District
OMAR	Operation and Maintenance at Risk
OOP	Operations Optimization Plan
ORP	oxidation-reduction potential
OSS	Ozone System Supplier
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter
PCS	Plant Control System
PDT	pressure decay test
PE	polyethylene
PFAS	polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexane sulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFR	pipeline flash reactor
PFTA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnA	perfluoroundecanoic acid
PG&E	Pacific Gas and Electric
PLC	Programmable Logic Controllers
PO_4	phosphate
PPCPs	pharmaceuticals and personal care products
PRMS	Precipitation-Runoff Modeling System
psi	pound per square inch
psia	atmospheric pressure
psig	pounds per square gauge
PTFE	polytetrafluoroethylene
PUC	Public Utilities Commission
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
PVWMA	Pajaro Valley Water Management Agency
PWM	Pure Water Monterey
PWPS	Purified Water Storage Tank and Pump Station
PWS Project	Pure Water Soquel: Replenishing Mid-County Groundwater & Preventing Further Seawater Intrusion Project
PWS	Pure Water Soquel
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RDLs	Reportable Detection Limits
RDX	cyclotrimethylene tetranitramine
Recycled Water Policy	SWRCB Water Quality Control Policy for Recycled Water
RIO	Remote I/O Units
RL	reporting limit
RO	reverse osmosis
ROC	RO concentrate
RRT	Response Retention Time
RSC	Risk Science Center

RWC_{max}	maximum allowable Recycled Municipal Wastewater Contribution
RWQCB	Regional Water Quality Control Board
Santa Cruz NPR Project	Santa Cruz Non-Potable Reuse Project
SAR	sodium adsorption ratio
SC WWTF	Santa Cruz Wastewater Treatment Facility
SCADA	Supervisory Control and Data Acquisition
SCCSD	Santa Cruz County Sanitation District
SCWD	City of Santa Cruz Water Department
sec	second(s)
SGMA	Sustainable Groundwater Management Act
Silvex	2,4,5-TP
SIUs	Significant Industrial Users
SLIC	Spills-Leaks-Investigations-Cleanups
sMCLs	Secondary MCLs
SNC	Significant Non-Compliance
SNMP	Salt and Nutrient Management Plan
scfh	standard cubic feet per minute
scfm	standard cubic feet per hour
SOCs	synthetic organic chemicals
SOPs	standard operating procedures
SqCWD	Soquel Creek Water District
SWIP	Seawater Intrusion Prevention
SWPS	Source Water Pump Station
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TAC	Technical Advisory Committee
TBA	tertiary butyl alcohol
TBD	to be determined
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCP	1,2,3-trichloropropane
TDS	total dissolved solids
Title 22	Title 22 Water Recycling Criteria
TKN	Total Kjeldahl Nitrogen
TLC	Twin Lakes Church
TMF	technical, managerial, and financial
TMP	transmembrane pressure
TN	total nitrogen
TNT	2,4,6-trinitrotoluene
TOC	total organic carbon
TP	trichlorophenol
TPH	Total Petroleum Hydrocarbons
TSS	total suspended solids
TTF	Tertiary Treatment Facility
TTHM	trihalomethanes
TTO	Total Toxic Organics
TUa	acute toxicity units
TUc	chronic toxicity units
UCL	upper control limit
UCMR	Unregulated Contaminant Monitoring Rule
UIC	underground injection control
UPS	Uninterruptible Power Supplies
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UV	ultraviolet
UV-AOP	UV light-based AOP with hydrogen peroxide
UVT	UV Transmittance
UZF	Unsaturated Zone Flow
VOCs	volatile organic chemicals
W	watt(s)
WC	water column
WCR	well completion report
WDRs	Waste Discharge Requirements
WHO	World Health Organization
WIFIA	Water infrastructure Finance and Innovation Act
WRRs	Water Reclamation Requirements
µg/L	microgram(s) per liter
µS	microsecond(s)

Section 1: Executive Summary

The objective of the Pure Water Soquel: Replenishing Mid-County Groundwater and Preventing Further Seawater Intrusion Project (Pure Water Soquel, PWS or PWS Project) is to replenish the local Santa Cruz Mid-County Groundwater Basin (Basin) with purified water to help prevent further seawater intrusion into the groundwater basin. The PWS Project will develop a drought-resistant supplemental water source to diversify Soquel Creek Water District's (SqCWD) water supply portfolio adding resiliency, reliability, and aiding in the sustainability of the Basin. By recharging purified water into the Basin, overall quality and safety of the water supply will be improved for the customers of SqCWD, as well as other municipal pumpers and private well users, who rely on the Basin.

1.1 Report Overview

The purpose of the Pure Water Soquel Engineering Report is to present detailed information on the PWS Project and the overall plan for compliance with the California Code of Regulations (CCR) Title 22 Water Recycling Criteria (Title 22) for groundwater replenishment by subsurface application (CCR, 2018). Per Article 7 of the Title 22, the Pure Water Soquel Engineering Report must be approved by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW), forming the basis for drafting of Waste Discharge Requirements/Water Reclamation Requirements (WDRs/WRRs) by the Central Coast Regional Water Quality Control Board (RWQCB) for the PWS Project.

Non-potable reuse (NPR) water facilities will also be constructed at the Santa Cruz Wastewater Treatment Facility (SC WWTF) to provide the City of Santa Cruz (City) with disinfected tertiary non-potable recycled water. This portion of the work is known as the Santa Cruz Non-Potable Reuse Project (Santa Cruz NPR Project), which is being constructed as part of the SqCWD's overall program efforts.

Separate Title 22 Engineering Reports are being prepared to facilitate SWRCB review, as follows:

- Pure Water Soquel Engineering Report, for conditional approval of the PWS Project for water recycling requirements intended for indirect potable reuse through groundwater recharge (this document).
- City of Santa Cruz Non-Potable Reuse Engineering Report, for conditional approval of the Santa Cruz NPR Project within an updated National Pollutant Discharge Elimination System (NPDES) permit encompassing these facilities (separate engineering report submittal).

Because of shared facilities and the collaborative nature of both projects, the separate City of Santa Cruz Non-Potable Reuse Engineering Report is referenced within this Pure Water Soquel Engineering Report.

1.2 PWS Project Overview

The PWS Project is designed to produce a total annual average of 1,500 acre-feet per year (afy), or approximately 1.3 million gallons per day (mgd), of purified water to replenish the Basin and is scheduled to be constructed by the middle of 2023 and operational by the beginning of 2024. The PWS Project aims to prevent further seawater intrusion and will increase water supply reliability for SqCWD's only water supply source.

Santa Cruz NPR Project facilities will be built concurrently with the PWS Project; design details for the Santa Cruz NPR Project facilities are not included in this Pure Water Soquel Engineering Report but are described separately in the City of Santa Cruz Non-Potable Reuse Engineering Report.

1.2.1 PWS Project Partners

PWS is being sponsored and implemented by SqCWD in partnership with the City. The City entered into an agreement with SqCWD on July 19, 2019 to provide secondary effluent from the SC WWTF as the supply to SqCWD's planned Tertiary Treatment Facility (TTF), which includes the Source Water Pump Station (SWPS) that will feed the advanced water purification facility (AWPF) (SqCWD, 2019).

1.2.2 PWS Project Goals

The primary goal of the PWS Project is to produce up to 1,500 afy of purified water from the SC WWTF secondary effluent for groundwater replenishment intended to prevent further seawater intrusion and improve the Basin's reliability as a water supply. The sustainable water supply will allow for a reliable, drought-resistant supplemental water source for SqCWD's customers. Additional environmental benefits to the surface and marine water as well as a more diverse water supply portfolio will also be achieved through completion of the PWS Project. Public outreach, participation, and education is a large goal for the PWS Project. SqCWD emphasizes the importance of the inclusion of the public and the ability to educate and inform the public.

1.2.3 Public Outreach

SqCWD recognizes and embraces the concept that the local water supply challenges can only be addressed through an honest and productive partnership with the community and interested parties. This belief is shared and implemented at all levels of the organization. Thus, extensive efforts are being made to educate the public. The focus of education revolves around the value of groundwater recharge, the safety within the technologies involved in advanced water purification, and the sustainability the PWS Project provides for the water source. These efforts include an award-winning Mobile Educational Trailer that is used at local events to educate the public about the advanced treatment processes and the need for the PWS Project.

SqCWD has conducted community surveys, most recently in early 2020, to gain insight into the public's awareness, perception, and understanding of SqCWD, local water challenges, and the PWS Project. The surveys confirm that customers have broadly positive views of SqCWD, and trust SqCWD to take urgent action to address water quality and supply issues. The most recent survey also confirms that people are comfortable with the water purification process used in PWS once it is described to them and, more specifically, they are comfortable with using purified recycled water for a variety of uses, including drinking water.

SqCWD's public outreach efforts – utilizing tools such as videos, fact sheets, email newsletters, and more – have increasingly focused on the PWS Project. As PWS moves into its construction phase, SqCWD continues to offer additional means of engaging the community, such as public ribbon-cutting ceremonies and public information meetings to continue to build open communication and trust with the community.

Once the PWS facilities are complete and operational, SqCWD will build on its current outreach program and develop a Learning Center at the new purification facility at Chanticleer highlighting the purification process being used in this setting. This will include tours of the AWPF and various visuals to educate community members on the history, technology, and broad use of purification processes here and around the world.

1.2.4 Independent Advisory Panel

A National Water Research Institute (NWRI) panel for third-party review was formed for evaluation of the PWS Project. This Independent Advisory Panel (IAP) consisted of seven technical and scientific experts from relevant disciplines pertaining to the PWS Project including: groundwater replenishment, recycled water, water science, advanced treatment technologies, public health, and risk assessment. The IAP concluded that, with the understanding of the state and federal drinking water regulations, quality of the secondary effluent from SC WWTF, and proven advanced treatment technologies, "the Project is plausible, feasible, and protective of public health." This finding is documented in a report prepared by the NWRI in December 2017 and available on SqCWD's website (NWRI, 2017).

1.2.5 Technical Advisory Committee

As part of the PWS Project's development, SqCWD received a SWRCB Prop 1 Groundwater Planning Grant for $2 million (M) in 2018, which included the formation of a Technical Advisory Committee (TAC) to provide input on the grant deliverables. The Planning Grant TAC was comprised of staff representatives from the SWRCB DDW, RWQCB, Division of Financial Assistance (DFA), and a local water agency, Pajaro Valley Water Management Agency (PVWMA).

With the award of the SWRCB Prop 1 Groundwater Implementation Grant for $50M in 2020, the TAC is being maintained to provide input on the grant deliverables. The Implementation Grant TAC is comprised of staff representatives from the SWRCB DDW, RWQCB, the Department of Water Resources (DWR), and the DFA.

1.3 Regulatory Requirements

In California, recycled water production and use are regulated by the SWRCB DDW and RWQCB. Regulations governing recycled water and pertaining to the PWS Project are summarized in Section 3 of this Engineering Report.

Water recycling, including groundwater reuse replenishment projects (GRRP) such as PWS, is regulated by Title 22, Division 4, Chapter 3 of the CCR (CCR, 2018). Title 22 Water Recycling Criteria are developed and administered by the DDW. For subsurface application projects such as this PWS Project (Title 22, Article 5.2), the full volume of recycled water applied must receive advanced treatment that consists of reverse osmosis (RO) and an advanced oxidation process (AOP). The regulations establish RO and AOP performance criteria and include requirements for wastewater source control, pathogen control, chemical control, response retention time (RRT), water quality criteria and monitoring.

1.4 Source Wastewater

The SC WWTF will provide secondary effluent (referred to as source water throughout this Engineering Report) for purification for the PWS Seawater Intrusion Prevention (SWIP) wells and for production of tertiary disinfected recycled water for City in-plant and other non-potable uses.

1.4.1 Sewershed Description

The City owns and operates a wastewater collection, treatment, and disposal system that provides sewerage service for the City and areas of the Santa Cruz County Sanitation District (SCCSD), which includes the communities of Live Oak, Capitola, Soquel and sections of Aptos. It also receives dry weather urban runoff diverted from Neary Lagoon. The City collection system conveys municipal wastewater

generated within the City limits to the SC WWTF via 160 miles of wastewater mains and 34 pumping stations for treatment at the SC WWTF. The SCCSD collection system has 180 miles of gravity sanitary sewer lines, 20 miles of force mains and 35 pump stations, all of which discharge untreated municipal wastewater to the SC WWTF (County of Santa Cruz, 2020). In 1990, the City of Santa Cruz and the SCCSD established a 50-year agreement enabling SCCSD to discharge up to 8 mgd of wastewater to the SC WWTF. Under its own separate NPDES permit, the City of Scotts Valley adds its treated wastewater to the SC WWTF's effluent for combined ocean discharge.

The wastewater conveyed from SCCSD makes up about 37 percent of SC WWTF influent flow. The SCCSD has an annual contract with the County of Santa Cruz Buena Vista Landfill for discharge of its leachate. The contract restricts the landfill discharge to 7,200 gallons per day (gpd) and it must comply with SCCSD wastewater quality limits. Additionally, SCCSD has an annual contract with the City of Capitola for collection of its dry weather urban runoff. This contract does not limit the amount of flow discharged into the SCCSD collection system.

1.4.2 Raw Wastewater Characteristics

Municipal wastewater generated within the City comprises about 63 percent of the total SC WWTF influent flow (2015–19 flow data). The remaining 37 percent is municipal wastewater piped from SCCSD. From 2015-19, the total daily wastewater influent flow averaged 8.48 mgd.

The sewershed experiences seasonal fluctuations with elevated wastewater flows from December to April (Wet Months) and reduced flows from May to November (Dry Months). The average daily influent flows are shown in **Figure 1-1**. In 2015, the City experienced severe drought, which forced implementation of conservation measures to reduce water consumption. Wastewater influent flows during this period represent the low-flow conditions for the system.

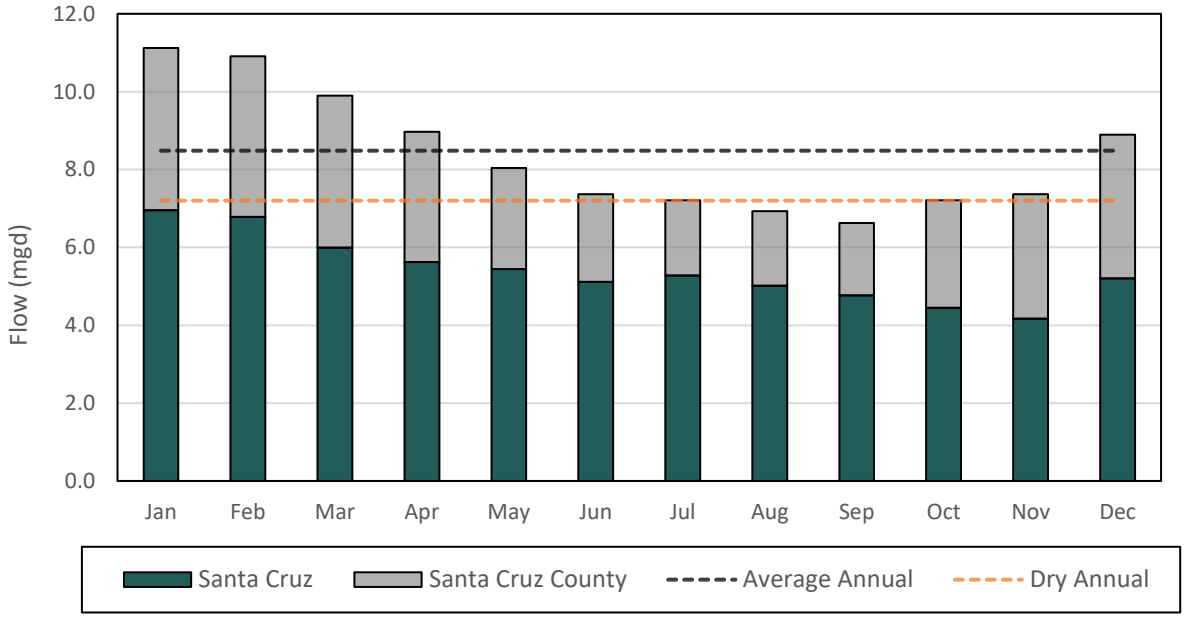

Figure 1-1. Average daily influent wastewater flows from 2015-19

The SC WWTF has conducted wastewater influent monitoring according to the RWQCB (Region III) Order No. R3-2017-0030 in compliance with the Standard Provisions and Reporting Requirements of their NPDES Permit. Both conventional and priority pollutants were analyzed by the City's and contracted laboratories using methods specified by the plant's NPDES permit (CA 0048194) and the Code of Federal Regulations (CFR) at 40 CFR 136; Table 1B. **Section 4** summarizes the historical wastewater quality ranges observed from 2015-19. The parameter calculated biochemical oxygen demand (BOD) (calculated BOD) is a computed value based on a correlation between total organic carbon (TOC) and BOD permitted by the SC WWTF NPDES permit (TOC milligrams per liter [mg/L] = 0.4141 (5-day BOD [BOD_5]; mg/L) + 4.3937). **Table 1-1** summarizes the range of historical annual influent water quality observed from 2015-19.

Table 1-1. Range of Historical SC WWTF Influent Water Quality during 2015-19 Timeframe

Parameter	TOC	TSS	Calculated BOD	NH_3-N	NO_3-N	PO_4
Daily average (mg/L)	119-148	293-445	255-322	39-48	0.56-1.16	8.7-11.3
Peak day (mg/L)	262-390	465-1064	597-886	51-66	3.0-10.2	12.4-25.6
Daily loading (lb/day)	813-967	2114-2619	1869-2227	254-283	4.2-11.4	61-71

Note. Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19
lb/day = pounds per day
NH_3-N = ammonia-nitrogen
NO_3-N = nitrate-nitrogen
PO_4 = phosphate
TSS = total suspended solids

1.4.3 Wastewater Source Control

The City administers an industrial pretreatment program (described in **Section 4.3** of this Engineering Report) in conformance with the United States Environmental Protection Agency (USEPA) pretreatment regulations set forth in the CFR, Section 40, Part 403 (40 CRF 403). Requirements for the City's existing industrial pretreatment program are specified in the SC WWTF permit issued by the Central Coast RWQCB:

- RWQCB Order No. R3-2017-0030, NPDES CA0048194 adopted on December 7, 2017, entitled "Waste Discharge Requirements for the City of Santa Cruz Wastewater Treatment Facility Discharge to the Pacific Ocean" (RWQCB, 2017).

The purpose of the City's current pretreatment program is to prevent waste discharges into the collection system that may have an adverse impact on treatment facility performance (e.g., ability to meet ocean discharge permit and recycled water requirements) or create hazardous conditions that may damage facilities or endanger workers and the public.

Per Title 22 Section 60320.206 (CCR, 2018), source wastewater supplied to a GRRP must be from a wastewater management agency that administers an industrial pretreatment and source control program that includes:

- An assessment of the fate of DDW- and RWQCB-specified chemicals and contaminants through the wastewater collection and recycled water treatment systems
- Provisions to investigate sources of and monitor for DDW- and RWQCB-specified chemicals and contaminants

- An outreach program to industrial, commercial, and residential communities within the Project sewershed for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source
- An up-to-date inventory of chemicals and contaminants that may be discharged into the wastewater collection system in the sewershed

The City and SqCWD work together to implement these program elements, as described in **Section 4.3.5** of this Engineering Report.

1.5 Project Facilities

The PWS Project includes the following facilities (see **Figure 1-2** and **Figure 1-3**):

- TTF at SC WWTF:
  - SWPS, pumping water to the AWPF and the Santa Cruz NPR Project facilities
  - Source water automatic strainers
  - Source water surge tank
  - Pigging stations
  - Santa Cruz NPR Project facilities, including cloth filter, Ultraviolet (UV) disinfection (The Santa Cruz TTF facilities are described in the City of Santa Cruz Non-potable Reuse Engineering Report.)
  - Chemical feed
  - Title 22 back-up storage tank and pump station
  - RO concentrate (ROC) pipeline connection to SC WWTF outfall Tunnel Portal, including additional bioassay/sampling panel equipment
  - Communications pole
- AWPF at Chanticleer:
  - Ozonation
  - Membrane filtration (MF), including automatic strainers
  - RO, including cartridge filters
  - UV light-based AOP with hydrogen peroxide (UV-AOP)
  - Decarbonators
  - Post treatment stabilization
  - Sanitary lift station (to convey minor AWPF waste streams to the local sewer; includes membrane cleaning and analyzer wastes and floor drain residuals)
  - Chemical storage and feed
  - ROC Wet Well (to convey major AWPF waste streams to the Outfall via the ROC Pipeline)
  - Purified Water Storage Tank and Pump Station (to convey stabilized product water to the Purified Water Pipeline and SWIP wells)
  - Operations and Control Room
  - Communications pole

- SWIP wells at Monterey, Willowbrook, and Twin Lakes Church (TLC) sites:
  - Wells and backwash system and facilities
  - Communication equipment
- Monitoring wells
- Conveyance:
  - Source Water pipeline: 16-inch pipe from SC WWTF conveying source water to the Chanticleer AWPF
  - ROC pipeline: 16-inch pipe from AWPF to SC WWTF conveying ROC, MF backwash waste, pre-MF automatic strainer waste, and off-specification water to the City's ocean outfall
  - Purified Water pipeline: 14-inch pipe from AWPF conveying purified water for recharge to the SWIP wells
  - Turnouts from the Purified Water pipeline conveying purified water for non-potable use (e.g., irrigation at the athletic fields near the TLC SWIP well site)

The Santa Cruz NPR Project facilities are described in greater detail in the City of Santa Cruz Non-Potable Reuse Engineering Report.

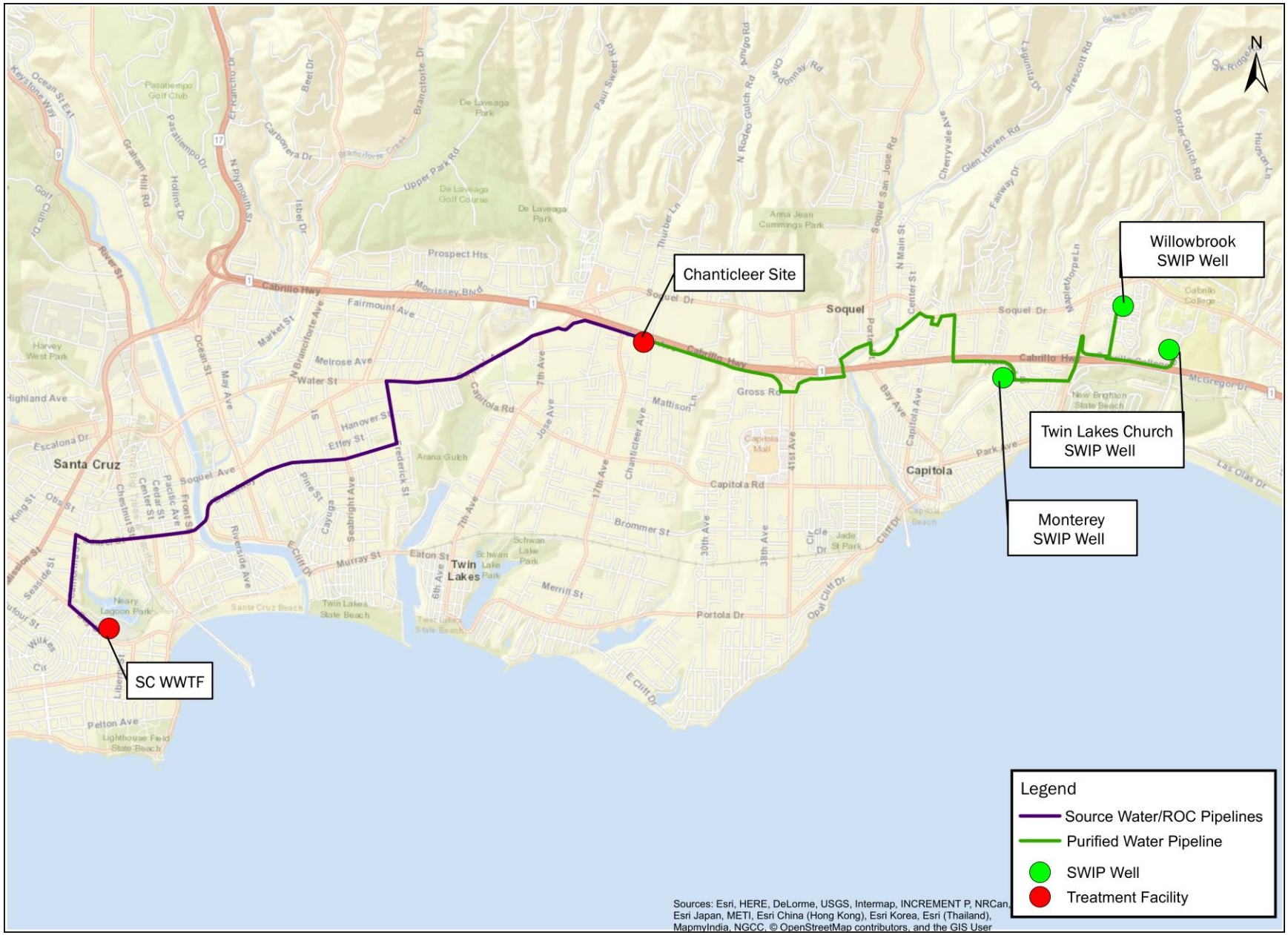

Figure 1-2. PWS facilities

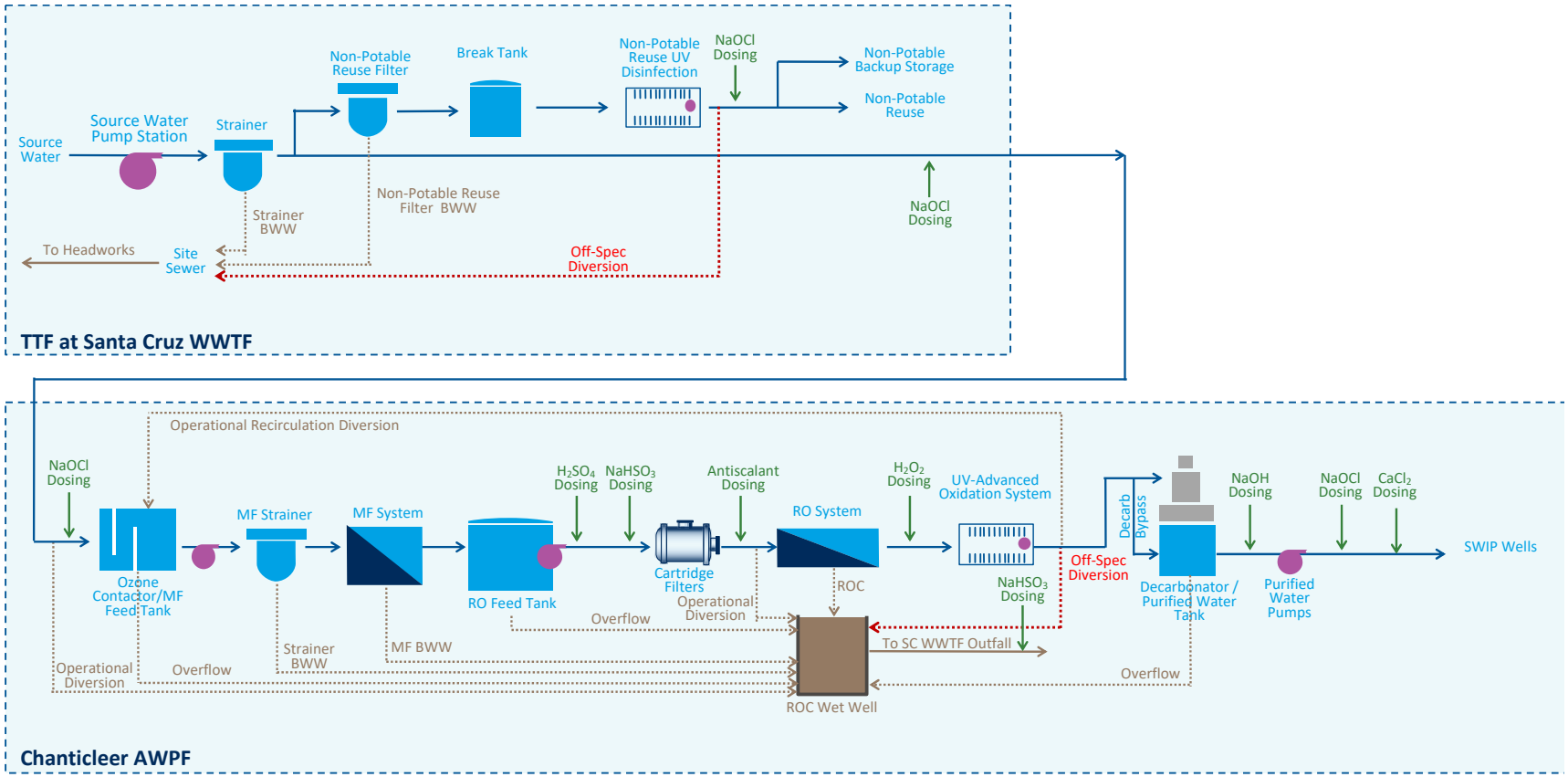

Figure 1-3. PWS overall process flow diagram

The SC WWTF secondary effluent will flow into the SWPS and be conveyed to the Chanticleer AWPF. A small portion of the SWPS flow will be treated at the Santa Cruz TTF by cloth disk filtration and UV disinfection to produce disinfected tertiary recycled water per Title 22 Section 60304, as part of the Santa Cruz NPR project. Design information for the Santa Cruz NPR Project is found in the City of Santa Cruz Non-Potable Reuse Engineering Report.

The source water conveyed to the AWPF at Chanticleer will be treated via ozonation, MF, RO, UV-AOP with hydrogen peroxide, and conditioning via post treatment stabilization prior to being pumped to the SWIP wells for groundwater recharge. Major AWPF waste streams, including ROC, MF strainer waste, and MF backwash waste will be conveyed back to the SC WWTF through the ROC pipeline prior to ocean discharge via the City's existing ocean outfall. Minor AWPF waste streams, including membrane cleaning and analyzer wastes and floor drain residuals, will be conveyed to the local sewer by the sanitary lift station. **Section 5** provides detailed descriptions of the TTF, AWPF facilities, conveyance and SWIP wells.

1.6 Secondary Effluent Water Quality

Historically collected secondary effluent water quality data was compiled and analyzed to determine the concentrations of key constituents. The secondary effluent water quality was assessed to understand the level of additional treatment required at the AWPF to produce a product water that meets the regulatory requirements described in **Section 3**. Secondary effluent water quality data for key constituents, including those with (1) maximum contaminant levels (MCLs) and notification levels (NLs), (2) lead and copper, (3) TOC, (4) total nitrogen, (5) priority pollutants, and (6) other monitored constituents were assessed. The majority of the constituents measured in the secondary effluent already meet the required concentration for the AWPF product water. **Section 6** describes the analysis approach and summarizes the secondary effluent water quality. **Section 8** focuses on the constituents identified in **Section 6** that require additional treatment at the AWPF to comply with the regulations, and describes the anticipated treatment achieved at the AWPF and the estimated concentrations of these key constituents in the AWPF product water.

1.7 Collaboration with the Santa Cruz NPR Project

The City is providing source water for PWS as part of a strategic partnership to meet water supply objectives for both agencies. For the City, one of those goals includes producing disinfected tertiary recycled water in compliance with Title 22. The Santa Cruz NPR Project is described in detail separately in the City of Santa Cruz Non-Potable Reuse Engineering Report. A brief summary is provided to describe the Santa Cruz NPR Project facilities that will be built by the design-builder that is constructing the PWS treatment facilities at the SC WWTF and at the Chanticleer site.

The SC WWTF currently produces recycled water that does not meet the definition of disinfected tertiary under Title 22 but does not distribute the water outside of the facility. The facility uses this recycled water on-site for operations and maintenance activities such as tank cleaning, chemical dilution, and providing water for on-site pump seals. On average, the on-site recycled water demand is approximately 126,000 gpd with peak demands of approximately 193,000 gpd. On-site recycled water use has reduced the SC WWTF potable water demand by about 90 percent.

Recycled water production is being expanded to provide 324,000 gpd of Title 22 disinfected tertiary recycled water for on-site and external applications. A portion of the flow from the SWPS will feed the new non-potable recycled water facilities, which will include cloth disk filtration and UV disinfection. The intended external uses for recycled water are non-agricultural irrigation, truck fill station, and dust suppression, while internal use is expected to stay the same.

1.8 Purified Water Quality

The PWS Project's purified water is subject to water quality requirements from the following:

- Title 22 Water Recycling Criteria
- Water Quality Control Plan for the Central Coastal Basin (Basin Plan)
- SWRCB Water Quality Control Policy for Recycled Water (Recycled Water Policy)

The AWPF product water will be required to meet primary MCLs, secondary MCLs (sMCLs), lead and copper action levels (ALs), NLs, product water limits for TOC, 1,4-dioxane, and total nitrogen, Basin Plan objectives, and pathogen log-reduction value (LRV) requirements. **Table 1-2** provides a summary of the water quality objectives for the AWPF product water. Based on the secondary effluent water quality and expected treatment through the AWPF, these water quality objectives are anticipated to be met in the AWPF product water. Compliance with these requirements is further explained in **Section 8**.

Table 1-2. Summary of Water Quality Objectives

Parameter	Units	Purified Water Quality Goal	Basis
Regulated Constituents			
Primary drinking water standards	-	≤ MCL	Title 22 CCR
Secondary drinking water standards	-	≤ sMCLs	
Lead and copper	-	≤ ALs	
NL contaminants	-	≤ NL	
Pathogens (see Section 9)			
Enteric virus	Log_{10} reduction	≥ 12	Title 22 CCR
Giardia cysts	Log_{10} reduction	≥ 10	
Cryptosporidium oocysts	Log_{10} reduction	≥ 10	
Organics			
TOC	mg/L	≤ 0.5[a]	Title 22 CCR
1,4-Dioxane	Log_{10} reduction with UV-AOP	≥ 0.5	
Inorganics			
Total nitrogen	mg/L as N	≤ 10[b]	Title 22 CCR
Basin Plan			
Water quality objectives for the Basin	-	≤ WQ Objective	Water Quality Control Plan for the Central Coastal Basin
Finished Water Stabilization			
pH	-	7.5 – 8.5	Corrosion and groundwater aquifer leaching minimization
Alkalinity	mg/L as $CaCO_3$	≥ 40	
Langelier Saturation Index (LSI)	-	-1-0.5	

a. Purified water TOC concentration of 0.5 mg/L shall not be exceeded by the 20-week running average of all TOC results and the average of the last four TOC results, and the RO permeate shall not exceed 0.25 mg/L more than 5% of the time during the first 20 weeks of operation.

b. A total nitrogen concentration of 10 mg/L as N shall not be exceeded by the average of two consecutive samples taken at least three days apart, every week.

$CaCO_3$ = calcium carbonate

1.9 Pathogenic Microorganism Control

The PWS Project facilities are designed to meet the necessary pathogen LRVs defined in Section 60320.208 of Division 4, Chapter 3, Article 5.2 of the Title 22 CCR for GRRPs using subsurface application via injection. GRRPs are required to achieve LRVs of at least 12, 10, and 10 (12/10/10) for enteric viruses, *Giardia* cysts, and *Cryptosporidium* oocysts, respectively.

The pathogen LRVs for the PWS Project are summarized in **Table 1-3**. Total pathogen LRVs for the Project exceed the 12/10/10 requirements.

Table 1-3. Pathogen Log-Reduction Credit Summary

Treatment Process	Crediting Method	LRVs		
		Virus	*Giardia*	*Cryptosporidium*
Primary and secondary treatment	Credit currently not pursued	0.0	0.0	0.0
Source water pipeline chlorine disinfection	Credit currently not pursued	0.0	0.0	0.0
Ozonation	Credit currently not pursued	0.0	0.0	0.0
MF	Direct monitoring (Daily pressure decay test [PDT]) and indirect monitoring (continuous filtrate turbidity monitoring)	0.0	4.0	4.0
RO	Online monitoring (TOC and Electrical Conductivity [EC])	1.5	1.5	1.5
UV-AOP	UV Dose (through monitoring of UV Transmittance (UVT), UV intensity, and flow rate) or DDW-approved alternative	6.0	6.0	6.0
Purified water pipeline chlorine disinfection	Credit currently not pursued	0.0	0.0	0.0
Underground retention time	Numerical modeling and Analytical equations	6.0	0.0	0.0
PWS Project LRVs		13.5	11.5	11.5
Required LRVs		12.0	10.0	10.0

Pathogen log-reduction credits are not being pursued for the following processes at this time:

- Primary and secondary treatment at the SC WWTF
- Chlorine disinfection through the source water pipeline between the SC WWTF and the AWPF
- Ozonation at the AWPF
- Chlorine disinfection in the purified water pipeline after the AWPF

1.10 Hydrogeologic Setting

The three SWIP recharge wells are located in the Basin as identified by the California DWR in *Bulletin 118 Interim Update 2016* (DWR, 2016). The Basin is classified as a high priority basin and therefore subject to the requirements of the Sustainable Groundwater Management Act (SGMA). The Santa Cruz Mid-County Groundwater Agency (MGA) is the exclusive Groundwater Sustainability Agency to manage the Basin under SGMA. The SqCWD is one of four member agencies of the MGA.

DWR has designated the Basin as critically overdrafted and subject to seawater intrusion. Therefore, the MGA adopted the Groundwater Sustainability Plan (GSP) in November 2019 to submit to DWR by the SGMA deadline of January 31, 2020 for critically overdrafted basins. The State announced approval of the MGA's GSP on June 3, 2021.

Much of the hydrogeologic information included in **Section 10** of this Report is adapted from the GSP.

Over-pumping of Basin aquifers dating back to the 1980s lowered groundwater elevations in the coastal portions of the Basin where the majority of municipal pumping occurs. Lowered groundwater levels allowed seawater intrusion into portions of the Basin and continues to pose a threat of more widespread seawater intrusion.

Seawater intrusion is a concern for both the Purisima and Aromas formations, as the aquifers are hydrologically connected to the Pacific Ocean. Both the Purisima and Aromas Red Sands have been impacted by seawater intrusion. The Purisima A unit aquifer has experienced seawater intrusion at Soquel Point, and the Aromas Red Sands aquifer has ongoing seawater intrusion between SC-A8 and SC-A3. The potential for seawater intrusion in coastal monitoring wells in the PWS Project area is presented in **Figure 1-4**. This analysis indicates that seawater intrusion is an active threat along the Basin's entire coastal margin based on geophysical research (Ramboll, 2018), groundwater elevations, and groundwater modeling (Hydrometrics, 2018). Analysis indicates the highest risk of additional long-term seawater intrusion in SqCWD is near SC-5A, which is the closest coastal monitoring well to the planned location of the SWIP wells.

The Purisima A and BC aquifer units are the main units where the TLC, Willowbrook, and Monterey SWIP wells are planned for completion. **Section 10** describes the hydrogeology encountered by SWIP wells and wells in surrounding area.

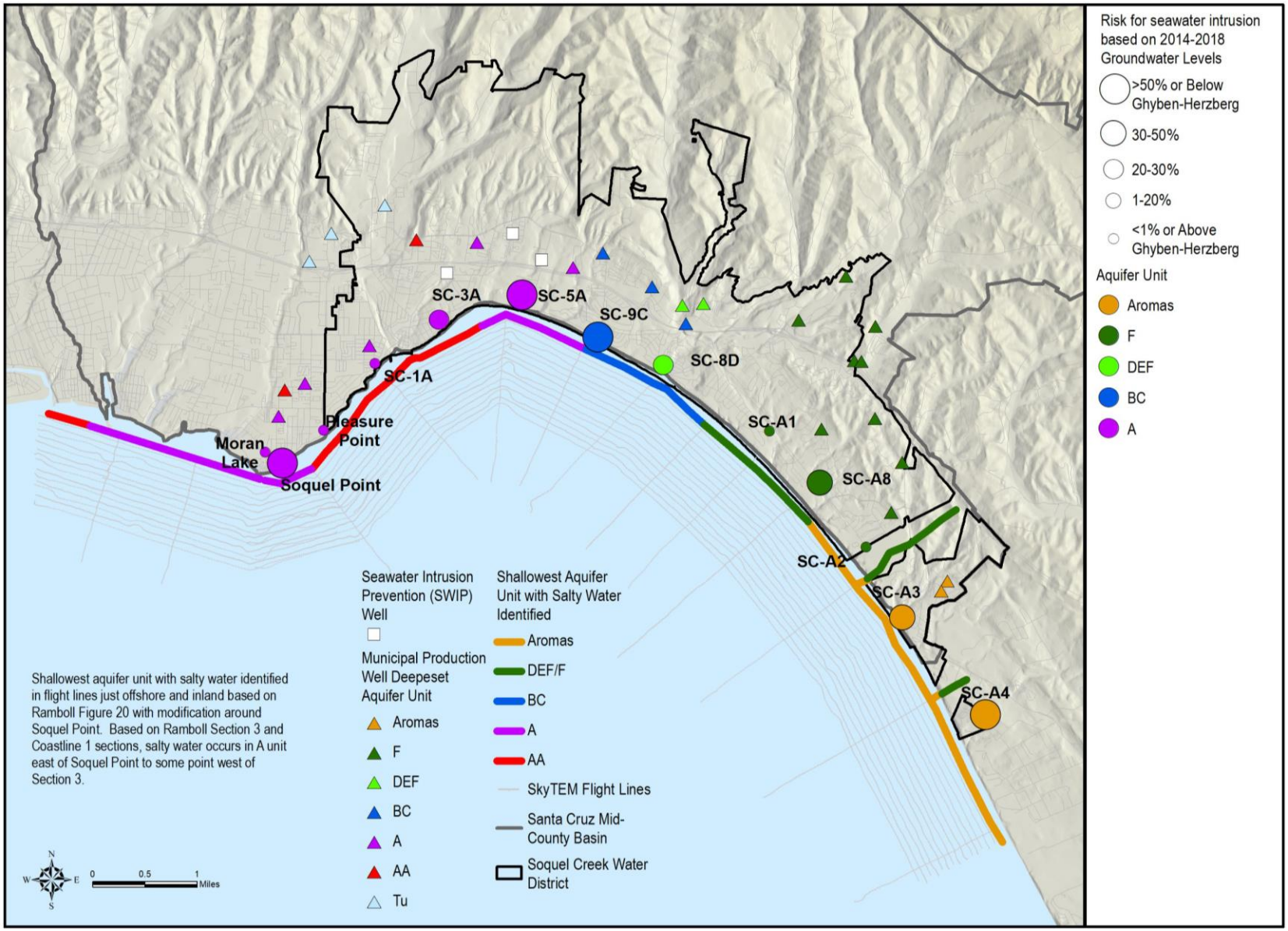

Figure 1-4. Seawater intrusion risk in Basin

1.10.1 Groundwater Sustainability Plan

The MGA submitted the Basin GSP to DWR in November 2019. The GSP establishes sustainable management criteria for sustainability indicators such as seawater intrusion and groundwater quality including minimum thresholds and measurable objectives. The GSP also describes the extensive existing monitoring network used to monitor groundwater conditions in the Basin. The GSP then evaluates projects and management actions for whether the Basin can achieve sustainability by 2040.

The GSP includes the PWS Project as a planned project and management action for achieving groundwater sustainability. The GSP uses the groundwater model of the Basin to evaluate groundwater sustainability benefits from the PWS Project under future conditions. The GSP concludes that the PWS Project will reduce undesirable results for seawater intrusion by raising groundwater elevations above minimum thresholds at coastal monitoring wells throughout SqCWD. The GSP also shows PWS Project benefits for streamflow depletion by raising shallow groundwater levels. Benefits for sustainability are achieved both by direct recharge of purified water and redistribution of pumping throughout SqCWD. As a result, the PWS Project helps achieve sustainable yield and the reduction of groundwater in storage criteria in all three aquifer groups defined in the GSP.

The State announced approval of the GSP in June 2021; the GSP was one of the first two GSPs approved by the State. An excerpt from Santa Cruz Mid-County GSP DWR Determination Letter (dated June 3, 2021) acknowledged that the "*use of conservation efforts as well as projects such as Pure Water Soquel, at this time, appear feasible and reasonably likely to mitigate overdraft. The projects and management actions are expected to reduce net pumping by 1,740 afy; thereby, likely bringing the Basin to operate within its sustainable yield*."

SGMA requires that an annual report on GSP status and implementation be submitted to DWR by April 1 each year. The MGA has submitted the annual reports for Water Year 2019, 2020, and 2021. These annual reports identify continued undesirable results for seawater intrusion. A five-year update to the GSP is due in January 2025.

1.10.2 Basin Groundwater Model

The groundwater model of the Basin (Basin Model) is a numerical model of the Basin using U.S. Geological Survey GSFLOW software (Montgomery & Associates [M&A], 2019). GSFLOW integrates simulations of surface water and groundwater processes by combining Precipitation-Runoff Modeling System (PRMS) and MODFLOW code. The GSP used the Basin Model to understand Basin hydrogeology and water budget as well as to evaluate PWS Project benefits for achieving sustainability under future conditions.

The Basin Model has been used to further evaluate the PWS Project for this report and the anti-degradation study. Information from the TLC pilot well testing has been incorporated in the Basin Model for these evaluations. Refined particle tracking to estimate retention time of purified water is based on the Basin Model.

1.10.3 Groundwater Quality

Groundwater produced in the Basin is generally of good quality and does not regularly exceed primary drinking water standards. Groundwater produced from the Purisima Formation, which the SWIP wells recharge, regularly exceeds secondary drinking water standards for naturally occurring iron and manganese.

Treated groundwater delivered by SqCWD and other municipal water agencies in the Basin meets all state and federal drinking water parameters. The municipal water agencies routinely analyze untreated groundwater to determine the groundwater quality of the Basin and to comply with state water quality reporting requirements. Groundwater quality parameters analyzed include general minerals, general physical parameters, and organic/inorganic compounds. Analyses for these constituents are conducted in accordance with requirements of the CCR, Title 22. Groundwater quality results are compared to primary and secondary drinking water standards, established by the USEPA, and water quality standards established by DDW.

Total dissolved solids (TDS) concentrations measured in production wells in the Purisima aquifers have historically ranged between 270 and 740 mg/L. The TDS concentration measured at the TLC pilot well was measured as 572 mg/L, exceeding the secondary drinking water standard of 500 mg/L. TDS concentrations measured during zone testing as part of TLC pilot well construction were above the secondary drinking water standards in both Purisima A unit zones and the BC unit zone. Chloride concentrations measured in production wells in the Purisima Formation have typically ranged between 10 and 100 mg/L, which is below the secondary drinking water standard of 250 mg/L. The chloride concentration measured at the TLC pilot well was measured at 54 mg/L. TDS and chloride concentrations in municipal production wells do not indicate any impacts from seawater intrusion.

Arsenic was not detected in sampling of groundwater produced by the TLC pilot well but was detected in samples of the three zones sampled during zone testing. Concentrations in the three zones ranged from 0.6 to 1.3 micrograms per liter (µg/L), below the state drinking water standard of 10 µg/L. The SqCWD conducted a geochemical source investigation for arsenic in 2003 and concluded that the arsenic detections are most likely associated with the depositional and geochemical conditions in the coastal environment. There have been no increasing arsenic concentration trends in affected wells because the source of arsenic occurs naturally within the sediments and is not being added from a contamination point source. Geochemical effects of SWIP wells on concentrations of arsenic and other minerals are addressed in separate reports (Phase II Potential Injection Aquifer Geochemistry Characterization, 11/1/2019 and Phase III Potential Injection Aquifer Geochemistry Characterization, December 2022).

While chromium VI, nitrate, organic compounds and constituents of emerging concern have been detected in other aquifers or units in the Basin, they have not been detected in the Purisima Formation A and BC units planned for SWIP well recharge.

1.11 Groundwater Recharge Impacts

Based on modeling, the Environmental Impact Report (EIR) concluded that there are no significant groundwater hydrology impacts from the PWS Project. Subsequent modeling for the PWS Project has not changed the EIR's significance determinations.

Modeling for the GSP shows recharge at SWIP wells and pumping redistribution at SqCWD municipal wells for the PWS Project provides expected benefits of preventing seawater intrusion into SqCWD area to help meet the sustainability goal for the Basin within 20 years as mandated by the SGMA.

Information from the TLC pilot well testing has been incorporated in the Basin Model to support Title 22 permitting requirements. As described in **Section 11**, refined particle tracking to estimate underground retention time of purified water up to 36 months is based on the updated Basin Model. The shortest underground retention time from a SWIP well to a drinking water well is estimated as 33 months based on the maximum recharge rate at the Monterey SWIP well. Conservatively applying a factor of 0.25 to this estimate results in an underground retention time of over 8 months that exceeds PWS Project requirements for log virus reduction credits and the RRT proposed below. Primary control and secondary control zones for new drinking water well construction are proposed based on estimates of underground

travel times from the Monterey SWIP well to MM-1, the monitoring well with the shortest underground travel times from a SWIP well. Primary control and secondary control zones respectively represent 7.5 months and 8.5 months underground retention time after applying the factor of 0.25 to refined particle tracking estimates based on the maximum recharge rate at the Monterey SWIP well.

Estimates for underground retention times from SWIP wells greater than 36 months are based on analytical equations. Analytical equations are also used to evaluate underground retention times based on the minimum recharge rate at the Monterey SWIP well, which would necessitate higher recharge rates at the other two SWIP wells than what was simulated with the Basin Model. Based on this combination of recharge rates, the shortest underground retention time from a SWIP well to a drinking water well is estimated as 39 months. Applying the factor of 0.25 for analytical equations results in an underground retention time of over 9.5 months that exceeds PWS Project requirements for log virus reduction credits. These results are also used to estimate the range of RRT discussed below. The range of RRT supports associated primary and secondary control zones of 9.2 and 10.2 months that are based on the minimum recharge rate at the Monterey SWIP well and estimates of underground travel times from Monterey SWIP well to MM-1 using analytical equations.

1.12 Response Retention Time

Title 22 Section 60320.224 requires that groundwater recharge projects using subsurface applications propose a RRT as part of the project's Engineering Report. The RRT is intended to provide ample time for the project sponsor to identify treatment failures and implement actions necessary to protect the public from inadequately treated purified water. The RRT is the minimum time that the recycled water must be retained underground before extraction for use as drinking water to allow treatment system failures to be identified and corrected. The RRT must be approved by DDW, and per Title 22 Section 60320.224, the RRT shall be no less than two months. The proposed RRT is dependent on providing enough time to identify and address potential water quality problems and if necessary, provide an alternative source of drinking water or supplemental drinking water treatment. Title 22 Section 60320.224 specifies that the underground retention time be no less than the approved RRT.

The RRT proposed for the PWS Project is 7.5 to 9.2 months and also considers groundwater modeling results that are presented in **Section 11** of this report. The proposed RRT is presented as a range to reflect variable recharge rates at the Monterey SWIP well, which modify the underground travel time to the nearest monitoring well (MM-1). The proposed RRT is conservative because it uses a factor of 0.25 RRT credit per month applied to estimates from refined particle tracking based on the Basin Model. The proposed 7.5- to 9.2-month RRT is less than the shortest estimated underground travel time to the closest drinking water well of 33 months (from the Monterey SWIP well to a private domestic well at assessor's parcel number [APN] 037-191-12). This will provide ample time to identify and respond to any water quality or operational problems at the treatment facilities before inadequately treated purified water injected at any of the SWIP injection wells reaches their respective closest drinking water wells.

A tracer study will be initiated within the first three months of the PWS Project operational startup to demonstrate underground retention time from the injection wells to the drinking water wells is not less than the proposed RRT. The proposed RRT will be updated after the tracer study is complete. As discussed in **Section 14**, a work plan for the tracer study will be submitted to DDW for review and approval.

1.13 Contingency Plan

To produce a water supply that is reliably protective of public health and the environment, the PWS facilities will be equipped with automatic control and monitoring equipment as well as necessary standby equipment to facilitate both planned and unplanned service of equipment. Responses and notifications will be implemented if the operating conditions were to transition from normal to challenging conditions. The PWS Project's contingency plans to protect public health includes the actions to be taken to ensure the availability of an alternative water source in the event of a system failure or production of water that is non-compliant with permit requirements, as well as diversion for off-specification water. Provisions outlined in **Section 12** and **Section 13** describe the steps that SqCWD would take to provide an alternative water supply in the event that a SqCWD drinking water well or non-SqCWD drinking water well (small, private well) is adversely impacted by the PWS Project.

1.14 Monitoring and Reporting Program

The proposed Monitoring and Reporting Program (MRP) for the PWS Project is designed to satisfy requirements specified in GRRP regulations set forth by DDW and Basin Plan objectives established by RWQCB. The existing SC WWTF operates under permit requirements for discharging secondary treated wastewater (secondary effluent) to the Pacific Ocean via the existing ocean outfall specified in NPDES No. CA0048194 (RWQCB Order No. R3-2017-0030) (RWQCB, 2017). The SC WWTF permit also specifies requirements for recycled water (disinfected tertiary-treated effluent) production and use in the future. The monitoring and reporting provisions in the SC WWTF permit, for which the City is responsible, may be modified by the Project upon renewal of the City's NPDES permit in 2023 incorporating ROC, MF strainer backwash, and MF backwash into the ocean outfall discharge. Monitoring requirements for the planned non-potable recycled water system at SC WWTF will be updated upon approval of the non-potable recycled water system in the City's NPDES permit renewal. SqCWD will be responsible for the PWS Project MRP. **Section 14** of this report outlines the MRP proposed for the PWS Project. **Figure 1-5** shows the proposed sampling locations for the Project.

The quality of the purified water produced by the AWPF for groundwater recharge will be monitored downstream of the entire advanced treatment train at Monitoring Point M-002 near the Purified Water Pump Station (**Figure 1-5**). SqCWD will assess purified water at the regulatory-prescribed frequency for constituents with primary MCLs, ALs, sMCL, NLs, Basin Plan-Specified Water Quality Objectives; and California Toxics Rule Standards. SqCWD will monitor the chemicals and indicated compounds that DDW and the RWQCB specify based on their review of this Engineering Report. The proposed purified water monitoring program for the Project to satisfy requirements for public health protection as required under Title 22 for groundwater recharge is further detailed in **Section 14** of this report.

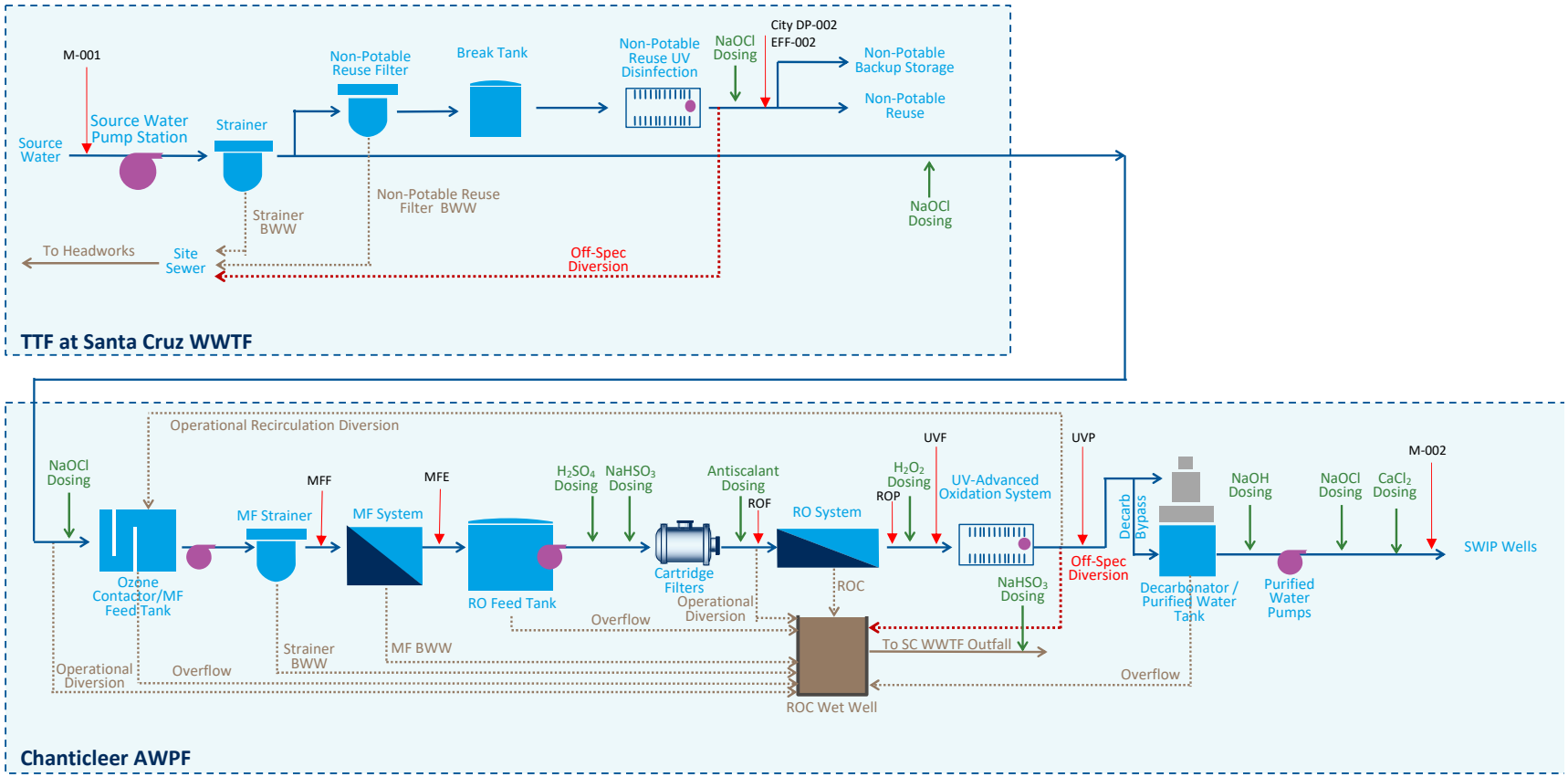

Figure 1-5. Project flow schematic with monitoring points

Groundwater quality will be monitored at monitoring wells installed downgradient from the SWIP wells. Groundwater will be sampled from the aquifers that receive purified water and analyzed and reported for parameters listed in **Section 14** in compliance with Title 22. Background groundwater quality monitoring will begin in 3rd quarter of 2022; at least four quarterly rounds of baseline sampling prior to the Project onset of operation will characterize the groundwater quality and water levels in the Purisima A and BC units. After the Project begins operation, required quarterly groundwater monitoring will be conducted and reported for the nine monitoring wells downgradient of the SWIP recharge wells.

1.15 General Operations Plan

Section 15 comprises a preliminary overview of operations and elements of the Operations Optimization Plan (OOP) that will be submitted for review/approval prior to commencement of actual operation of the completed Project. The General Operations Plan is based on the Project EIR, SqCWD 2019 Basis of Design Report (BODR), and the Issued for Construction Documents 2022.

The AWPF will be equipped with monitoring and control equipment to facilitate system operations by a highly trained staff of operators to produce a water supply that is reliably protective of public health and complies with the permit requirements. Standby equipment will be included, as needed, to facilitate scheduled and unscheduled maintenance requirements. The future OOP will provide standard operating procedures (SOPs) for operation and routine maintenance of AWPF process systems. If the product water does not meet water quality permit requirements based on online monitoring systems (e.g., conductivity, UV intensity) and critical control points, it will be sent to the ocean outfall.

1.16 Technical, Managerial and Financial Capacity

SqCWD has the necessary technical, managerial, and financial (TMF) capability to support the PWS Project. Title 22 Section 60320.200 requires that the sponsor of a project for groundwater replenishment using recycled water via subsurface application demonstrate that it possesses adequate technical and managerial capacity for the proposed GRRP. Although DDW has yet to develop specific TMF requirements for potable reuse system operations, elements of the DDW TMF Assessment for Public Water Systems can be used as the basis for SqCWD to demonstrate its TMF capacity for the PWS Project, described in further detail in **Section 16** of this Engineering Report.

1.16.1 Technical Capacity

SqCWD has demonstrated its technical ability to implement and operate the PWS Project by:

- Operating and maintaining a water infrastructure and distribution system to deliver a reliable, high quality, safe supply of drinking water to its customers
- Monitoring groundwater levels and water quality using strategically placed monitoring wells
- Implementing sustainable and environmentally protective water resource management solutions to meet the water supply needs of the service area
- Participating as member of a Groundwater Sustainability Agency to develop and implement a GSP approved by DWR
- Completed planning reports and pre-design documents in preparation for implementing the PWS Project
- Prepared and certified the Final EIR for the PWS Project
- Preparing for a long-term contract to engage the services of third-party operators proficient in advanced treatment technologies

- Completed technical planning and reports to secure grant funding and low-interest loans for the PWS Project
- Managing final design and construction phases of the PWS Project.

1.16.2 Managerial Capacity

The SqCWD is a nonprofit, special district that provides water resource management within its service area to deliver a safe and reliable supply of high-quality water to meet present and future needs in an environmentally sensitive and economically responsible way. SqCWD has demonstrated its ability to proficiently manage its public water system and has received numerous awards for community outreach, public process and transparency, and budgeting excellence. In 2019, SqCWD's General Manager received "Special District Administrator Certification".

For the PWS Project, a core management team has been assembled to design and implement the PWS Project. SqCWD intends to utilize the experience of its leaders and established procedures to manage all aspects of the PWS Project.

1.16.3 Financial Capacity

SqCWD has been awarded the Distinguished Budget Presentation Award by the Government Finance Officers Association (GFOA) of the United States and Canada for the 2018-19 Budget. This award represents a commitment by SqCWD's governing body and staff to meet the highest principles of governmental budgeting and to develop a budget document that serves as a policy document, a financial plan, an operations guide, and a tool for effective communications.

Over the last three years, SqCWD has accomplished these financial milestones:

- Adopted five years of Proposition 218 Rates in 2019 with rate increases that included 100 percent debt financing of the PWS Project (estimated at $90M)
- Awarded $50M Proposition 1 Groundwater Implementation Grant from SWRCB
- Secured a $25M Low-Interest Loan through Seawater Intrusion Control Loan Program from SWRCB
- Selected for low-interest loan through the Water Infrastructure Finance and Innovation Act (WIFIA) from USEPA for up to $88.9M
- Selected for $30M in grant funding through US Bureau of Reclamation's Title XVI Program
- Received and completed requirements for $2M Proposition 1 Groundwater Replenishment and SWIP Planning Grant from SWRCB

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Section 2: Project Overview

The objective of the PWS Project is to replenish the local Basin with purified water to help prevent further seawater intrusion into the groundwater basin. The Basin has also been designated by the State as being in critical overdraft due to seawater intrusion. The PWS Project will develop a drought-resistant supplemental water source to diversify and add resiliency to SqCWD's water supply portfolio. By replenishing the groundwater basin with purified water, the overall quality and reliability of the water supply will be improved for the customers of SqCWD.

Non-potable recycled water facilities will also be constructed at the SC WWTF to provide the City with disinfected tertiary non-potable recycled water. This portion of the work is known as the Santa Cruz NPR Project, which is being constructed as part of the SqCWD's overall program efforts.

Separate Title 22 Engineering Reports are being prepared to facilitate the RWQCB/DDW review, as follows:

- Pure Water Soquel Engineering Report, for conditional approval of the PWS Project for water recycling requirements intended for groundwater recharge (this document)
- City of Santa Cruz Non-Potable Reuse Engineering Report, for conditional approval of the Santa Cruz NPR Project within the City's updated NPDES permit encompassing these facilities (separate engineering report submittal).

Because of interrelated facilities and the collaborative nature of both projects, the separate City of Santa Cruz Non-Potable Reuse Engineering Report is referenced within this Pure Water Soquel Engineering Report.

2.1 Purpose of the Engineering Report

This Pure Water Soquel Engineering Report summarizes SqCWD's plan for compliance of the PWS Project with the CCR Title 22 for subsurface application groundwater replenishment and minor non-potable water uses. This report is prepared in fulfillment with the SWRCB DDW requirements in Section 60323 of Article 7 (Groundwater Replenishment using Recycled Water) and contains 17 sections.

As described above, a separate City of Santa Cruz Non-Potable Reuse Engineering Report is being developed for the Santa Cruz NPR Project, but may be referenced throughout this document.

2.2 Background

SqCWD relies solely on groundwater sources for its water supply. The Basin, the primary source of water for SqCWD, is in a state of critical overdraft; groundwater has been extracted at a rate that has caused seawater intrusion. Seawater intrusion has been detected as high chloride concentrations in some of the coastal monitoring wells in the Basin, which has been confirmed by geophysical mapping. There are also areas where seawater intrusion has not been detected in coastal monitoring wells but low groundwater elevations indicate an undesirable and imminent risk of seawater intrusion. Geophysical mapping shows seawater in the aquifers just offshore of these areas, which demonstrates the urgency of raising groundwater elevations to reduce the seawater intrusion risk in these areas.

Despite significant conservation efforts by SqCWD customers, the groundwater basin remains critically overdrafted and an additional water supply is required to supplement the natural recharge of the Basin and combat the seawater intrusion. Planning for a reliable, high-quality and affordable water supply that protects groundwater resources is a top priority for SqCWD. To that end, SqCWD is implementing the PWS

Project. As part of this Project, SqCWD is planning to replenish approximately 1,500 afy of purified water into the groundwater basin. SqCWD Board's goal is to have the PWS project in operation by 2023.

As part of an independent effort, the MGA developed its GSP as a roadmap to achieve Basin-wide sustainability. The GSP was submitted to California DWR in January 2020 and approved in June 2021. SqCWD is a partner member of the MGA and the GSP includes the PWS Project as one of the projects to help achieve Basin-wide sustainability. SqCWD's current PWS Project has the goal of replenishing 1,500 afy of purified water in the Basin, while providing conveyance infrastructure and treatment footprints that would accommodate future expansion of the treatment system if needed to achieve sustainability in the Basin beyond SqCWD service area.

2.3 Project Participants

SqCWD is the sponsor for the PWS Project. SqCWD has the necessary TMF capabilities to plan, design, construct, and operate the PWS Project. Through the planning, implementation, and operation of the PWS Project, SqCWD will work with many Project participants and interested parties, including State and Federal government regulators, local government agencies, and private landowners described in **Table 2-1**.

Table 2-1. Pure Water Soquel Project Participants

Project Participants	Roles
Federal Agencies	
USEPA	Administration of the WIFIA Loan program; maintains inventory of Class V injection wells as part of the Underground Injection Program.
U.S. Army Corps	Approval of the Section 408 permit for modifications to be made to the San Lorenzo River levees to bring the conveyance pipelines through the levees where they would then be mounted to the existing bridge structure.
Monterey Bay National Marine Sanctuary	Review of the RWQCB issued NPDES Permit.
State Agencies	
SWRCB – Division of Financial Assistance	Administration of the Proposition 1 Planning Grant funds, the Proposition 1 Implementation Grant funds, and the Seawater Intrusion Control Loan.
SWRCB – DDW	Approval of PWS Project Engineering Report, recommendations to RWQCB for Project WDRs/ WRRs for recycled water.
California DWR	Approval of Santa Cruz MGA's GSP which includes PWS as project to achieve sustainability.
State Office of Historic Preservation	Letter of Concurrence of National Historic Preservation Act Section 106 Compliance.
RWQCB – Central Coast	Multiple Permits: NPDES General Permit for Discharges with Low Threat to Water Quality, Update of the City NPDES permit, WDRs/WRRs for the use of recycled water for groundwater replenishment, Section 401 Water Quality Certification. Other general permits – low threat discharge of construction storm water.
Coastal Commission	Approval of a Consolidated Coastal Development Permit for the Monterey Avenue well site, SC WWTF NPR facilities, SWPS, and conveyance pipeline within the coastal zone.
CalTrans	Approval of encroachment permits for sections of conveyance pipeline within Cal Trans right of way.

Table 2-1. Pure Water Soquel Project Participants	
Project Participants	**Roles**
Regional and Local Agencies	
County of Santa Cruz – Department of Public Works	Approval of encroachment permits for conveyance pipeline and right of way easements for monitoring wells in public right of way.
County of Santa Cruz – Environmental Health Department	Approval of hazardous materials (chemicals) at Chanticleer AWPF site. Responsible for permitting the construction of new SWIP wells, destruction of existing production well at Monterey Ave. site.
County of Santa Cruz – Planning Department	Approval and support of consolidated Coastal Development Permit approach with Coastal Commission.
City – Department of Public Works	Approval of encroachment permits for conveyance pipeline, approval of mounting pipeline to the Laurel Street Bridge, local maintainer for the Section 408 permit.
City	Land Lease Agreement for the construction, maintenance and operation of the SWPS located in the SC WWTF, inclusion of PWS Project discharges into the City's updated NPDES discharge permit, agreement to provide source water for PWS Project operation; enhanced source control.
City – Water Department	Recycled water feasibility study.
City – Planning Department	Approval and support of consolidated Coastal Development Permit approach with Coastal Commission.
City of Capitola – Department of Public Works	Approval of encroachment permits for conveyance pipeline and one monitoring well.
City of Capitola	Approval and support of consolidated Coastal Development Permit approach with Coastal Commission.
Santa Cruz County Regional Transportation Commission	Interested party in the Chanticleer AWPF site with an easement for future pedestrian bridge infrastructure.
Santa Cruz MGA	Adopted and submitted the Santa Cruz Mid-County GSP. Implement GSP including preparation of annual reports and 5-year updates, which will include updates of PWS Project implementation and progress toward sustainability.
Private Entities	
Cabrillo College	Agreement for the location of up to three monitoring wells on community college property.
TLC	Long term Lease Agreement and construction easement for the construction and operation of the TLC SWIP well and non-potable use of purified water for irrigation of athletic fields with TLC becoming a non-potable water customer of SqCWD.
Shorelife Community Church	Land lease agreement for the use of church property for contractor access and staging areas during construction of the Monterey Ave. SWIP well. Easement agreement for the location of (1) monitoring well on church property.
Santa Cruz Subaru, Santa Cruz Toyota, Seaside Company	Easement agreement for conveyance pipeline and construction in private roadway, Auto Plaza Drive.

Local agency PWS Project stakeholders include the City, the City of Capitola, and the County of Santa Cruz where PWS Project components will exist within each jurisdiction. Agreements have been developed with the City to use secondary effluent from the SC WWTF as the source water for purification. The PWS SWPS will be built and operated on SC WWTF land. A Lease agreement is in place between SqCWD and the City to accommodate the usage of this land. SqCWD acquired the Chanticleer Mid-County property in March 2020 to be the site of the AWPF. The TLC site, Monterey Avenue Well site, and the Willowbrook Lane site are the locations for the SWIP wells. These three locations will house SWIP wells used to recharge purified water into the groundwater basin. The Willowbrook Lane and Monterey Avenue well sites are owned by SqCWD and the TLC well site will be operated on a long-term lease agreement with the TLC.

2.4 PWS Project Development and Supporting Activities

To protect SqCWD's endangered groundwater resources, ensure water reliability and resiliency for its customers, and prepare for climate change and other future challenges, SqCWD developed in 2015 an action-oriented Community Water Plan that was updated in 2017. The Community Water Plan is based on community input and, along with SqCWD's Urban Water Management Plan, serves as SqCWD's roadmap to meeting the goal of sustainability by 2040. One option described in the Community Water Plan included recycled water purification for groundwater recharge and was selected by the SqCWD Board to further consider and evaluate.

Recycled water projects must comply with the SWRCB Resolution 68-16 (Antidegradation Policy). A groundwater recharge project, which includes an indirect potable reuse (IPR) project such as PWS, that lacks a Salt and Nutrient Management Plan (SNMP) requires a project-specific impact study. A draft antidegradation evaluation (Brown and Caldwell [BC], 2020c) was conducted focusing on mineral constituents to comply with the SWRCB requirements and an update to this report is in progress. The antidegradation study concluded that "Assuming proper conditioning to prevent geochemical mobilization in excess of water quality objectives is in place prior to operation, the [IPR] project conforms with Resolution 68-16 Antidegradation Policy and would be consistent with a SNMP" (BC, 2020).

A Regional Recycled Water Feasibility Study (Carollo, 2017) was performed in 2017 to determine the feasibility of the PWS Project. This study analyzed the feasibility of six different alternative approaches for implementing IPR to supplement the groundwater basin water supply. Each alternative was evaluated based upon cost, energy requirements, environmental impacts, public acceptance, agency coordination, and ease of implementation. The outcome of this study yielded three recommended alternatives to be considered based upon the characteristics upon which the alternatives were evaluated. The Feasibility Study alternatives were incorporated into the EIR.

SqCWD conducted additional technical evaluation and completed a Basis of Design Report (BC, 2019c) and in 2020 executed an agreement with a Design-Build contractor for the design and construction of the treatment facilities.

The Regional Recycled Water Feasibility Study (Carollo, 2017) and the PWS Project EIR (ESA, 2018) proposed five potential segments for the conveyance pipelines between the treatment facilities and to the SWIP wells. The Alignment Study for Conveyance Pipelines (BC, 2019b) was performed to assess the pipeline segments and determine a preferred alignment. The preferred alignment was incorporated into the Basis of Design Report (BC, 2019c) and in 2020 SqCWD executed an agreement with a Design-Builder for the design and construction of the conveyance pipelines. In spring 2021, the Design-Builder was awarded the construction phase of the Project.

In 2019, a pilot recharge well was constructed at the TLC site. Data collected from the pilot recharge well was incorporated into groundwater modeling and recharge well design. In 2020, SqCWD procured a drilling contractor for the Willowbrook Lane SWIP well, Monterey Avenue SWIP well, and the redevelopment of the TLC pilot recharge well as a SWIP well. Procurement of the drilling contractor for the SWIP wells was done using the design-bid-build approach. In spring 2021, a drilling contractor for the monitoring wells was procured using the design-bid-build approach. A contractor for the equipping of the SWIP well sites will be procured separately in 2022 using the design-bid-build approach.

In 2020, SqCWD additionally procured an Operations and Maintenance at Risk (OMAR) professional for the AWPF. The OMAR has been brought on board to participate in the PWS Project design and construction phase to provide valuable insight and design review with the long-term operation of the facility in mind.

The PWS Project includes the following new facilities (see **Figure 2-1**):

- TTF at SC WWTF:
  - SWPS, pumping water to the AWPF and the Santa Cruz NPR Project facilities
  - Source water automatic strainers
  - Source water surge tank
  - Pigging stations
  - Santa Cruz NPR Project facilities, including cloth filter, UV disinfection
  - Chemical feed
  - Title 22 back-up storage tank and pump station
  - ROC pipeline connection to Tunnel Portal, including additional bioassay/sampling panel equipment
  - Communications pole
- AWPF at Chanticleer:
  - Ozone
  - MF, including automatic strainers
  - RO, including cartridge filters
  - UV light-based AOP with hydrogen peroxide (UV-AOP)
  - Decarbonators
  - Post treatment stabilization
  - Sanitary lift station (to convey minor AWPF waste streams to the local sewer; includes membrane cleaning and analyzer wastes and floor drain residuals)
  - Chemical storage and feed
  - ROC Wet Well (to convey major AWPF waste streams to the Outfall via the ROC Pipeline)
  - Purified Water Storage Tank and Pump Station (to convey stabilized product water to the Purified Water Pipeline and SWIP wells)
  - Operations and Control Room
  - Communications pole
- SWIP recharge wells at Monterey, Willowbrook, and TLC sites:
  - Wells and backwash system and facilities
  - Communication equipment
- Monitoring wells
- Conveyance:
  - Source water pipeline: 16-inch pipe from SC WWTF conveying source water to the Chanticleer AWPF
  - ROC pipeline: 16-inch pipe from AWPF to SC WWTF conveying ROC, MF backwash waste, pre-MF automatic strainer waste, and off-specification water to the City's ocean outfall
  - Purified water pipeline:14-inch pipe from AWPF conveying purified water for recharge to the SWIP wells
  - Turnouts from the Purified Water pipeline conveying purified water for non-potable use (e.g., irrigation at the athletic fields near the TLC SWIP well site)

The Santa Cruz NPR Project facilities are described in greater detail in the City of Santa Cruz Non-Potable Reuse Engineering Report.

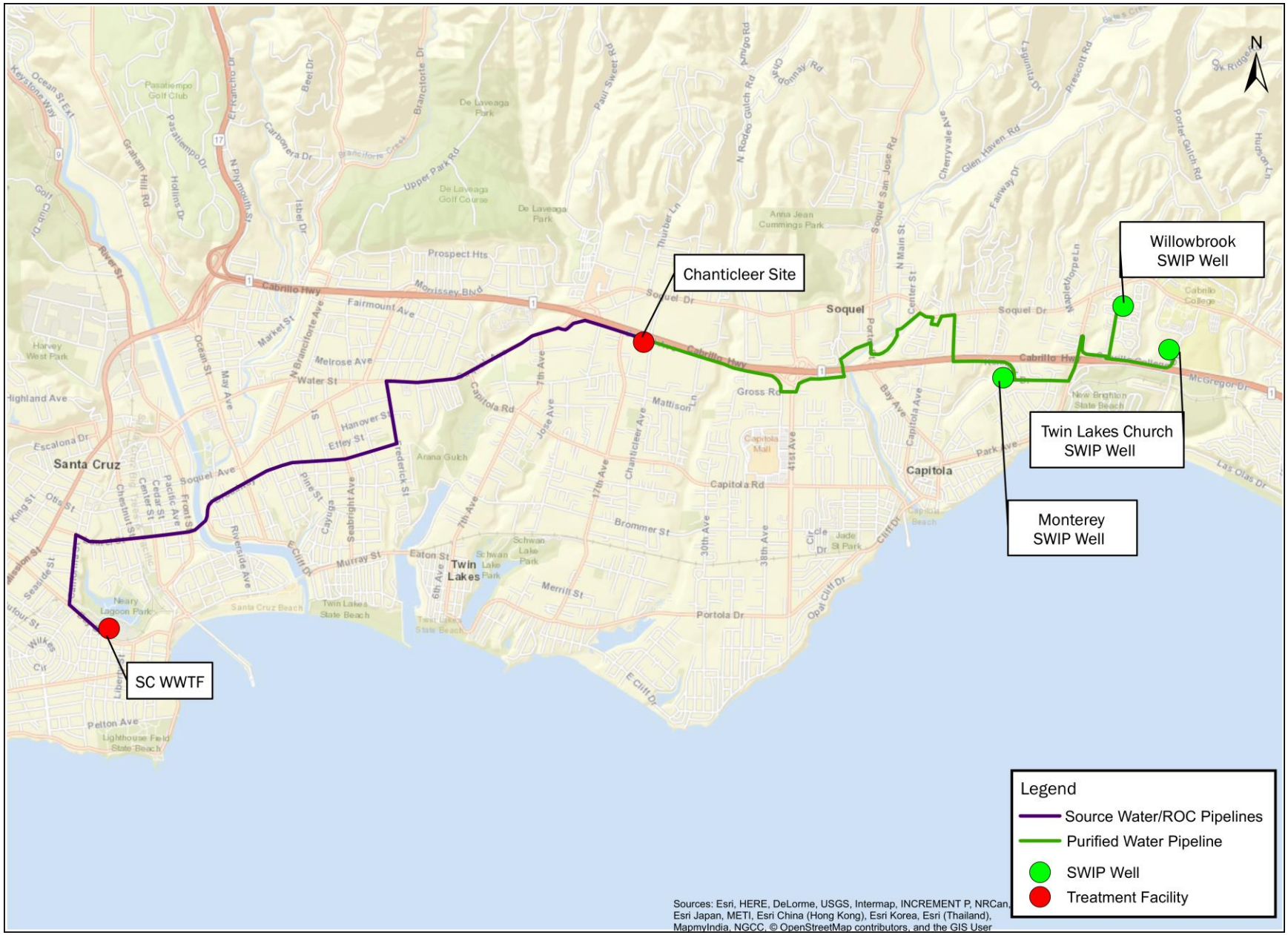

Figure 2-1. PWS facilities

2.5 Public Outreach

Outreach, and education activities are conducted with the following set of SqCWD core values firmly in mind:

- Fairness, Honesty, and Ethics
- Customer Service
- Environmental Stewardship
- Collaboration
- Commitment and Dedication

These values help guide how SqCWD manages its day-to-day business, and how it informs and engages the community on the critical issues of groundwater supply reliability/sustainability, water quality, and the PWS Project.

SqCWD recognizes and embraces the concept that the local water supply challenges can only be addressed through an honest and productive partnership with the community and interested parties. This belief is shared and implemented at all levels of the organization.

To that end, SqCWD developed its Community Water Plan, prepared with significant engagement and involvement of the people who live and work here. This Plan is a roadmap to meeting the goal of water supply sustainability by 2040 and is a testament to SqCWD's commitment to transparency and community partnership.

A central principle of honest public outreach is to "cast a wide net" – ensure all segments of the community are reached by engaging through many channels. SqCWD utilizes a variety of tools and methods in connecting with and involving its constituents in a regular, consistent, and authentic manner. Those tools include:

- SqCWD website (including a "transparency section") and social media
- Email newsletters
- "Water Wisdom" monthly articles in local newspapers
- Short videos explaining SqCWD operations, PWS, and water purification processes
- Fact sheets, news releases, advertising
- School education programs and materials
- Special events and presentations
- A "Water Wisdom Academy" for community members to learn about SqCWD and water issues
- Water-wise house calls for residential and commercial customers
- Tours of SqCWD facilities
- A "Learning Center" at SqCWD headquarters explaining the groundwater supply, challenges, and solutions
- The national award-winning mobile PWS Water Educational Trailer used at schools and events throughout the year

SqCWD has conducted community surveys, most recently in early 2020, to gain insight into the public's awareness, perception, and understanding of SqCWD, local water challenges, and the PWS program. The surveys confirm that customers have broadly positive views of SqCWD, and trust SqCWD to take urgent action to address water quality and supply issues. The most recent survey also confirms that people are comfortable with the water purification process used in PWS once it is described to them and, more

specifically, they are comfortable with using purified recycled water for a variety of uses including drinking water.

These survey results point directly to SqCWD's communications and outreach efforts as being appropriate and useful in engaging and educating the public. They also reaffirm the various communications tools SqCWD is using as effective means of engaging with and reaching the community with information.

Another positive indicator of SqCWD's commitment to public outreach, and the resulting successful results, is the WateReuse Association's national Award of Excellence for Outreach and Education, awarded to SqCWD in 2018. The award was in recognition of the PWS Mobile Educational Trailer, which displays water supply options as outlined in the Community Water Plan, and the steps involved in advanced water treatment to replenish and recharge the groundwater basin – illustrated in a fun, colorful, interactive, and hands-on way. The award recognizes SqCWD's significant success in advancing the public's understanding and knowledge of recycled water, and acknowledges SqCWD's ongoing efforts to provide the community with clear, understandable, and useful information about water reuse.

SqCWD's public outreach efforts – utilizing all of the communications and outreach tools noted above, and more – have increasingly focused on the PWS program. And, as PWS moves into its construction phase, SqCWD continues to offer additional means of engaging the community:

- The EIR process involved not only the required public hearings, but also additional community meetings featuring multiple information "stations" explaining key elements of the EIR, along with an abundance of knowledgeable staff to engage one-on-one with community members. The purpose was to offer people an additional transparent and comprehensible view of the purpose and scope of the EIR, and gain productive community input into the final version to help ensure the PWS Project meets the needs of the people it will serve.
- SqCWD staff visited several advanced purification and groundwater recharge facilities in other jurisdictions and had lengthy discussions with technical and public outreach staff. This gave SqCWD key insight and "lessons learned," about how these projects were accomplished, how the communities were involved in the process (before, during, and after project completion), and the public issues which may have emerged, that SqCWD can learn to address early.
- A short video ("The Ways of Water"), produced by WateReuse, was shown to customers to educate them on the water cycle and introduce various methods of purifying water for IPR and Direct Potable Reuse. Other videos and collateral materials were also developed to further explain and convey the technical process of purifying water. The cumulative exposure of these educational materials is invaluable in clarifying the seawater intrusion challenge SqCWD faces and shines a light on the remedy of the PWS treatment process.
- In addition to providing written explanatory materials, SqCWD is also holding public information meetings (presently online only) near construction zones to continue to build open communication and trust with the community.
- Once the PWS facilities are complete and operational, SqCWD will build on its current outreach program and develop a Learning Center at the new purification facility at Chanticleer highlighting the purification process being used in this setting. This will include tours of the AWPF and various visuals to enlighten community members on the history, technology, and broad use of purification processes here and around the world.

Experience in the water industry has shown that public acceptance of potable reuse is one of the primary challenges facing the use of this new source of water supply. Just as processes leading to potable reuse involve the use of a proven and reliable technology to purify recycled water, SqCWD has utilized a set of proven outreach processes that have been proven to help communicate and educate the community. The outreach effort SqCWD has facilitated has been flexible and was designed to meet the specific needs of the community served by SqCWD.

SqCWD will continue to utilize industry best practices for water conservation and deploy educational outreach techniques determined to further community awareness and appreciation of our water resources, including water recycling. We remain dedicated stewards of our natural environment and protective of our water resources from seawater intrusion to ensure safe water is available for future generations.

2.6 Independent Advisory Panel

An IAP for third-party review was formed for evaluation of the PWS Project. The IAP consisted of seven technical and scientific experts from relevant disciplines pertaining to the PWS Project including: groundwater replenishment, recycled water, water science, advanced treatment technologies, public health, and risk assessment:

- **Channah Rock, Ph.D. (Panel Chair).** Channah Rock serves as a Water Quality Extension Specialist and Associate Professor in the Department of Soil, Water, and Environmental Science at the University of Arizona.
- **Joseph Cotruvo, Ph.D., BCES.** Joe Cotruvo is President of Joseph Cotruvo & Associates, an environmental and public health consulting firm in Washington, DC. Joe Cotruvo and is active in the World Health Organization (WHO)/National Science Foundation (NSF) International Collaborating Centre for Drinking Water Safety and Treatment and previously, he served as director of the Criteria and Standards Division of the USEPA Office of Drinking Water.
- **Jason Dadakis, PG, CHG.** Jason Dadakis is Executive Director of Water Quality and Technical Resources for the Orange County Water District (OCWD).
- **Michael Dourson, Ph.D., DABT, FATS, FSRA.** Michael Dourson is Professor of Environmental Health in the Risk Science Center (RSC) at University of Cincinnati College of Medicine.
- **Kara Nelson, Ph.D.** Kara Nelson is a Professor in Civil and Environmental Engineering at the University of California, Berkeley. Her research program addresses critical issues at the intersection of public health and the environment, with a focus on reducing the threat posed by waterborne pathogens by improving our engineering infrastructure to make it more effective, affordable, and environmentally beneficial.
- **Gordon Thrupp, Ph.D., PG, CHG.** Gordon Thrupp is a senior hydrogeologist at Geosyntec Consultants in San Francisco, California, and has more than 30 years of experience providing hydrogeological consulting services, including developing groundwater flow models, designing wells and hydraulic testing programs, and directing environmental investigations.
- **Lynne Haber, Ph.D., DABT.** Lynne Haber is a Senior Toxicologist and Adjunct Associate Professor at University of Cincinnati's RSC.

The IAP held two meetings: a conference call meeting on February 27, 2017 and a public meeting at Capitola City Hall on September 20, 2017. At the public meeting, SqCWD's Project Team presented an overview of the PWS Project. The IAP responded to written questions that were submitted by local community members. A video of the public meeting is available.

These meetings were held to address the challenges of developing and maintaining safe and reliable drinking water supplies in Santa Cruz County. The IAP communicated with the public by supplying information about the PWS Project and addressing community members' concerns. Community members in attendance posed questions and concerns during the meeting and those not in attendance submitted questions via e-mail. The IAP concluded that with the understanding of the state and federal drinking water regulation, quality of the source water from SC WWTF, and proved advanced treatment technologies that "the Project is plausible, feasible, and protective of public health." This finding was documented in a report prepared by the NWRI in December 2017.

2.7 Technical Advisory Committee

As part of the PWS Project's development, SqCWD received a SWRCB Prop 1 Groundwater Planning Grant for $2 M in 2018 which included the formation of a TAC to provide input on the grant deliverables. The Planning Grant TAC was comprised of staff representatives from the SWRCB DDW, RWQCB, DFA, and a local water agency, PVWMA, as shown below:

- Tricia Carter - Grant Manager, SWRCB, DFA (Finance)
- Robert Reeves – Proposition 1 Groundwater Grant, Program Manager (Finance)
- Jan Sweigert – District Engineer (Monterey), SWRCB, DDW, (Regulatory Compliance)
- Jonathan Weininger – Sanitary Engineer (Monterey), SWRCB, DDW (Regulatory Compliance)
- Harvey Packard – Supervising Engineer, Central Coast RWQCB (Regulatory Compliance)
- Cecile Blancarte – Water Resources Control Engineer, Central Coast RWQCB (Regulatory Compliance)
- Jennifer Epp – WDR/UST Program Manager, SWRCB (Regulatory Compliance)
- Sherly Rosilela – Water Resource Control Engineer, Recycled Water Unit, SWRCB, DDW, (Regulatory Compliance)
- Randy Barnard – Recycled Water Unit (former) Chief, SWRCB, DDW (Regulatory Compliance)
- Brian Bernados – Recycled Water Unit, SWRCB, DDW, (Regulatory Compliance)
- Brian Lockwood – General Manager, PVWMA (Agency perspective)

With the award of the SWRCB Prop 1 Groundwater Implementation Grant for $50M in 2020, the TAC is being maintained to provide input on the grant deliverables. The Implementation Grant TAC is comprised of staff representatives from the SWRCB DDW, RWQCB, DWR, and DFA:

- Tricia Carter – Grant Manager, SWRCB, DFA
- Sherly Rosilela – Senior Water Resources Engineer, Recycled Water Unit, SWRCB, DDW
- Aide Ortiz – Water Resource Control Engineer, Recycled Water Unit, SWRCB, DDW (permanently replaced Sherly Rosilela in October 2021)
- James Bishop – Engineering Geologist, Central Coast Regional Water Quality Control Board, WDR Program
- Dane Mathis – Supervising Engineering Geologist, DWR, Division of Regional Assistance, South Central Region
- Mir Ali– Water Resource Control Engineer, Recycled Water Unit, SWRCB, DDW (Added July 2022)

2.8 Environmental Compliance

The California Environmental Quality Act (CEQA) requires state and local agencies to identify the significant effects a proposed project may have on the physical environment. The review and input of the public, agencies, and interested parties is an important part of the CEQA process, which provides a number of opportunities for public participation. In accordance with CEQA, an EIR was prepared for the PWS Project which identified and evaluated potential environmental effects, indicated how and whether the significant effects can be mitigated or avoided, and described and analyzed possible alternatives to the PWS Project. The objective of preparing an EIR was to ensure that SqCWD considered potential environmental effects of the PWS Project and that public input was solicited, received, and incorporated when deciding whether to approve the PWS Project.

For the PWS Project:

- The notice of preparation of an EIR (State Clearinghouse No. 2016112045) was issued on November 16, 2016, and a revised notice of preparation was issued on June 22, 2017.
- The 46-day public review period for the PWS: Groundwater Replenishment and SWIP (PWS Project) Draft EIR was held from June 29 through August 13, 2018.
- A Responses to Comments document was prepared and, along with the Draft EIR, is considered the Final EIR. This Final EIR was prepared in compliance with CEQA (California Public Resources Code, Sections 21000 et seq.), and the CEQA Guidelines (Code of Regulations Title 14, Chapter 3, Sections 15000 et seq.). The Final EIR was issued on December 7, 2018.
- The Final EIR was certified by SqCWD's Board of Directors on December 18, 2018. SqCWD Board adopted Resolution 18-30 certifying the EIR and Resolution 18-31 adopting the environmental findings with regard to the PWS Project EIR, adopting a statement of overriding considerations and a mitigation MMRP and approving the Project.
- An Addendum to the Final EIR was approved by the SqCWD Board of Directors on November 17, 2020. This addendum approved the minor project changes including the addition of the Nitrifying Biologically Aerated Filters (nBAF) pretreatment, the addition of a sewer pump station at the AWPF, and the addition of a new adjacent parcel and existing structure to the AWPF facility. The EIR addendum found that these project changes did not lead to any new significant environmental impacts.
- An additional Addendum to the Final EIR was approved by the SqCWD Board of Directors on October 5, 2021. This addendum analyzed the changes to consolidate the PWS treatment facilities at the Chanticleer site including removal of nBAF pretreatment at the SC WWTF (which has been replaced with ozone at Chanticleer) and all associated appurtenances to construct and operate those facilities. The EIR addendum found that these project changes did not lead to any new significant environmental impacts. The SqCWD Board of Directors also took action on October 5, 2021, to approve these project changes.

2.9 Project Goals

The primary goal of the PWS Project is to produce up to 1,500 afy of purified water from the SC WWTF source water for groundwater replenishment. By replenishing 1,500 afy of purified water into the groundwater basin, SqCWD can prevent further seawater intrusion improve the groundwater basin's reliability as a water supply and help achieve groundwater sustainability as defined by the GSP for the basin. The sustainable groundwater supply will allow for a reliable, drought-resistant supplemental water source for SqCWD's customers. Additional environmental benefits to the surface and marine water as well as a more diverse water supply portfolio will also be achieved through completion of the PWS Project. In addition to groundwater replenishment, a minor amount of purified water may be used for non-potable water purposes allowed under CCR Title 22. Public outreach, participation, and education are a large goal for the PWS Project. SqCWD emphasizes the importance of the inclusion of the public and the ability to educate and inform the public.

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Section 3: Regulatory Requirements

In California, recycled water production and use is regulated by the SWRCB, DDW, and RWQCB. Regulatory requirements for the PWS Project are summarized in this section. This summary of the groundwater replenishment reuse requirements pertaining to the PWS Project is not intended to replace the actual regulatory requirements; for details of the requirements, the reader is referred to the Title 22 (CCR, 2018). Regulatory requirements for the Santa Cruz NPR Project are summarized in the City of Santa Cruz Non-Potable Reuse Engineering Report.

3.1 Requirements for Public Health Protection

This Pure Water Soquel Engineering Report is prepared for DDW review and approval. DDW is responsible for:

- Administering California's Drinking Water and Recycled Water Programs
- Establishing criteria to protect public health regarding recycled water production and use
- Developing Water Recycling Criteria in the CCR, Title 22, which includes regulations for non-potable and potable reuse projects
- Participating in public hearings and making recommendations for recycled water permits issued by the RWQCBs

Water recycling is regulated by Title 22, Division 4, Chapter 3 of the CCR (CCR, 2018). Title 22 (or Title 22 Criteria) is developed and administered by DDW. Non-potable water production for reuse has been practiced for decades and was initially regulated under Title 22 as reclaimed water in 1978. Over the years, expanded beneficial uses were recognized and incorporated into the regulations. Requirements for groundwater replenishment with recycled water were added to the Title 22 Criteria in June 2014; requirements for surface water source augmentation using recycled water were added in October 2018.

The groundwater replenishment regulations classify planned groundwater replenishment reuse projects (GRRPs) by their method of recharge: surface application (spreading) and subsurface application (injection wells).

The PWS Project is a subsurface application. For subsurface application projects (Title 22, Article 5.2), the full volume of recycled water applied must receive "full advanced treatment" (FAT) that consists of RO and an AOP. The regulations establish RO and AOP performance criteria.

3.1.1 General GRRP Requirements

The Title 22 Criteria contain a number of provisions that apply to all GRRPs using recycled water (defined as treated municipal wastewater). Among these common requirements for surface and subsurface applications are: submittal of an Engineering Report, an OOP, and a plan to provide an alternative water supply; maintenance of a source control program; and collection of baseline groundwater data. Each of these common requirements is described in subsections of **Section 3.1.1**.

In addition, the project sponsor must demonstrate to DDW that it possesses adequate managerial and technical capability to implement the GRRP. **Section 16** of this Engineering Report presents SqCWD's TMF capability for the PWS Project.

Specific requirements for GRRPs using subsurface application are set forth in the Title 22 Criteria and discussed in **Sections 3.1.2** through **3.1.10** (i.e., pathogenic microorganism control and multiple barriers, tracer study to validate underground retention time, RRT, control zones, recycled water contribution and diluent water, TOC and nitrogen requirements, FAT for regulated contaminants and physical characteristics control, unregulated contaminant monitoring, and monitoring wells).

3.1.1.1 Engineering Report

An Engineering Report prepared by a licensed engineer describing the GRRP and documenting how it complies with the Title 22 Criteria must be submitted to DDW for review and approval. This Engineering Report for the PWS Project is submitted to DDW for review and approval in compliance with this requirement. The Engineering Report must also include a contingency plan that will assure that no untreated or inadequately treated wastewater will be delivered to the use area.

More specifically, the review process involves first submitting a draft Engineering Report to DDW and the RWQCB for review and for approval by DDW. After addressing any questions from the regulators and revising the draft Engineering Report as necessary, the project sponsor then holds a public hearing in accordance with Title 22 Section 60320.202. Prior to the public hearing, the GRRP sponsor must provide DDW information about the project to be presented at the public hearing for DDW's review and approval. Per Title 22 Section 60320.202, advance notification and information about the public hearing must be posted at least 30 days prior to the hearing on the sponsor's website and in a publicly accessible repository; in addition to the general public, the owner of the first downgradient drinking water well and owners of drinking water wells within ten years underground travel time downgradient of the GRRP must be notified of the public hearing. Public hearing notices may be made by direct mail, posted in a local, general circulation newspaper, statements in water bills, and/or television/radio advertisements. Following the public hearing, the Engineering Report must be revised as necessary to address pertinent public comments and any follow-up comments received from DDW and resubmitted to DDW. Once DDW deems the Engineering Report is final, DDW conditionally accepts the project and submits a letter with recommendations to the RWQCB for permit conditions. The RWQCB, as the permitting and enforcement authority, then issues the WDRs/WRRs, incorporating DDWs recommendations and applicable regional Basin Plan requirements or other pertinent requirements. The Engineering Report must be updated every five years or when significant changes are proposed. Throughout the operating life of the project, annual reports must be submitted to DDW and the RWQCB as well as nearby downgradient public water agencies and drinking water well owners.

A public hearing for the PWS GRRP was held on December 1st, 2022. A summary of the outreach and public hearing is provided in Appendix A.

3.1.1.2 Operation Optimization Plan

Prior to operation of the GRRP, the project sponsor must submit an OOP to DDW and the RWQCB for review and approval. The plan must identify the operations, maintenance, sampling, analytical methods (e.g., grab or composite sampling, lab methods and online analyzers), and monitoring necessary for the GRRP to meet its permit and Title 22 regulatory requirements. The plan should be updated as needed to be representative of current operations.

Please refer to **Section 15**, which describes the General Operations. The initial draft OOP will be submitted to DDW and the RWQCB prior to completion of construction. An amended draft OOP that incorporates prior comments and new operations information gathered during startup (including results of the UV-AOP Challenge Test) will be submitted prior to the DDW Inspection. A final OOP will be submitted 90 days after the DDW Inspection.

3.1.1.3 Source Control

The recycled water must be from a wastewater agency that administers an industrial pretreatment and pollutant source control program that includes:

- An assessment of the fate of DDW- and RWQCB-specified contaminants through the wastewater and recycled water treatment systems
- Contaminant source investigations and monitoring that focus on DDW- and RWQCB-specified contaminants
- An outreach program to industrial, commercial, and residential communities with the aim of managing and minimizing discharges of contaminants at the source
- An up-to-date inventory of contaminants that may be discharged into the wastewater collection system in the project area

While many of the source control requirements are already addressed through the SC WWTF's existing industrial pretreatment program, compliance with the Title 22 Criteria will require enhancements to the program.

Please refer to **Section 4.3** for a description of the City's source control program and planned enhancements to support the PWS Project.

3.1.1.4 Alternative Water Supply Plan

Prior to operation of a GRRP, the project sponsor must obtain approval from DDW for an alternative water supply plan. The plan must describe the steps to provide an alternative source of potable water or treatment at a drinking water well if a GRRP causes the well to no longer be safe for drinking water purposes as determined by DDW.

Please refer to **Section 13.5** that describes the SqCWD alternative water supply plan for the PWS Project.

3.1.1.5 Collection of Baseline Groundwater Quality Data

Prior to operation, the GRRP project sponsor must collect at least four samples, at least one sample each quarter (e.g., a year's worth of data), from each potentially affected aquifer. The samples must be analyzed for nitrogen compounds, regulated contaminants and physical parameters, TOC, priority toxic pollutants, chemicals that have NLs, and any other DDW-specified contaminants.

Section 14.5.1 in Monitoring and Reporting Plan describes the plan for collection of baseline groundwater quality data. The plan includes data to be collected from samples taken from monitoring wells installed for the PWS Project; other available wells in the PWS Project vicinity from which to collect samples and historical data could also be utilized.

3.1.2 Pathogenic Microorganism Control and Multiple Barrier Requirements for GRRPs

The Title 22 Criteria establish pathogen reduction requirements for recycled water used for groundwater replenishment projects using a risk-based multiple barrier approach. Groundwater replenishment projects must achieve a total of at least a 12-log enteric virus reduction, a 10-log *Giardia* cyst reduction, and a 10-log *Cryptosporidium* oocyst reduction using at least three treatment barriers, each of which must achieve at least a 1.0-log reduction. No individual treatment process can be credited with more than 6-log reduction.

Failure to meet the specified minimum pathogen reductions (12-log virus, 10-log G*iardia* cyst, or 10-log *Cryptosporidium* oocyst reduction) requires notification to DDW and RWQCB and investigation to correct

the problem and achieve the required pathogen reduction levels. The Title 22 Criteria require notification to DDW and the RWQCB of failures lasting longer than four consecutive hours or more than eight hours in any 7-day period. Shorter failures must be reported within ten days after the month in which the failure occurred. If the GRRP performance declines to less than 10-log virus, 8-log *Giardia* cyst, or 8-log *Cryptosporidium* oocyst reduction, recharge of purified recycled water must be discontinued and DDW and the RWQCB shall be immediately notified. The Title 22 Criteria do not grant pathogen reduction credit for post-treatment of extracted groundwater. The Title 22 Criteria do, however, grant pathogen reduction credit for treatment barriers and underground retention time.

Sections 9 and 11 discuss pathogenic microorganism control provided by the PWS Project AWPF and underground control zones.

3.1.2.1 Tracer Study to Demonstrate Underground Retention Time

For virus, reduction credit is given for residence time underground of up to 1-log per month with the retention time from the point of recharge to the nearest downgradient drinking water well validated by a tracer test that is started within the first three months of operation. A protocol for the GRRP tracer study must be submitted for DDW's review and approval in advance of conducting the tracer study.

A tracer study using an added tracer would receive the full 1-log per month virus reduction credit. An intrinsic tracer may be used, if approved by DDW, in lieu of an added tracer for the tracer study. An intrinsic tracer test would receive only 0.67-log per month virus reduction credit.

The demonstrated underground retention time is based on the difference in tracer concentration from where the water is recharged to the downgradient monitoring point as either: (1) two percent of the initial tracer concentration has reached the downgradient monitoring point, or (2) ten percent of the peak tracer concentration has been observed at the downgradient monitoring point.

For project planning purposes, the Title 22 Criteria allow the use of groundwater flow models to evaluate underground retention time from the recharge point to the closest downgradient drinking water well and assignment of virus log-reduction credits using a safety factor based on the precision of the model utilized. A numerical model consisting of a computer model that has been calibrated and validated to simulate groundwater flow in the project area is credited with 0.5-log per month of virus reduction. An analytical model using equations (e.g., Darcy's Law) to estimate groundwater flow based on assumptions about the aquifer is credited with 0.25-log per month of virus reduction.

Thus, if a numeric model is used to estimate the underground travel time, and a 6-log credit for the underground retention time component is necessary to meet the overall total 12-log virus reduction requirements, the required retention time estimated by the numerical model to be used for planning would be doubled (for 6-log credit required and at 0.5-log per month = 12 months modeled retention) to account for uncertainty in the method of analysis during the project planning phase.

In summary, virus reduction credits for underground retention time for tracers and models are as follows:

- Added tracer study – 1.0-log per month
- Intrinsic tracer study – 0.67-log per month
- Numerical modeling – 0.5-log per month
- Analytical modeling – 0.25-log per month

As discussed in **Section 5**, the PWS Project will receive source water from the SC WWTF for the AWPF that will use ozonation, MF, RO and UV light/AOP in compliance with Title 22 Criteria for subsurface application. The required 10-log *Giardia* cyst and 10-log *Cryptosporidium* oocyst reductions will be achieved via treatment at the AWPF prior to injection. Virus reduction will be achieved via treatment at the AWPF as well as underground retention.

3.1.3 RRT Requirements for GRRPs

The Title 22 Criteria require a project sponsor to propose a RRT – a specified time that the purified recycled water (after post-treatment) must be retained underground before withdrawal for use as a drinking water supply. The RRT is intended to provide sufficient time to retain purified recycled water underground to identify any treatment failures so that inadequately treated purified recycled water that has inadvertently been recharged does not enter a potable water system. Sufficient time must elapse to allow for a response or actions to be taken that will protect the public from exposure to inadequately treated water and provide (if necessary) an alternative source of drinking water.

The RRT is the aggregate of time to:

- Identify that the purified recycled water (after post-treatment) quality is out of compliance
- Collect and analyze confirmation samples
- Determine the appropriate corrective action, activate the response, and wait for the response to become effective

For purified recycled water quality and RRT compliance, the primary focus is on constituents that are acutely toxic, such as nitrate, nitrite, and perchlorate. The minimum RRT allowed is 2 months. Furthermore, the RRT must be equal to or less than the underground retention time demonstrated by a tracer study.

Section 12 presents the proposed RRT for the PWS Project.

3.1.4 Control Zones for GRRPs

The Title 22 Criteria require that primary and secondary boundary control zones, or buffer areas restricting drinking water well construction, be established around the purified recycled water recharge site(s).

The primary control zone is determined by the lowest underground retention time needed for pathogen reduction or the RRT (whichever is greater) and forms the basis for establishing a three-dimensional zone of controlled (i.e., restricted) potable well construction for a GRRP. Thus, the Title 22 Criteria specify that the project create a primary boundary area within which the groundwater is not deemed suitable for use as a drinking water supply.

A secondary control zone (typically beyond or larger than the primary control zone) must also be established that reflects an area where existing or proposed future drinking water wells may be controlled and would require further evaluation of potential mitigating activities before a potable well could be constructed or operated.

The proposed control zones for the PWS Project are discussed in **Section 11.4**.

3.1.5 Recycled Water Contribution and Diluent Water Requirements for GRRPs

Control of unregulated chemicals for all GRRPs is accomplished in part through requirements for the maximum allowable Recycled Municipal Wastewater Contribution (RWC_{max}). The Title 22 Criteria define RWC_{max} by two conditions: fraction of the recharge water that is recycled water, and TOC concentration of the recycled water.

Firstly, RWC_{max} is defined on a volumetric basis as the fraction of recycled water applied divided by the sum of the quantity of recycled water and credited diluent water. Compliance is based on the monthly running average RWC using the preceding 120-month averaging period. For new GRRPs, the calculation of the monthly running average RWC begins after 30 months of recycled water application based on the total volume of the recycled water and credited diluent water introduced during the preceding months.

Secondly, the RWC_{max} is a function of the TOC concentration in the recycled water, where, for subsurface application projects, the initial maximum RWC allowed is based on DDW review and may be up to 1.0 (100 percent).

If needed, a GRRP may increase its RWC_{max} provided:

- The increase is approved by DDW and RWQCB
- For the previous 52 weeks, the TOC 20-week running average has not exceeded 0.5 mg/L divided by the proposed RWC_{max}
- The RWQCB permit for the GRRP allows for the increased RWC_{max}

Diluent water that is "credited" for a GRRP's RWC calculation must be of non-wastewater origin (e.g., storm water, imported untreated water, potable water, or groundwater underflow) that meets water quality requirements as specified in Title 22. Except for potable water used as diluent, a source water evaluation of the diluent source must be approved by DDW. To receive diluent water credit in subsurface applications, the diluent water quality must not exceed a primary MCL, a secondary MCL (upper limit in Title 22 Table 64449-B), and DDW NLs.

To comply with the RWC_{max}, diluent water may be:

- Blended with recycled water or introduced separately into the GRRP injection wells, storage tanks, or piping.
- A source that indirectly commingles with the recycled water (e.g., in nearby spreading basins or as groundwater underflow in the recharge area). A method to account for use of underflow as credited diluent must be approved by DDW.

For the PWS Project, the proposed RWC is 1.0 (100 percent); thus, use of diluent water is not proposed.

3.1.6 TOC Requirements for GRRPs

The Title 22 Criteria include provisions for the allowable TOC concentration in purified recycled water (after post-treatment) based on the RWC_{max}.

For a subsurface application project, the entire purified recycled water volume must undergo FAT that produces a TOC in purified recycled water (after post-treatment) less than or equal to 0.5 mg/L and therefore would allow an RWC_{max} up to 1.0 (or 100 percent).

Compliance with the TOC limit is based on collection of weekly samples of purified recycled water (after post-treatment) (i.e., at a minimum frequency of once per week), and a 20-week running average of all TOC results as well as the average of the last four TOC results.

During the initial 20 weeks of operation of a subsurface application project, the TOC concentration in the RO permeate must be equal to or less than 0.25 mg/L (based on the 95th percentile of all results).

Compliance with these TOC requirements is discussed in **Sections 5, 8, 14, and 15**.

3.1.7 Nitrogen Requirements for GRRPs

For subsurface application projects, the total nitrogen concentration in the purified recycled water (after post-treatment) must be equal to or less than 10 mg/L.

Compliance with the total nitrogen limit is based on two samples per week of the purified recycled water (after post-treatment), collected at least three days apart. Reduced sampling frequencies may be approved for qualified applications that have demonstrated over the most recent 24 months an average total nitrogen concentration of less than 5 mg/L and have had no exceedances of the 10 mg/L limit.

Compliance with this requirement is discussed in **Sections 8, 14, and 15**.

3.1.8 Other Recycled Water Quality Requirements for GRRPs

The Title 22 Criteria establish recycled water quality requirements for regulated contaminants and physical characteristics and additional monitoring requirements for unregulated contaminants and chemicals.

3.1.8.1 Regulated Contaminants and Physical Characteristics Control

The Title 22 Criteria establish requirements for regulated compounds (e.g., those with drinking water MCLs). For subsurface application projects, the purified recycled water (after post-treatment) must meet all primary MCLs (except nitrogen compounds), ALs (i.e., lead and copper), and sMCLs (in Title 22 Table 64449-A, or the upper limit in Table 64449-B), with one exception – disinfection byproducts (DBPs).

For subsurface application projects, compliance with DBP MCLs can be determined in the purified recycled water (after post-treatment) or recharge water.

For primary MCLs, samples must be collected and analyzed monthly; after 12 consecutive months of results not exceeding an MCL or AL, the frequency may be reduced to quarterly with DDW's approval. For sMCLs, samples must be collected and analyzed annually. For primary MCLs established for pollutants with chronic toxicity, compliance is based on a running annual average. For primary MCLs established for pollutants with acute toxicity (such as perchlorate), compliance is based on a running four-week average; weekly monitoring is required if the quarterly result exceeds the MCL and shall continue until four consecutive results are lower than the MCL or ALs.

For sMCLs, compliance is based on a single (and confirmation) annual sample. If the annual result exceeds the sMCL, quarterly monitoring shall be initiated for that contaminant. If the running average of quarterly results exceeds a secondary MCL, the project sponsor must describe the reason(s) and any corrective actions in a report submitted to DDW and RWQCB. Annual sampling may resume when the running annual average of quarterly results does not exceed a secondary MCL.

Compliance with these requirements is discussed in **Sections 8 and 14**.

3.1.8.2 Additional Chemical and Contaminant Monitoring

Purified recycled water (after post-treatment) must also be monitored quarterly for Clean Water Act Priority Pollutants (chemicals listed in 40 CFR Section 131.18 "Establishment of numeric criteria for priority toxic pollutants for the State of California") and chemicals specified by DDW and RWQCB based on information in the Engineering Report and source control program. Other purified recycled water monitoring and reporting is also required by the SWRCB Recycled Water Policy (SWRCB, 2018), as described in **Section 3.3.2**.

For subsurface application projects, the project must monitor purified recycled water (after post-treatment) or recharge water monthly for DDW-specified chemicals having NLs. The frequency of monitoring NLs may be reduced to quarterly with DDW approval provided that no results exceed a NL during 12 consecutive months. If a result exceeds an NL, a confirmation sample must be taken, and if the average of the initial and confirmation sample exceeds the NL, weekly monitoring shall be initiated. Weekly monitoring for that constituent shall continue until the running four-week average does not exceed the NL.

If the running four-week average exceeds the NL, a report shall be submitted to DDW and RWQCB describing the reason and schedule for corrective actions. After 16 weeks, if the running four-week average is greater than the NL, the project sponsor shall notify DDW and RWQCB.

Annual monitoring of indicator compounds specified by DDW and RWQCB shall be conducted based on review of the Engineering Report, source control inventory, the affected groundwater basin(s), and an indicator compound's ability to characterize the presence of contaminants of emerging concern (CECs), pharmaceuticals, endocrine disrupting chemicals, personal care products, and presence of wastewater. Any detected compounds that are included in this additional monitoring program must be reported to DDW and RWQCB no later than the following quarter in which the results are received.

These requirements are further discussed in **Sections 8 and 14**.

3.1.9 Monitoring Well Requirements for GRRPs

The Title 22 Criteria require at least two monitoring wells for a GRRP:

- At least one monitoring well shall be located:
  - No less than 2 weeks but no more than 6 months of underground travel time downgradient from the GRRP
  - At least 30 days upgradient of the nearest drinking water well
- At least one monitoring well shall be located between the GRRP and the nearest downgradient drinking water well

The monitoring wells must be constructed to allow for collection of water from each aquifer receiving purified recycled water (after post-treatment) from the GRRP.

After the GRRP begins operation, groundwater from the monitoring wells from each aquifer that receives recharged water shall be sampled quarterly and analyzed for total nitrogen, nitrate, nitrite, sMCLs, any chemicals or contaminants specified by DDW or the RWQCB, and priority toxic pollutants specified by DDW. Any results exceeding 80 percent of a nitrate, nitrite, or nitrate plus nitrite MCL shall be confirmed by collecting and analyzing another sample. If the average of the initial and confirmation samples exceeds the contaminant's MCL the project sponsor shall notify DDW and the RWQCB, discontinue recharging until corrective actions have been taken, or determine that the GRRP is not the source of the contamination.

Prior to beginning operation of the GRRP, baseline groundwater quality monitoring is required. At least four quarterly samples of groundwater from each potentially affected aquifer shall be collected and analyzed for total nitrogen (sum of nitrate, nitrite, ammonia and organic nitrogen, as nitrogen), regulated contaminants and physical characteristics (MCLs, sMCLs, and AL s), TOC, priority toxic pollutants, and any other contaminants specified by DDW.

The approximate location of the proposed monitoring wells should be included in the Engineering Report. **Section 11** describes proposed monitoring wells sites for the PWS Project. **Section 14.5** describes the groundwater monitoring plan for the PWS Project, including baseline and operational groundwater monitoring.

3.1.10 Provisions for Alternatives

Alternative approaches to meeting any of the requirements in the Title 22 Criteria may be submitted for review and approval by DDW. Unless waived by DDW, the alternative approach must also be reviewed by an independent expert panel. The project sponsor must demonstrate that the alternative provides the same level of public health protection as the requirements set forth in the Title 22.

Please note no alternative approaches are requested for the PWS Project.

3.2 Requirements for Environmental and Water Quality Protection

The RWQCB Central Coast Region is the permitting and enforcement authority in the coastal region of California, extending from Santa Clara County south to northern Ventura County. The PWS Project is located in Santa Cruz County, which is part of the Central Coast Region. The RWQCB is responsible for:

- Protecting and, where possible, enhancing surface water and groundwater quality by establishing water quality standards
- Regulating discharges and establishing water recycling and WDRs to maintain water quality
- Incorporating recommendations from the DDW into permits for water recycling and groundwater recharge projects
- Issuing and enforcing water recycling and waste discharge permits and requirements

Permits issued by the RWQCB implement applicable State water quality control policies and plans, including water quality objectives and policies established in the Water Quality Control Plan for the Central Coastal Basin (Basin Plan) (RWQCB, 2019). The Basin Plan designates beneficial uses and water quality objectives for surface water and groundwater in the region. Permit limits for groundwater recharge projects are set to ensure that groundwater quality is not degraded or affected such that it contains concentrations of chemicals in amounts that adversely impact beneficial uses.

The PWS Project is located in the Big Basin Hydrologic Unit, which is one of the surface watersheds in the Central Coast Region. Within the Big Basin Hydrologic Unit, the PWS Project extends over two hydrologic areas and three hydrologic sub-areas:

- Big Basin Hydrologic Unit (No. 304.00)
  - Santa Cruz Hydrologic Area (No. 304.10)
    - Davenport Hydrologic Sub-Area (No. 304.11)
    - San Lorenzo Hydrologic Sub-Area (No. 304.12)
    - Aptos-Soquel Hydrologic Sub-Area (No. 304.13)
- Año Nuevo Hydrologic Area (No. 304.20)

The Basin Plan describes numerous smaller watersheds in the PWS Project area and lists beneficial uses and water quality objectives for each water body (Basin Plan, 2019). The PWS Project area also extends into the northern portion of Monterey Bay. The SC WWTF discharges treated wastewater into Monterey Bay via an existing ocean outfall.; the ocean discharge area is within the Monterey Bay National Marine Sanctuary.

The PWS Project will recharge the Basin (Basin No. 3-001) with purified water. California DWR (DWR, 2016) defined the Basin as an expansion of the former Soquel Valley basin to include portions of the previously defined Pajaro Valley, West Santa Cruz Terrace, and Purisima Highlands basins based on approval of a basin boundary modification request submitted under SGMA (Soquel-Aptos Groundwater Management Committee, 2015). The Basin Plan refers to the formerly defined basins prior to the approved basin boundary modification. Of these formerly defined basins, the reference to the Soquel Valley Groundwater Basin is of particular interest for the PWS Project because that area uses the Purisima Formation aquifer as a major part of its water supply. The PWS Project will inject purified water into the Purisima aquifer, and thus the Soquel Valley Groundwater Basin beneficial uses and water quality objectives are most applicable for establishing regulatory requirements. **Table 3-1** lists the designated beneficial uses for groundwater basins established in the Basin Plan in the PWS Project area.

Table 3-1. Summary of Existing Beneficial Uses of Water in the Pure Water Soquel Project Area		
Existing Beneficial Uses		
Abbreviation	**Use Type**	**Description**
Santa Cruz Mid-County Groundwater Basin Soquel Valley Groundwater Sub-Basin		
MUN	Municipal and Domestic Supply	Uses of water for community, military, or individual water supply systems including, but not limited to drinking water supply.
IND	Industrial service supply	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
AGR	Agricultural Supply	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Source: RWQCB, Basin Plan, 2019, adopted for modification by Soquel-Aptos Groundwater Management Committee, 2016.

The Basin Plan specifies water quality objectives for groundwater basins associated with the designated beneficial uses:

- General narrative objectives for taste and odor and radioactivity that apply to all groundwater.
  - Taste and odor producing substances shall not be present in concentrations that adversely affect beneficial uses.
  - Radionuclides shall not be present in concentrations that are harmful to or result in accumulation in the food chain so as to present a hazard for human, plant, animal, or aquatic life.
- All of the groundwater basins in the PWS Project area are designated as MUN and must comply with Federal and State primary and secondary drinking water standards and coliform criteria.
  - Inorganic chemicals shall not be at concentrations greater than the primary drinking water MCL
  - Organic chemicals shall not be at concentrations greater than the primary drinking water MCLs for regulated organics
  - Radioactivity shall not be at concentrations greater than the primary drinking water MCLs for radionuclides
  - Median concentration of coliform over any 7-day period shall be less than 2.2 most probable number (MPN)/100 milliliters (mL)

For agricultural supply (AGR), water quality objectives are set to protect the soil productivity and livestock, and guidelines are established for:

- Salinity (EC)
- Permeability (EC and sodium adsorption ratio [SAR])
- Sodium
- Chloride
- Boron
- NH_3-N for sensitive crops
- NO_3-N for sensitive crops
- Bicarbonate (only for overhead sprinklers)
- pH

Agricultural water quality objectives set in the Basin Plan are presented in **Table 3-2**. The agricultural groundwater quality objectives are provided for informational purposes in this section.

Table 3-2. Water Quality Objectives for Agricultural Water Use

Constituent	Units	Agricultural Water Quality Objective Maximum Concentration[a]	
		Irrigation Supply	Livestock Watering
Aluminum	mg/L	5.0	5.0
Arsenic	mg/L	0.1	0.2
Beryllium	mg/L	0.1	--
Boron	mg/L	0.75	5.0
Cadmium	mg/L	0.01	0.05
Chromium	mg/L	0.10	1.0
Cobalt	mg/L	0.05	1.0
Copper	mg/L	0.2	0.5
Fluoride	mg/L	1.0	2.0
Iron	mg/L	5.0	--
Lead	mg/L	5.0	0.1
Lithium	mg/L	2.5	--
Manganese	mg/L	0.2	--
Mercury	mg/L	--	0.01
Molybdenum	mg/L	0.01	0.5
Nickel	mg/L	0.2	--
Nitrate + Nitrite	mg/L	--	100
Nitrite	mg/L	--	10
Selenium	mg/L	0.02	0.05
Vanadium	mg/L	0.1	0.10
Zinc	mg/L	2.0	25

a. Source RWQCB, Basin Plan, 2019

The anti-degradation assessment in **Section 11.5** presents the PWS Project's compliance with the SWRCB Anti-Degradation Policy, which is noted in **Section 3.3.1**.

The Basin Plan establishes specific numerical water quality objectives that are intended to serve as a baseline to evaluate water quality management for some groundwater basins. The Basin Plan does not establish specific numeric water quality objectives for the previously defined Soquel Valley Groundwater Basin.

The PVWMA prepared a SNMP in fulfillment of the SWRCB Recycled Water Policy (PVWMA, 2016). The purpose of the SNMP is to ensure attainment of water quality objectives to protect beneficial uses. The currently defined Pajaro Valley Groundwater Basin is managed by the PVWMA and lies outside the Basin (MGA, 2019). As noted above, the PWS Project will replenish the Purisima aquifer, which is not a source of supply for the Pajaro Valley Groundwater Basin adjacent to the Basin and managed by PVWMA.

3.3 SWRCB Requirements

The SWRCB adopts state-wide policies for water quality control. Two policies are particularly relevant to groundwater recharge projects: (1) Antidegradation Policy, and (2) Recycled Water Policy.

3.3.1 Antidegradation Policy

The California Antidegradation Policy is set forth in SWRCB Resolution No. 68-16, which is entitled "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (SWRCB, 1968). The Basin Plan references and incorporates the Antidegradation Policy, which specifies:

- "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high-quality water will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."
- "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet WDRs which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

The anti-degradation assessment in **Section 11.5** presents the PWS Project's compliance with the SWRCB Anti-Degradation Policy.

3.3.2 SWRCB Recycled Water Policy

Originally adopted by the SWRCB in 2009, the Recycled Water Policy has been amended twice, in 2013 and most recently in 2018. The amended "Water Quality Control Policy for Recycled Water" (aka Recycled Water Policy) was adopted by the SWRCB on December 11, 2018, in SWRCB Resolution 2018-0057 (SWRCB, 2018). The amended Recycled Water Policy establishes CEC monitoring requirements for recycled water groundwater recharge projects. It also instructs all RWQCBs to not issue requirements for monitoring of additional CECs in recycled water beyond the requirements provided in the Recycled Water Policy, except when recommended by DDW or requested by the project sponsor. The Recycled Water Policy establishes goals for increasing recycled water use in California and sets forth annual reporting requirements for the volumes of wastewater collected, treated wastewater discharged, and recycled water distributed for a variety of uses, including groundwater recharge. Furthermore, the Recycled Water Policy describes coordination between agencies to support water recycling, including water rights issues associated with wastewater change petitions.

The Recycled Water Policy also establishes requirements for SNMPs, which are used to support permits for recycled water projects and associated antidegradation analyses that may provide technical information for possible amendment(s) to RWQCB Basin Plans. In some cases, the RWQCB may determine that groundwater management plans are functionally equivalent to a SNMP. For groundwater basins where a SNMP is in development or under review by the RWQCB, compliance with the SWRCB Anti-Degradation Policy can be demonstrated by evaluating two assimilation capacity thresholds. A groundwater recharge project that proposes to utilize less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a groundwater basin/sub-basin) are only required to conduct an anti-degradation analysis verifying the use of the assimilative capacity. For basins/sub-basins where the RWQCB has not determined the baseline assimilative capacity, the baseline assimilative capacity can be calculated by the project proponent for

review and approval by the RWQCB until the SNMP is accepted by the RWQCB. In the event that a project or multiple projects utilize more than the designated assimilative capacity (e.g., 10 percent for a single project or 20 percent for multiple projects), the project proponent must conduct a RWQCB-deemed acceptable analysis. The RWQCB has the discretionary authority to allocate assimilative capacity to groundwater replenishment projects. The PWS Project complies with the SWRCB Anti-Degradation Policy as presented in **Section 11.5**.

The Recycled Water Policy specifies that monitoring be conducted at GRRPs for designated CEC parameters, which are comprised of four groups of constituents and parameters:

- Health-based CECs
- Performance-indicator CECs
- Surrogates
- Bioanalytical screening tools

It should be noted that the Recycled Water Policy does not require CEC monitoring for non-potable recycled water uses (e.g., irrigation).

Proposed monitoring to meet Recycled Water Policy requirements is presented in **Section 14.4.5**.

3.4 Federal Requirements for Groundwater Replenishment Projects

The USEPA underground injection control (UIC) program applies to injection wells but has no permitting consequences for the PWS Project. The UIC program categorizes injection wells into five classes, only one of which (Class V) applies to groundwater replenishment projects. Under existing Federal regulations, Class V injection wells are "authorized by rule", which means they do not require a Federal permit if they do not endanger underground sources of drinking water and comply with other UIC program requirements (USEPA, 2021). In California, USEPA Region 9 is the permitting administrator for Class V wells. Any injection project planned in California must meet the State Sources of Drinking Water Policy, which ensures protection of groundwater quality for drinking water supplies, and therefore a Federal permit would not be necessary (USEPA, 2021). All Class V injection well owners in California are required to submit information to USEPA on the well for USEPA's inventory.

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Section 4: Source Wastewater

The SC WWTF will provide secondary effluent as source water for purification for the PWS SWIP wells and for production of tertiary reuse water for City in-plant and other non-potable uses. A portion of the SC WWTF secondary effluent will provide source water (approximately 2.1 mgd) to the AWPF at Chanticleer; the remainder of final effluent from SCWWTF will discharge at the existing ocean outfall in compliance with the City's NPDES permit.

4.1 Sewershed Description

The City owns and operates a wastewater collection, treatment, and disposal system that provides sewerage service for the City and areas of the SCCSD including the communities of Live Oak, Capitola, Soquel and sections of Aptos (**Figure 4-1**).

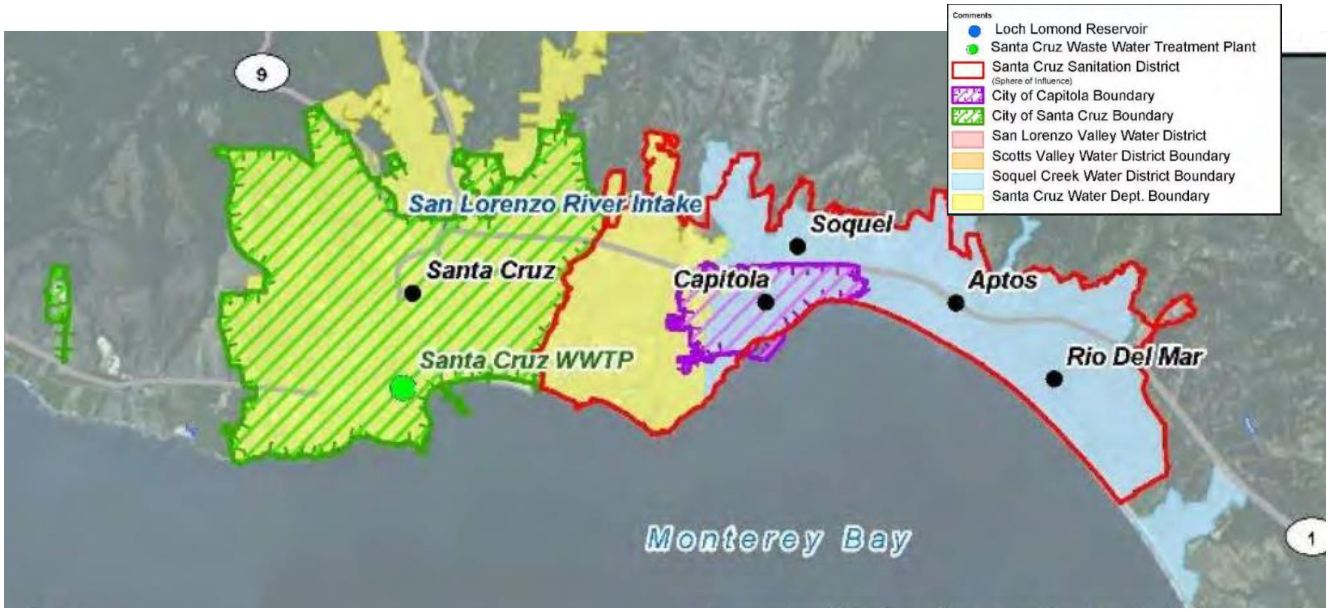

Figure 4-1. Water and sanitation service areas

Adapted from Kennedy/Jenks Consultants Draft Santa Cruz Regional Recycled Water Facility Planning Study, 2017

It also receives urban runoff diverted from Neary Lagoon. Flow from the lagoon into the SC WWTF is controlled via pump and control valve to the plant based on lagoon stored water depth and WWTF hydraulic and loading capacity. The wastewater collection system also receives leachate from the City landfill. The City landfill is a Class III landfill with best management practices and monitoring and reporting requirements detailed in the State MRP Order No. R3-2006-0018 including site inspections for all lined and unlined areas of the landfill, including the leachate management system. The City landfill is permitted to discharge leachate to the City of Santa Cruz's wastewater collection system under Permit No. NC0004, issued by the City of Santa Cruz. Monitoring requirements for landfill leachate discharge to the collection system, maximum allowable concentrations and sampling needs are detailed in **Table 4-1**. The City collection system conveys municipal wastewater generated within the City limits to the SC WWTF via 160 miles of wastewater mains and 34 pumping stations for treatment at the SC WWTF. Under its own separate NPDES permit, the City of Scotts Valley adds its treated wastewater to the SC WWTF's effluent for combined ocean discharge. The SCCSD wastewater collection system consists of approximately 220 miles

of gravity sanitary sewer lines, 14 miles of force mains and 35 pump stations, all of which discharge untreated municipal wastewater to the SC WWTF (County of Santa Cruz, 2017). In 1990, the City of Santa Cruz and the SCCSD established a 50-year agreement enabling SCCSD to discharge up to 8 mgd of average dry weather flow to the SC WWTF.

Table 4-1. City Landfill Wastewater Discharge Monitoring Requirements

Parameter	Units	Maximum Allowable Concentration	Monitoring Frequency
Arsenic	mg/L	0.40	Semi-Annual
Cadmium	mg/L	0.85	Semi-Annual
Chromium, total	mg/L	9.00	Semi-Annual
Chromium, hexavalent	mg/L	4.25	Semi-Annual
Copper	mg/L	0.75	Semi-Annual
Cyanide	mg/L	0.05	Semi-Annual
Lead	mg/L	2.00	Semi-Annual
Mercury	mg/L	0.05	Semi-Annual
Nickel	mg/L	1.25	Semi-Annual
Silver	mg/L	0.50	Semi-Annual
Sulfide (dissolved)	mg/L	0.20	Semi-Annual
Suspended solids	mg/L	1000	Semi-Annual
Zinc	mg/L	13.25	Semi-Annual
pH	units	5.0 to 10.0	Semi-Annual
Total Petroleum Hydrocarbons	mg/L	100	Semi-Annual
Temperature	°F	≤ 104	Semi-Annual
Oil or Grease of animal or vegetable origin	mg/L	300	Semi-Annual
Methyl-t-butyl Ether (MTBE)	mg/L	1.0	Semi-Annual
Total Toxic Organics (TTO)[a]	mg/L	1.0	Semi-Annual
Phenols, Total[b]	mg/L	150	Semi-Annual
Phenols, Chlorinated[c]	mg/L	0.60	Semi-Annual
Flow	mg/L	--	Continuous

a. *TTO is defined as the sum of all individual compounds listed in the CFR at 40 CFR 433.11e with quantifiable concentrations greater than 0.01 mg/L when measured using test methods approved under 40 CFR 136 or other methods approved for NPDES monitoring, and other toxic organic compounds as determined by the Director.*

b. *Phenols, Total by EPA Method 420.1*

c. *Phenols, Chlorinated is defined as the sum of 2-chlorophenol, 2,4-dichlorophenol, pentachlorophenol, 2,4,6-trichlorophenol and 4-chloro-3-methylpehnol (p-chloro-m-cresol).*

Currently, the wastewater conveyed from SCCSD makes up about 37 percent of SC WWTF influent flow. The SCCSD has an annual contract with the County of Santa Cruz Buena Vista Landfill for discharge of its leachate. The contract restricts the landfill discharge to 7,200 gpd and it must comply with SCCSD wastewater quality limits. Additionally, SCCSD has an annual contract with the City of Capitola for collection of its dry weather urban runoff. This contract does not limit the amount of flow discharged into the SCCSD collection system.

4.2 Raw Wastewater Characteristics

The section presents the raw wastewater flow and water quality characteristics.

4.2.1 Flow Characteristics

Municipal wastewater generated within the City comprises about 63 percent of the total SC WWTF influent flow (2015–19 flow data). The remaining 37 percent is municipal wastewater piped from SCCSD. From 2015-19, the total daily wastewater influent flow averaged 8.48 mgd.

The sewershed experiences seasonal fluctuations with elevated wastewater flows from December to April (Wet Months) and reduced flows from May to November (Dry Months). **Table 4-2** summarizes the average annual daily flows, flows during the elevated and reduced flow months, and minimum and maximum day flows and peak wet weather flows. Average daily influent wastewater flows are shown in **Figure 4-2**. In 2015, the City experienced severe drought, which forced it to implement conservation measures to reduce water consumption. Wastewater influent flows during this period represent the low-flow conditions for the system.

Table 4-2. Historical SC WWTP Influent Flows (mgd)

Averaging Period	2015[a]	2016	2017	2018	2019	2020	2021
Daily average (Annual)	7.2	9.1	9.5	7.8	8.9	7.1	7.0
Daily average (Dry Months)	6.8	7.8	7.4	7.2	7.1	6.5	6.5
Daily average (Wet Months)	7.8	10.9	12.5	8.6	11.4	7.9	7.7
Minimum day	6.2	6.6	5.7	6.3	5.9	5.9	5.65
Maximum day	20.6	26.6	44.3	27.2	30.6	18.4	27.3
Peak wet weather flow (Wet Months)	44.1	62.1	67.4	60.1	63.3	62.1	66.9

Data compiled from SC WWTF operational spreadsheet from 1/1/2015 – 12/31/2021.
a. Regional severe drought in 2015.

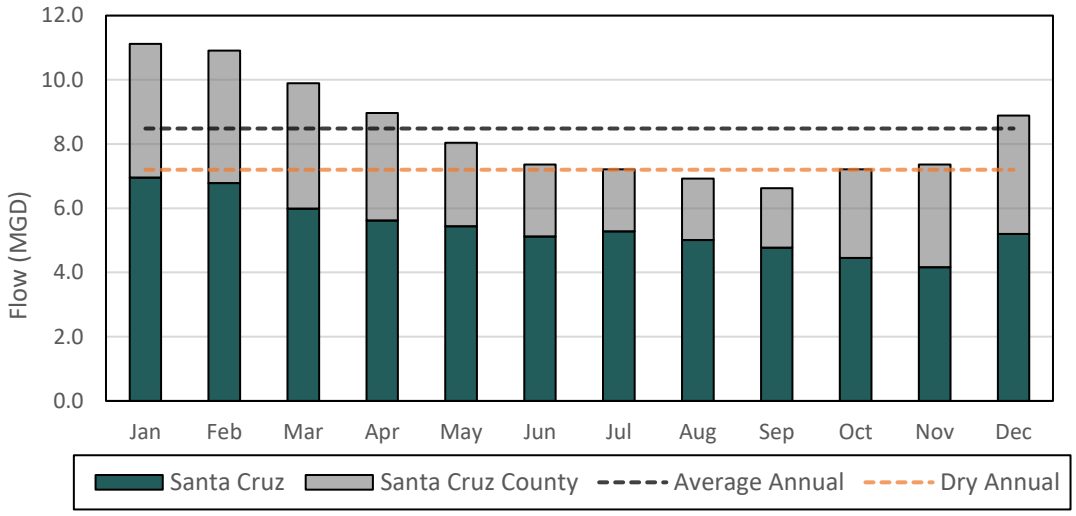

Figure 4-2. Average daily influent wastewater flows

Note. Influent wastewater flows were based on SC WWTF self-reported flow data from 2015–19. Dry influent flows were based on 2015 average daily flows.

The Santa Cruz Water Department's *2015 Econometric Analysis of Demand and Forecast* (Cubed, 2015) projected average annual wastewater flows to marginally increase by about 1 percent (0.18 mgd) from 2014-35. Based on population growth and water conservation measures, the *Regional Recycled Water Feasibility Study* (Carollo, 2017) projected similarly low increases in average annual influent flows from 2020-35. **Figure 4-3** shows historical and projected average annual flows.

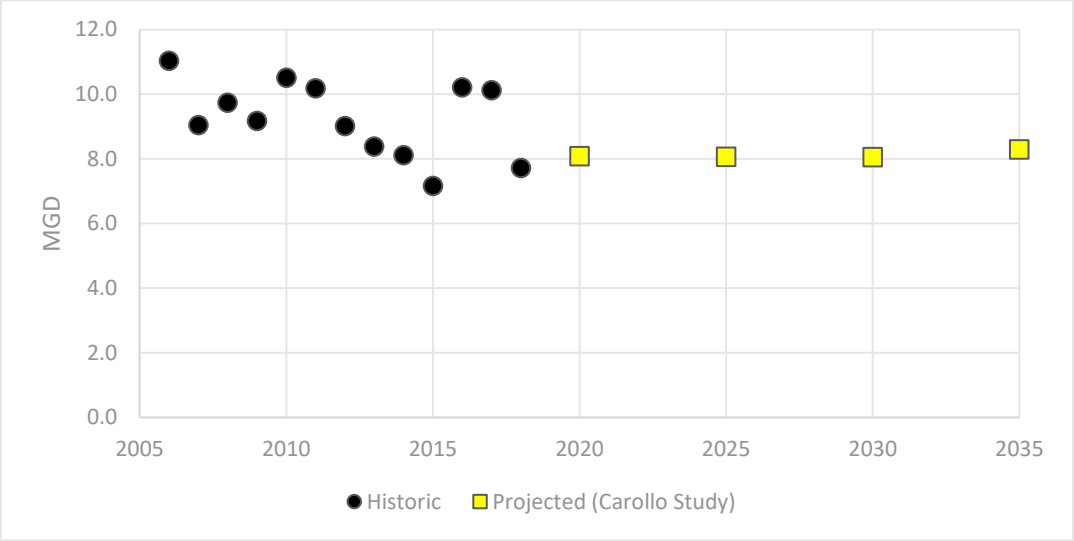

Figure 4-3. SC WWTF average annual influent flows

4.2.2 Wastewater Quality

The SC WWTF has conducted wastewater influent monitoring according to the RWQCB (Region III) Order No. R3-2017-0030 in compliance with the Standard Provisions and Reporting Requirements of its NPDES Permit (No. CA0048194). The City's and contracted laboratories analyzed for both conventional and priority pollutants using methods specified by the SC WWTF NPDES permit and the CFR at 40 CFR 136; Table 1B. The following section summarizes the historical wastewater quality from 2015-19.

4.2.3 Influent Water Quality

SC WWTF influent water quality was compiled for this report from the SC WWTF daily operational monitoring log. **Table 4-3** through **Table 4-8** summarize influent TOC, TSS, calculated BOD, NH_3-N, NO_3-N, and PO_4. The parameter calculated BOD is a computed value based on a correlation between TOC and BOD_5 (TOC [mg/L] = 0.4141 (BOD_5; mg/L) + 4.3937).

Table 4-3. Historical SC WWTF Influent TOC

Averaging Period	2015	2016	2017	2018	2019
Daily average (mg/L)	148	119	140	142	120
Peak day (mg/L)	266	262	390	352	295
Daily loading (lb./day)	871	861	967	883	813

Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19. No. of samples (658)
lb/day = pounds per day

Table 4-4. Historical SC WWTF Influent TSS					
Averaging Period	**2015**	**2016**	**2017**	**2018**	**2019**
Daily average (mg/L)	445	356	293	334	309
Peak day (mg/L)	1064	650	470	508	465
Daily loading (lb./day)	2619	2588	2125	2114	2136

Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19. No. of samples (1,746)

Table 4-5. Historical SC WWTF Influent Calculated BOD					
Averaging Period	**2015**	**2016**	**2017**	**2018**	**2019**
Daily average (mg/L)	322	255	304	308	258
Peak day (mg/L)	597	588	886	797	665
Daily loading (lb./day)	2,004	1,981	2,227	2,032	1,869

Data calculated based on average TOC concentrations measured 1/1/15 - 12/31/19.

Table 4-6. Historical SC WWTF Influent NH_3-N					
Averaging Period	**2015**	**2016**	**2017**	**2018**	**2019**
Daily average (mg/L)	48	40	40	43	39
Peak day (mg/L)	66	51	54	53	55
Daily loading (lb./day)	277	283	280	271	254

Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19. No. of samples (242)

Table 4-7. Historical SC WWTF Influent NO_3-N					
Averaging Period	**2015**	**2016**	**2017**	**2018**	**2019**
Daily average (mg/L)	0.85	0.96	1.16	0.56	0.91
Peak day (mg/L)	6.0	3.6	6.0	3.0	10.2
Daily loading (lb./day)	6.3	7.8	11.4	4.2	8.8

Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19. No. of samples (253)

Table 4-8. Historical SC WWTF Influent PO_4					
Averaging Period	**2015**	**2016**	**2017**	**2018**	**2019**
Daily average (mg/L)	11.2	8.7	9.8	11.3	9.3
Peak day (mg/L)	25.6	14.0	12.4	18.1	13.8
Daily loading (lb./day)	65	61	69	71	61

Data compiled from SC WWTF operational spreadsheet from 1/1/15 – 12/31/19. No. of samples (246)

SC WWTF staff collects composite influent TSS samples daily. During low-flow periods (2015 drought), the influent TSS concentration increased, which was likely due to water conservation. The staff collects TOC samples three times a week and estimates calculated biochemical oxygen demand (CBOD) concentrations using a linear correlation permitted by the RWQCB in the SC WWTF NPDES permit. Weekly ammonia, nitrate, and PO^4 sampling showed nutrient mass loading was relatively consistent over this period. Thus, influent flows and nutrient concentrations were shown to be inversely proportional, but the overall mass of nutrients entering the SC WWTF has remained relatively consistent.

4.2.4 Priority and Other Trace Pollutants

The City also conducted wastewater influent monitoring of priority and other trace pollutants. SC WWTF Annual Summary Report and Outfall Inspection Reports (City, 2015b, 2016a, 2017a, 2018a, 2019a) presented monitoring data from 2015-19. **Table 4-9** and **Table 4-10**, respectively, present the detected inorganic and organic priority pollutants. **Table 4-11** shows the non-detected (ND) trace organic compounds.

Table 4-9. SC WWTF Influent Inorganic Priority and Other Trace Pollutants (2015-2019)

Parameter	Units	Method	Average[a, b]	Maximum[c]	No. Samples (# of ND)
Aluminum, total	µg/L	200.7	2,900	9,100	6 (0)
Antimony, dissolved	µg/L	200.7	< 2.5	1.1	7 (6)
Arsenic, total	µg/L	200.7	3.5	5.6	7 (6)
Barium, dissolved	µg/L	200.7	60	94	7 (3)
Beryllium, total	µg/L	200.7	< 2.3	ND	7 (7)
Boron, dissolved	µg/L	200.7	350	490	6 (0)
Cadmium, total	µg/L	200.7	< 1.2	ND	7 (7)
Chromium (total)	µg/L	200.7	< 2.8	1.8	7 (6)
Cobalt, dissolved	µg/L	200.7	7.1	19	7 (4)
Copper, total	µg/L	200.7	100	300	7 (1)
Cyanide, total (as CN)	µg/L	4500-CN-B-2016 or C-2016	14	20	5 (0)
Hexavalent chromium	µg/L	218.6	< 0.1	ND	2 (2)
Iron, total	µg/L	200.7	2,200	5,000	6 (0)
Lead, total	µg/L	200.7	2.2	2.4	7 (5)
Mercury, total	µg/L	200.7	< 1.8	0.3	7 (5)
Molybdenum, dissolved	µg/L	200.7	6.8	24	7 (4)
Nickel, total	µg/L	200.7	5.2	11	7 (4)
Phosphorous total	mg/L	200.7	5.7	7	3 (0)
Potassium, dissolved	µg/L	200.7	28,000	39,000	6 (0)
Selenium, total	µg/L	200.7	< 3	1	7 (6)
Silver, total	µg/L	200.7	< 1.0	0.54	7 (6)
Sulfide, total (as S)	mg/L	4500-S-B or C-2011	1.1	2.0	5 (2)
Thallium, dissolved	µg/L	200.7	< 2.3	ND	7 (7)
Total Kjeldahl Nitrogen (TKN)	mg/L	4500-Norg B-2011 or C-2011 and 4500-NH3 B-2011	52	83	5 (0)
Vanadium, Dissolved	µg/L	200.7	< 2.8	2.3	7 (5)
Zinc, Total	µg/L	200.7	160	230	7 (3)

Data compiled from SC WWTF Self-Monitoring Reports, 2015 – 2019.

a. For this report analyses evaluated ND values at half the minimum detection limit.

b. Reporting limits vary across sampling events for some constituents. High reporting limits may impact average values.

c. Maximum detected results.

µg/L = micrograms per liter

Table 4-10. SC WWTF Influent Detected Organic Priority and Other Trace Pollutants (2015-2019)

Parameter	Units	Method	Average[a]	Maximum[b]	No. of Samples (number of NDs)
2-Chlorophenol	µg/L	604	30	70	6 (5)
Bis (2-Ethylhexyl) phthalate	µg/L	606	< 30	11	6 (4)
Bromoform	µg/L	601	0.46	0.88	6 (5)
Chloroform	µg/L	601	2.4	2.8	6 (0)
delta-BHC	µg/L	608.3	24	120	6 (5)
Dibromofluoromethane	µg/L	601	0.70	0.91	4 (1)
Diethyl phthalate	µg/L	606	< 18	4.1	7 (5)
Di-n-butyl phthalate	µg/L	606	< 18	0.87	7 (6)
Di-n-octyl phthalate	µg/L	606	< 37	11	7 (6)
Ethylbenzene	µg/L	602	0.22	0.36	7 (6)
Halomethanes	µg/L	601	0.17	0.089	3 (2)
Methylene chloride (dichloromethane)	µg/L	601	< 0.76	0.43	7 (6)
Nitrobenzene	µg/L	609	52	63	7 (6)
Phenols, total	µg/L	604	70	170	7 (1)
Radiation, gross alpha	pCi/L	900.0	< 0.1	0.1	3 (2)
Radiation, gross beta	pCi/L	900.0	< 0.1	0.1	2 (1)
Toluene	µg/L	602	2.5	3.6	3 (0)

Data compiled from SC WWTF Self-Monitoring Reports, 2015 – 2019.

a. For this report analyses evaluated ND values at half the minimum detection limit.

b. Maximum detected results.

Table 4-11. SC WWTF Influent ND Organic Priority Pollutants (2015-19)		
1,1,1-Trichloroethane	Aldrin	Endrin Aldehyde
1,1,2,2-Tetrachloroethane	alpha-BHC	Endrin ketone
1,1,2-Trichloroethane	alpha-Chlordane	Fluoranthene
1,1-Dichloroethane	Anthracene	Fluorene
1,1-Dichloroethylene	Benzene	gamma-BHC
1,2,4-Trichlorobenzene	Benzidine	gamma-Chlordane
1,2-Dichlorobenzene	Benzo(a)anthracene	Heptachlor
1,2-Dichloroethane	Benzo(a)pyrene	Heptachlor Epoxide
1,2-Dichloropropane	Benzo(b)fluoranthene	Hexachlorobenzene
1,2-Diphenylhydrazine	Benzo(ghi)perylene	Hexachlorobutadiene
1,3-Dichlorobenzene	Benzo(k)fluoranthene	Hexachlorocyclohexane
1,3-Dichloropropane	beta-BHC	Hexachlorocyclopentadiene
1,4-Dichlorobenzene	Bis (2-Chloroethoxy) Methane	Hexachloroethane
1-1-1-Trichloroethane	Bis (2-Chloroethyl) Ether	Indeno (1,2,3-cd) Pyrene
2,4,5-Trichlorophenol (2,4,5-TP)	Bis (2-Chloroisopropyl) Ether	Isophorone
2,4,6-Trichlorophenol	Bis (2-Ethylhexyl) Adipate	Methoxychlor
2,4-DDD	Bromodichloromethane	Naphthalene
2,4-DDE	Bromomethane	N-Nitrosodimethylamine (NDMA)
2,4-Dichlorodiphenyltrichloroethane (DDT)	Butylbenzyl Phthalate	N-Nitrosodi-n-Propylamine (NDPA)
	Carbon Tetrachloride	N-Nitrosodiphenylamine
2,4-Dichlorophenol	Chlordane	PCB_Total
2,4-Dimethylphenol	Chlordane-A	PCB-1016
2,4-Dinitrophenol	Chlordane-G	PCB-1221
2,4-Dinitrotoluene	Chlorobenzene	PCB-1232
2,6-Dinitrotoluene	Chloroethane	PCB-1242
2-Chloronaphthalene	Chloromethane	PCB-1248
2-Chlroethylvinylether	Chrysene	PCB-1254
2-Methylnaphthalene	cis-1,3-Dichloropropene	PCB-1260
2-Nitroaniline	Ddd-Pp	Pentachlorophenol
2-Nitrophenol	Dde-Pp	Phenanthrene
3,3-Dichlorobenzidine	Ddt_Ddd_Dde	Pyrene
3-Nitroaniline	Ddt-Pp	Pyridine
4,6-Dinitro-2-methylphenol	Dibenzo(a,h)anthracene	Tetrachloroethene
4-Bromophenyl Phenyl Ether	Dibenzofuran	Toxaphene
4-Bromophenylphenylether	Dibromochloromethane	Trans-1-2-Dichloroethene
4-Chloro-3-methylphenol	Dichlorobenzene	Trans-1-3-Dichloropropene
4-Chloroaniline	Dichlorodifluoromethane	Tributyltin
4-Chlorophenyl Phenyl Ether	Dieldrin	Trichloroethene
4-Nitroaniline	Dimethyl Phthalate	Trichlorofluoromethane
4-Nitrophenol	Endosulfan I	Vinyl chloride
Acenaphthene	Endosulfan II	Xylenes
Acenaphthylene	Endosulfan Sulfate	
Acrolein	Endrin	
Acrylonitrile		

NOTE: Monitoring is conducted according to test procedures approved under 40 C.F.R. part 136 for the analyses of pollutants unless another method is required under 40 C.F.R. chapter 1, subchapters N or O as required in the NPDES permit.

Sample analyses detected 23 out of 27 inorganic priority pollutants in the raw influent wastewater. Only two of the detected compounds (beryllium and cyanide) have NPDES secondary effluent limits; the maximum detected values for both were below their NPDES limits (4.6 μg/L and 140 μg/L, respectively).

Analyses detected seventeen out of 151 trace organic priority pollutants in the raw influent wastewater source. Eight of the detected compounds (bis (2-ethylhexyl) phthalate, diethyl phthalate, di-n-butyl phthalate, ethylbenzene, halomethanes, dichloromethane, nitrobenzene) have NPDES secondary effluent limits—all of the maximum detected values were below their NPDES values.

4.3 Wastewater Source Control

Section 60320.206 of the Title 22 regulations for a GRRP using recycled water via injection requires a comprehensive source control program to reduce the likelihood of undesirable chemicals being in the source wastewater.

The SC WWTF treats wastewater that serves as source water for the PWS Project. The SqCWD, as the PWS Project sponsor, and the City have a joint Memorandum of Agreement (SqCWD and City, 2019) that supports the enhanced source control program required for operation of the PWS Project. This section presents information about the existing industrial pretreatment programs for the SC WWTF implemented by the City and the SCCSD and the PWS Project's plan to provide more comprehensive source control requirements in support of groundwater recharge.

4.3.1 Existing Industrial Pretreatment Program

The City administers an industrial pretreatment program in conformance with the USEPA pretreatment regulations set forth in the CFR, Section 40, Part 403 (40 CRF 403). USEPA delegated responsibility to oversee the pretreatment program to the California SWRCB and RWQCBs.

The SC WWTF permit issued by the Central Coast RWQCB specifies requirements for the City's existing industrial pretreatment program:

- RWQCB Order No. R3-2017-0030, NPDES CA0048194 adopted on December 7, 2017, entitled "WDR for the City of SC WWTF Discharge to the Pacific Ocean" (RWQCB, 2017).

The purpose of the City's pretreatment program is to prevent waste discharges into the collection system that may have an adverse impact on treatment facility performance (e.g., impairment of the treatment processes to adequately remove contaminant(s), thereby creating the inability to meet ocean discharge permit and recycled water requirements) or create hazardous conditions that may damage facilities or endanger workers and the public.

Detailed records of pretreatment program efforts, updates, budget and staffing changes and anticipated updates to run the industrial pretreatment program are included in **Appendix B**.

In conformance with federal regulations and the RWQCB permit, the City's industrial pretreatment program for the SC WWTF sewershed applies and enforces three types of standards:

1. General and specific prohibitions that apply to all non-domestic dischargers
2. Categorical pretreatment standards that impose limits on particular types of industries
3. Local limits established by the local entity based on study of its sewershed

4.3.2 City's Sewer System Ordinance

Further supporting the SC WWTF permit standards, Chapter 16.08 entitled "Sewer System Ordinance" of the Santa Cruz Municipal Code sets forth rules and regulations for the discharge of wastewater to the public sewer system and wastewater treatment facilities. The City Council passed Ordinance No. 2010-20 amending and strengthening Section 16.08.110 of the Santa Cruz Municipal Code to establish prohibitions and limitations on wastewater discharges (City, 2010).

The primary objectives of the City's Sewer System Ordinance and Industrial Waste Discharge Program are to:

- Prevent the introduction of pollutants into the collection system that can pass through the treatment processes without sufficient removal, be incompatible with, or interfere with the operation of the SC WWTF, including interference with sludge reuse or disposal.
- Enable the SC WWTF to comply with its NPDES permit conditions, sludge use and disposal requirements, and any other applicable federal or state laws.
- Protect the SC WWTF, collection system, and operations and maintenance staff who may be affected by wastewater in the course of their work.
- Improve opportunities to recycle or reclaim wastewater and sludge.

The Sewer System Ordinance applies to all users of the wastewater collection and treatment system; authorizes the issuance of wastewater discharge permits; provides for monitoring, compliance, and enforcement activities; establishes administrative review procedures; requires user reporting; and provides for the setting of fees for the equitable distribution of program costs. The Sewer System Ordinance also includes restrictions for discharges of non-storm water runoff into the storm drain system.

The following summarizes of prohibitions and limitations on wastewater discharges to the sewer system from the Sewer System Ordinance:

- Dischargers shall comply with requirements set forth by the Ordinance, County, RWQCB, and USEPA, including federal categorical pretreatment limitations and other applicable standards.
- City may inspect any facility or property to ascertain whether the user is complying with the Ordinance. City inspections may be scheduled or unscheduled, without prior notification. The City may conduct sampling or metering of wastewater flows from the user's property at any time. The City shall determine the frequency for sampling of industrial wastewater.
- Users discharging industrial wastewater shall obtain a permit for each site or facility by filing an application with the City and paying associated fees.
- Users shall prevent the introduction of pollutants, flammable, explosive, corrosive, toxic, radioactive, or hazardous materials, or potentially obstructive solids into the public sewer system. High flows, slug loads, high temperature wastes, oils and grease, pollutants that violate state or federal pretreatment standards, and pollutants that pass-through or interfere with the SC WWTF operation are prohibited.
- Users shall provide wastewater treatment, storage, or flow equalization facilities necessary to comply with the Ordinance. Facilities needed for compliance shall be provided, operated, and maintained at the user's expense. Detailed plans describing the facilities and operating procedures shall be submitted to the City for review and approval before the facilities are constructed; approval shall not exempt the user from complying with the Ordinance.
- Users shall operate and maintain all facilities and systems of wastewater treatment and control properly including performance, preventive maintenance, equipment calibration, operator staffing and training, laboratory and process controls, and quality assurance procedures.
- Bypass of the users' treatment facilities is prohibited unless it is unavoidable to prevent loss of life, personal injury, or severe property damage, or no feasible alternatives exist. In the event of any bypass, the user shall notify the City (at least ten days prior to a planned bypass and immediately after an unplanned bypass).
- Users shall install and operate a monitoring manhole for equipment that samples, monitors, and meters their discharge to the sewer. Significant industrial users (SIUs) shall be required to sample at least twice per year. Compliance reports shall be submitted to the City at least twice per year, or more frequently as requested by the City. Compliance reports from industrial users will be reviewed and

screened for compliance, timeliness, completeness, and accuracy. Any accidental discharges or slug loadings should be immediately reported and followed-up by corrective actions to prevent recurrences.

- Users shall keep records of pretreatment equipment maintenance, monitoring, and flow and pH meter readings for a minimum of three years and allow the City to access these records.
- The City will conduct at least one annual detailed site inspection of the pretreatment and monitoring facilities at each user site without prior notification. Users shall allow the City staff to enter any user site for the purposes of sampling and/or metering of the user's operations.
- The City will pursue enforcement actions for abatement of nuisances associated with violations of the Sewer System Ordinance. Examples of such actions may include:
  - Warnings (lowest level action).
  - Notice of violation.
  - Order to prepare a plan of action.
  - Compliance orders with a time schedule.
  - Administrative order to stop work.
  - Cease and desist orders to immediately comply with all requirements.
  - Emergency suspension of the users' discharge.
  - Termination of discharge permit and termination order.
  - Civil penalties and fines.
  - Collection of costs to recover enforcement costs, including monitoring, surveillance, inspection, analyses, emergency response, corrections, repairs, and legal fees.
  - City shall publish annually in a newspaper a public notice listing the users that, at any time during the previous 12 months, were in significant noncompliance with applicable standards and requirements.

The City permits, monitors, and inspects all SIUs in its jurisdiction as required by federal, state, and local regulations. SIUs are defined in accordance with the CFR 40 CFR 403.3 (t) as:

- All industrial users subject to categorical pretreatment standards
- Any other user that has one or more of the following characteristics:
  - An average discharge flow of equal to or greater than 25,000 gpd of process wastewater to the SC WWTF
  - Contributes a process wastewater stream that is 5 percent or more of the average dry weather hydraulic or organic capacity of the SC WWTF
  - Reasonable potential to adversely affect operation of the SC WWTF; or violates any pretreatment standard or requirement (in accordance with 40 CFR 403.8 (f) (6)).

The City's application for an industrial waste discharge permit includes a detailed questionnaire regarding:

- Nature of the business, business activity, location, days/hours of operation, and number of employees
- Chemicals and raw materials used or stored on site and the maximum quantities stored at any time
- Water supply source (City or well) and usage
- Wastewater discharge average and maximum volumes, flow rates, frequency, days/times
- Description of existing or proposed pretreatment systems, loading rates, capacity, location at the site
- Sampling point(s), location and description (manhole, sump, clean out), accessibility for authorized City personnel, security measures, and safety precautions

- Wastewater characteristics
- Pollutants listed in the California Ocean Plan (Ocean Plan; SWRCB and California Environmental Protection Agency 2019) used at the facility (e.g., grease and oil, turbidity, pH, suspended solids, settleable solids, acute toxicity, toxics, noncarcinogenic pollutants, carcinogens, remaining priority pollutants)
- Other environmental permits (e.g., air quality, RWQCB, or County), or if generator of hazardous wastes (USEPA Generator ID and Transporter)

The City has specific waste discharge permitting requirements for dry cleaners (related to solvents), vehicle service businesses (related to vehicle fluids and cleaning practices), and restaurants and food service facilities (related to grease trap maintenance, kitchen materials washing, and other clean up practices). The City also has developed Best Management Practices (BMPs) for retail and commercial businesses and industrial facilities to reduce the amount of pollutants reaching storm drains, creeks, and the San Lorenzo River, and that pass through the SC WWTF, progressing on to Monterey Bay.

The City Council adopted Ordinance No. 2016-09 that added Chapter 6.93 to Title 6 of the Santa Cruz Municipal Code requiring the safe disposal of drugs and sharps (City, 2016). Establishing the Product Stewardship Program, the purposes of these requirements are to protect health, safety and welfare of the public and of the environment by providing for the safe and orderly collection and disposal of drug and sharps waste through manufacturer and/or producer-funded collection and disposal programs. The Product Stewardship Program must provide outreach and educational information (via signage, website and phone) to consumers, pharmacists, retailers, and health care practitioners that publicize the location and operation of collection locations. The Ordinance also requires reporting and annual assessments of the collection efforts of the Product Stewardship Program and specifies enforcement provisions for violations.

4.3.3 SCCSD Industrial Pretreatment Program

The SC WWTF sewershed encompasses the City and parts of Santa Cruz County (See **Section 4.1**). The SCCSD collects and transmits wastewater to the SC WWTF for treatment and discharge. The SCCSD has a service agreement with the City to treat its wastewater. An inter-jurisdictional agreement approved by the RWQCB between the City and SCCSD divides the pretreatment responsibilities between the two agencies and designates the City as the control authority (RWQCB, 2017). The same pretreatment requirements pertain to both the City and Santa Cruz County, i.e., to the entire SC WWTF sewershed.

The SCCSD Environmental Compliance Unit implements the industrial pretreatment program locally, within unincorporated areas of Santa Cruz County that discharge wastewater to the SC WWTF. The County Environmental Compliance Unit monitors existing and potential commercial and industrial users, inspects facilities annually and samples the SIUs at least twice per year. The SCCSD submits a local annual report for its pretreatment program to the City, which then incorporates that information into the City's annual pretreatment report.

4.3.4 Permitted Industrial Dischargers in the SC WWTF Sewershed

The number of permitted industrial dischargers in the SC WWTF sewershed varies over time. **Table 4-12** shows a summary of commercial and industrial dischargers in the SC WWTF sewershed as of 2019 (City, 2019b). Most of the permitted dischargers (over 800) are not required to pretreat their wastewater discharge. Food service facilities must have grease interceptors or traps. Pretreatment inspectors educate industries on process-specific pollution prevention and waste minimization opportunities by distributing BMP pamphlets and demonstrations for business owners, managers, and employees. For example, BMPs have been developed by the City and SCCSD for vehicle service facilities, dentists (e.g., disposal of amalgam

waste), restaurants, dry cleaners, printers, machine shops, paint contractors, carwashes, and medical facilities.

Table 4-12. SC WWTF Sewershed Commercial and Industrial Users Inventory

Type of Business	Number in City	Number in SCCSD
Agency	2	1
Auto Body	11	
Auto Dealer	10	
Auto Electric	1	
Auto Rental	5	
Auto Repair	49	
Auto Sales	3	
Auto Wash	5	
Auto-Motorcycle Sales	1	
Bakery	9	
Boat Repair	1	
Brewery	6	
College (Cabrillo)		1
Dental	18	
Dry Cleaner	5	
Food Catering	3	
Food Market	10	
Gas Station	17	
Hotel	1	
Industrial Light[a]		106
Laboratory – Commercial	4	
Manufacturing[b]	2	
Recreation Vehicle Repair	1	
Restaurant	276	276
Categorical[c]	1	
SIUs, Non-Categorical[c]	4	
Wastehauler	14	
Winery	5	1
Total	464	385
Combined Total in Sewershed	849	

Source: SC WWTP, Pretreatment Program, 2019 Annual Report (City, 2019b); as of December 2019

a. Includes vehicle service, dry cleaners, machine shops, car washes.

b. Includes manufacturers of jewelry and metal coatings.

*c. See **Table 4-13**.*

The City manages a pretreatment program that has a total of 849 permitted non-domestic dischargers (as of 2019). Of these, five dischargers are classified as SIUs; one of the SIUs is a Categorical Industrial User (CIU) as defined in 40 CFR 403.6 and 40 CFR Chapter 1, subchapter N. The remaining permitted dischargers include food service establishments, auto-related facilities, two manufacturers (jewelry and metal coatings), and other businesses.

Table 4-13 shows a list of the industrial dischargers in the SC WWTF sewershed as of December 2019.

Table 4-13. SC WWTF Industrial Users Inventory

Classification[a]	Number	Name and Type of Industry	Discharge
SIUs			
Non-categorical SIUs	4	City of Santa Cruz Water Department Water Treatment Plant	Backwash and treatment process waste
		City of Santa Cruz Landfill	Leachate from leachate collection system
		Santa Cruz Nutritionals Vitamin Manufacturer	Process waste, municipal waste
		University of California, Santa Cruz University	Non-hazardous laboratory waste, municipal waste
CIUs[b]			
Significant CIUs [c]	1	Persys Metal finishing	Process waste includes metals and solvents prior to on-site pretreatment, discharge to collection system following pretreatment
Non-significant CIUs	0	None – not applicable	
Other Authorized Users			
Other Industrial Users	844	See **Table 4-12**	
Total	849		

As of December 2019. (City, 2019b). Subject to Change.

a. *The USEPA defines SIU in three ways: (a) an industrial user subject to Categorical Pretreatment Standards under 40 CFR Part 403.6. Any industry that falls under these categories is considered a SIU whether it has process discharge to the sewer or not - these industries are CIUs; (b) Any industry which discharges an average of 25,000 gpd or more of process wastewater to the sewer system (excluding sanitary, contact cooling and blower blowdown wastewater); and (c) any industry which is designated as such by the wastewater management agency on the basis that the industrial user has a reasonable potential for adversely affecting the operation of the collection system or treatment plant, or violating any pretreatment requirements.*

b. *CIUs are those that perform a regulated activity designated in 40 CFR 400-424 and 425-699. Examples of CIUs include: food processing, chemicals/pharmaceuticals manufacturing, metals finishing, et al.*

c. *CIUs that are also SIUs.*

Table 4-14 lists the local limits for the SC WWTF sewershed as part of the City's industrial pretreatment program. The same local limits apply for the SCCSD service area because the SC WWTF treats wastewater from both areas. The City has initiated a local limits study to potentially update the local limits.

Table 4-14. SC WWTF Sewershed Local Limits		
Constituent	**Units**	**Concentration for Local Limits[a]**
Arsenic	mg/L	0.21
Cadmium	mg/L	1.57
Chromium, total	mg/L	35.65
Chromium, hexavalent	mg/L	5.26
Copper	mg/L	2.17
Cyanide	mg/L	0.08
Lead	mg/L	6.04
Mercury	mg/L	0.32
Nickel	mg/L	1.15
Silver	mg/L	0.70
Sulfide (dissolved)	mg/L	0.2 (Monthly average) 1.0 (Maximum)
Suspended solids	mg/L	3,000
Zinc	mg/L	25.23
pH	units	5.0 min to 10 max
Total Petroleum Hydrocarbons (TPH)	mg/L	100
Temperature	degrees F.	104[b]
Oil or Grease of animal or vegetable origin	mg/L	300[c]
MTBE	mg/L	1.0
TTO[d]	mg/L	1.0
Phenolics, total[e]	mg/L	150
Phenolics, chlorinated[f]	mg/L	0.60
Chlordane	mg/L	1.48E-05
DDT, o, p	mg/L	0.011
Dieldrin	mg/L	9.40E-05
Endosulfan I	mg/L	0.006
Endrin	mg/L	0.002
Heptachlor	mg/L	0.00014
Heptachlor epoxide	mg/L	1.39E-05
Hexachlorobenzene	mg/L	23.50
Naphthalene	mg/L	2,350
Phenanthrene/Anthracene, C1	mg/L	2,349.99
Anthracene	mg/L	2,422.68

Table 4-14. SC WWTF Sewershed Local Limits		
Constituent	**Units**	**Concentration for Local Limits[a]**
Fluoranthene	mg/L	123.38
8-PCB (Polychlorinated Biphenyls)[g]	mg/L	0.000138859
2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) (Dioxins)	mg/L	2.53E-09

a. Source: – Santa Cruz Municipal Code Section 16.08 Sewer System Ordinance
b. Except where higher temperatures are permitted by law; except in no case shall the temperature of the wastewater influent at the treatment plant exceed 104 degrees F.
c. Unless exempt by Santa Cruz Municipal Code Section 16.08.190.
d. TTO is defined as the sum of all individual compounds listed in 40 CRF 433.11e with quantifiable concentrations greater than 0.01 mg/L when measured using test methods approved under 40 CFR 136 or other methods approved for NPDES monitoring, and other toxic organic compounds as determined by the director.
e. Phenols, total, by EPA Method 420.1.
f. Phenols, chlorinated, is defined as the sum of 2-chlorophenol, 2,4-dichlorophenol, pentachlorophenol, 2,4,6-trichlorophenol and 4-chloro-3-methylphenol (p-chloro-m-cresol)
g. Sum of eight PCBs.

4.3.5 Compliance with Groundwater Recharge Regulations for Enhanced Source Control

Per Title 22 Section 60320.206 (CCR, 2018), source wastewater supplied to a GRRP must be from a wastewater management agency that administers an industrial pretreatment and source control program that includes:

- An assessment of the fate of DDW- and RWQCB-specified chemicals and contaminants through the wastewater collection and recycled water treatment systems
- Provisions to investigate sources of and monitor for DDW- and RWQCB-specified chemicals and contaminants
- An outreach program to industrial, commercial, and residential communities within the project sewershed for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source
- An up-to-date inventory of chemicals and contaminants that may be discharged into the wastewater collection system in the sewershed

4.3.5.1 Contaminant Fate Assessment

SqCWD has monitored and continues to work with the City to conduct monitoring of raw wastewater and treatment process effluents to assess the ability of treatment processes to reduce the concentrations of DDW- and RWQCB-specified chemicals through the SC WWTF and AWPF. SqCWD will receive and review the City's monitoring reports for raw wastewater and secondary effluent quality. The PWS Project will install a new monitoring point for secondary effluent quality at the SC WWTF TTF to inform the PWS Project AWPF of source water quality. The PWS Project FAT facilities are designed to reduce DDW- and RWQCB-specified contaminants. The fate of contaminants will be assessed during operations.

4.3.5.2 Contaminant Source Investigations

USEPA through RWQCB conducts periodic audits of the City's industrial pretreatment program to determine compliance and designate areas where the program needs improvements. The most recent Pretreatment Compliance Inspection was conducted in 2017. The federal pretreatment regulations and the

SC WWTF permit require that local limits be evaluated, developed, and enforced. The City is currently conducting a local limits study that includes sampling for DDW- and RWQCB-specified contaminants of interest for groundwater recharge projects to update their Local Limits. The results of the in-progress local limits study will be available prior to start-up of the PWS Project operation. Local limits studies will also be conducted periodically in the future by the City as required by the permit to investigate sources of potential contaminants. The analytes that are being monitored under the industrial pretreatment program and for the local limits study are listed in Table 1.2 in **Appendix B**. The program has also added chemicals of interest to DDW and RWQCB, including acetone, 1-4 dioxane, formaldehyde and boron, to be monitored in parallel with the City's local limits study. The monitoring of these additional constituents of interest for Pure Water Soquel will be conducted at the influent and effluent of the WWTF on the same monitoring schedule as the City's local limits analytes listed in Table 1.2 in **Appendix B**. Sampling of the constituents used the following analytical methods: EPA 8260B (acetone and 1-4 dioxane), EPA 8315A (formaldehyde), and EPA 6010D (boron). The monitoring of these constituents and any associated response action plans will be addressed in the upcoming OOP, including any updates from the final Local Limits study.

4.3.5.3 Public Outreach

The City and SCCSD already have active outreach programs to inform industrial, commercial, and residential customers about proper disposal of pharmaceuticals. The Santa Cruz Product Stewardship Program has successfully educated the community and provided facilities for safe collection and disposal of pharmaceuticals to prevent their discharge to the sewer system.

Both the City and the SCCSD have fats, oils, and grease (FOG) programs requiring restaurants that generate FOG to have grease traps which the owners pump out at least every six months to alleviate sewer blockages. The City also operates a robust and well-funded Outreach program which includes annual recognition of consistently compliant dischargers, annual publications in large local media of compliant industries, and the Clean Water Act mandated publication of Significant Non-Compliance (SNC), as well as public meetings to announce updates to Local Limits and updated regulations and presentations at local area colleges and conferences.

SqCWD will work with the City to expand public outreach program to inform industrial, commercial, and residential customers in the PWS Project sewershed about the importance of source water protection and need to minimize disposal of chemicals and contaminants in the wastewater collection system. SqCWD already has an active public outreach program about the PWS Project that it will use to inform the service area about protecting source water quality.

4.3.5.4 Chemical Inventory

The City and SCCSD have databases of permitted industrial dischargers. The City and SCCSD will develop these databases further to include an inventory of chemicals and contaminants that may be discharged into the sewer system, including new chemicals and contaminants resulting from new sources or changes to existing sources. As a key part of the Pure Water Soquel Program, SqCWD will review the database and update the inventory prior to the onset of operation of the GRRP. SqCWD will work with the City and SCCSD to regularly update the inventory to support the PWS Project.

In summary, the City currently prepares an annual report on the pretreatment program and submits it to the RWQCB in compliance with the SC WWTF permit. Future reports will address compliance with Title 22 source control provisions, particularly any DDW- and RWQCB-specified chemicals or contaminants. In addition, the SqCWD's Operation Optimization Plan will discuss enhanced source control measures for the PWS Project.

4.4 SC WWTF

The City operates SC WWTF and provides wastewater service to approximately 140,000 people in Santa Cruz, Capitola, Live Oak, Soquel, Aptos, and unincorporated areas of Santa Cruz County (City, 2019c).

In 1928 the City commissioned the SC WWTF located at 110 California Avenue in Santa Cruz, California with screening and disinfection treatment facility, subsequently adding primary treatment and other improvements over time, including a new tunnel and outfall. The SC WWTF was upgraded to a secondary treatment facility with disinfection in 1990s. It is designed to provide secondary treatment for an average dry weather flow of 17 mgd and a wet weather flow of 81 mgd. The City of Scotts Valley adds its treated wastewater to the SC WWTF effluent before it is discharged to the Monterey Bay National Marine Sanctuary approximately 1 mile offshore. The 12,250 feet (ft) ocean outfall is located at a depth of 110 ft below the water surface, where discharge through the diffuser ports achieves a minimum initial dilution of 1-part secondary effluent to 139-parts seawater. The City discharges under an NPDES permit issued by the RWQCB (Order No. R3-2017-0030, NPDES No. CA 0048194).

4.4.1 Collection System

The City conveys municipal wastewater generated within the City limits to the SC WWTF via 160 miles of wastewater mains and 34 pumping stations for treatment at the SC WWTF (**Figure 4-4**). The SCCSD (**Figure 4-5**) delivers wastewater from Capitola, Live Oak, Soquel, Aptos, and unincorporated areas of Santa Cruz County to the SC WWTF. The SCCSD wastewater collection system consists of approximately 220 miles of gravity sewers, 14 miles of force main, and 35 pump stations (County of Santa Cruz, 2017).

4.4.2 Wastewater Treatment Processes

The SC WWTF currently treats wastewater by screening, aerated grit removal, primary sedimentation, biological trickling filters, solids contact stabilization, secondary clarification, and disinfection with UV light. During wet weather periods, the SC WWTF operates in split-treatment mode where disinfected primary treated effluent in excess of the secondary treatment capacity blends with UV disinfected secondary treated effluent prior to discharge. Biosolids are processed by gravity thickening, anaerobic digestion, and centrifuge dewatering. **Figure 4-6** and **Figure 4-7**, respectively, illustrate the treatment schematic and site plan.

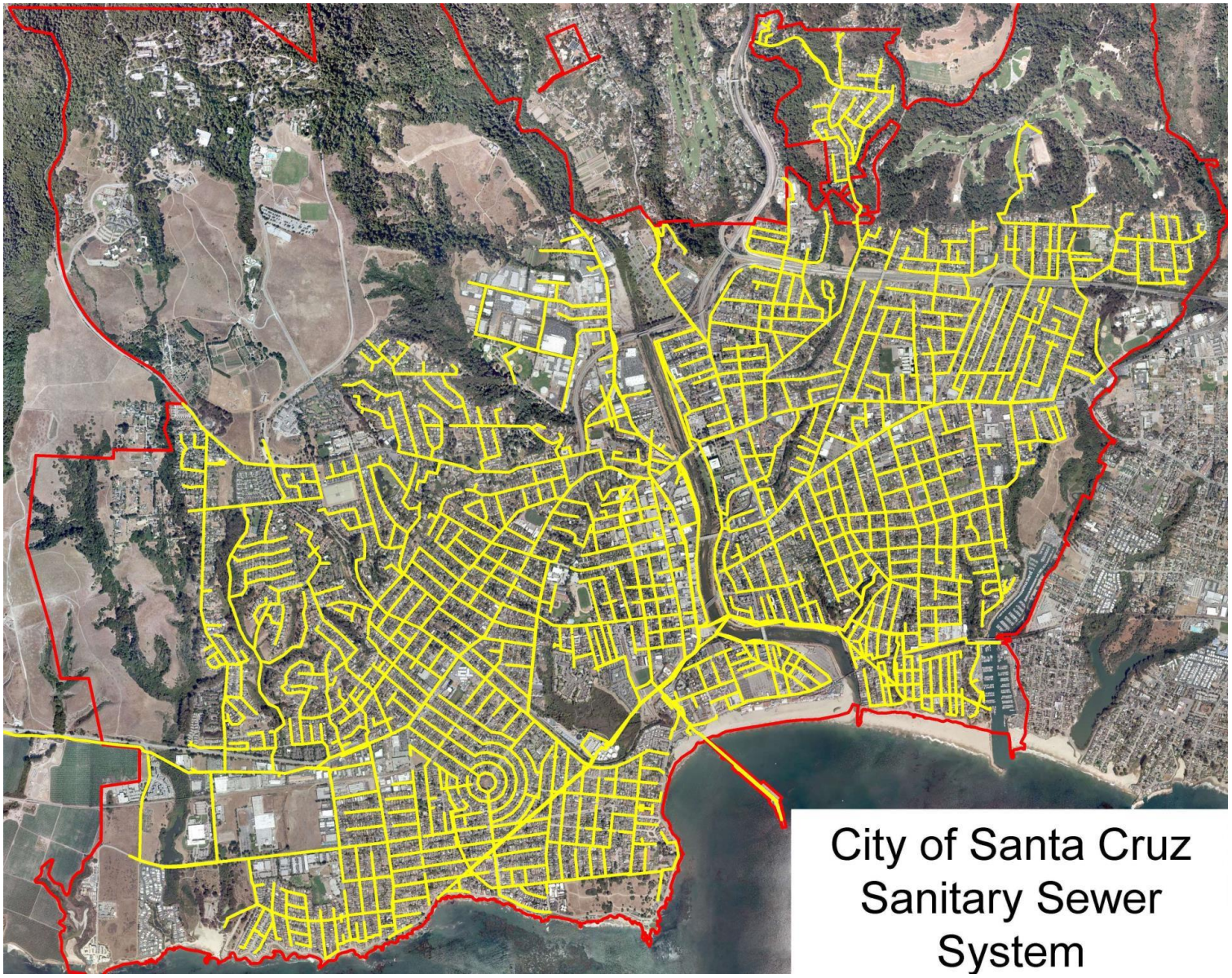

Figure 4-4. City sanitary sewer system

Source: City, 2019c

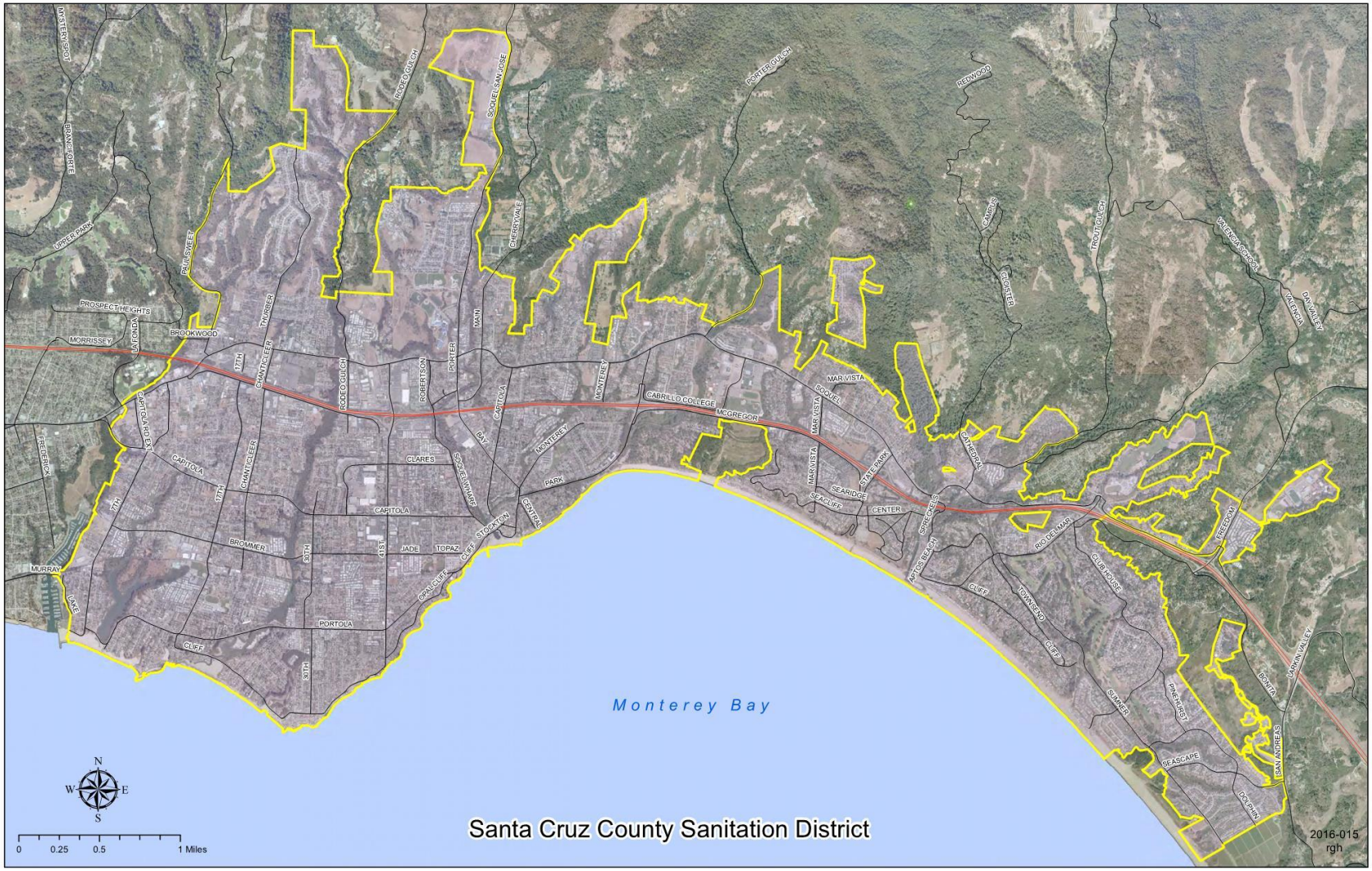

Figure 4-5. SCCSD collection area

Source: County of Santa Cruz 2019

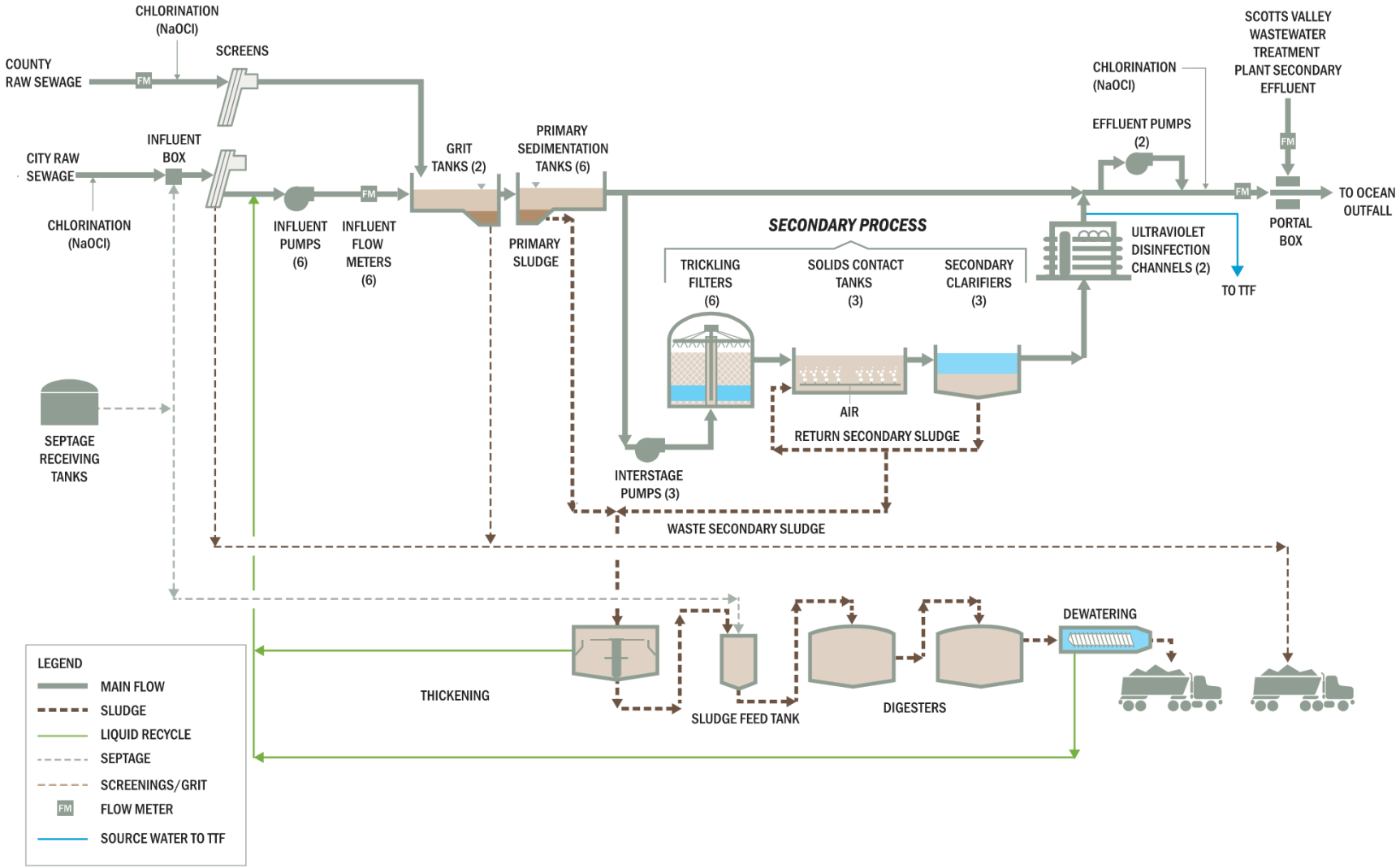

Figure 4-6. City of SC WWTF schematic



Figure 4-7. SC WWTF site plan

As seen in **Figure 4-6**, the SC WWTF may, in emergency conditions, during peak flows, blend the influent with treated flow to maintain permit limits. This blending occurs downstream of the influent connection to the new TTF; accordingly, it will not impact PWS operations.

SC WWTF secondary effluent is a fully oxidized wastewater and compliant with Title 22 Section 60320.201 requirements that specify the use of oxidized wastewater (defined in Title 22 Section 60320.650).

4.4.3 Permit Limits

The SC WWTF's discharge effluent specifications and receiving water limitations are stipulated by a combination of its RWQCB NPDES Permit and the Basin Plan (RWQCB Central Coast Region, SWRCB, California Environmental Protection Agency, 2017b). The NPDES and Basin Plan set forth effluent discharge specifications, receiving water limitations, and recycled water specifications.

Discharge is outside of Monterey Bay but within the Monterey Bay Marine Sanctuary, so it is also governed by the Ocean Plan. Discharge water quality and receiving water limitations are defined in the Ocean Plan.

4.4.3.1 Ocean Discharge Limitations

The 2018 NPDES permit (No. CA0048194) for the SC WWTF sets effluent discharge specifications for conventional pollutants, toxic pollutants, percent removals and bacteria. **Table 4-15** summarizes the specific conventional pollutants.

Table 4-15. Current SC WWTF NPDES Effluent Limitations for Conventional Pollutants

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
TOC[a]	mg/L[b]	17	23	--	--	--
TSS	mg/L[b]	30	45	--	--	--
Oil and grease	mg/L	25	40	75	--	--
Settleable solids	mL/L/hr	1.0	1.5	3.0	--	--
Turbidity	Nephelometric Turbidity unit (NTU)	75	100	225	--	--
pH[c]	--	--	--	--	6	9

a. As allowed by 40 CFR §133.104, the Executive Officer of the Central Coast Water Board has determined that the Discharger has demonstrated an adequately robust statistical correlation between TOC and BOD_5 at this facility and has approved the establishment of effluent limitations for TOC to meet the technology-based effluent limitation for BOD_5. A detailed discussion of the approved correlation is provided in section IV.B of the Fact Sheet (Attachment F) of the NPDES permit.

b. For flows equal to or less than 17 mgd, the effluent mass emission rate shall not exceed the maximum allowable mass emission rate.

c. Deviations from the effluent limit range are permitted subject to the following limitations (40 CFR Section 401.17):

- *The total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month; and*
- *No individual excursion from the range of pH values shall exceed 60 minutes.*

The NPDES permit and the Ocean Plan limit toxic pollutant discharge by the SC WWTF to protect marine aquatic life and human health. **Table 4-16** and **Table 4-17**, respectively, summarize the NPDES permit effluent limitations and Ocean Plan receiving water (post-seawater dilution) limitations.

Table 4-16. SC WWTF Toxic Pollutants Effluent Limitations for Protection of Marine Aquatic Life							
		NPDES Effluent Limitations (Pre-Seawater Dilution)			Ocean Plan Water Quality Objectives (Post-Seawater Dilution)		
Parameter	Units	6-Month Median[a]	Maximum Daily[b]	Instant Max[c]	6-Month Median[a]	Maximum Daily[b]	Instant Max[c]
Arsenic	µg/L	--	--	--	8	32	80
Cadmium	µg/L	--	--	--	1	4	10
Chromium hexavalent	µg/L	--	--	--	2	8	20
Copper	µg/L	--	--	--	3	12	30
Lead	µg/L	--	--	--	2	8	20
Mercury	µg/L	--	--	--	0.04	0.16	0.4
Nickel	µg/L	--	--	--	5	20	50
Selenium	µg/L	--	--	--	15	60	150
Silver	µg/L	--	--	--	0.7	2.8	7
Zinc	µg/L	--	--	--	20	80	200
Cyanide[d]	µg/L	140	560	1,400	1	4	10
Total chlorine residual	µg/L	280	1,100	8,400	2	8	60
Ammonia	µg/L	--	--	--	600	2,400	6,000
Acute toxicity	Acute toxicity units (TUa)	--	42	--	--	0.3	--
Chronic toxicity	Chronic toxicity units (TUc)	--	140	--	--	1	--
Phenolic compounds	µg/L	--	--	--	30	120	300
Chlorinated henolics	µg/L	--	--	--	1	4	10
Endosulfan[e]	µg/L	1.3	2.5	3.8	0.009	0.018	0.027
Endrin	µg/L	0.28	0.56	0.84	0.002	0.004	0.006
Hexachlorocyclohexane (HCH)[f]	µg/L	0.56	1.1	1.7	0.004	0.008	0.012
Radioactivity	Not to exceed limits specified in CCR, Title 22, Division 4, Chapter 15, Article 5, Section 64443.						

a. The six-month median shall apply as a moving median of daily values for any 180-day period in which daily values represent flow weighted average concentrations within a 24-hour period. For intermittent discharges, the daily value shall be considered to equal zero for days on which no discharge occurred. The six-month median limit on daily mass emissions shall be determined using the six-month median effluent concentration as Ce and the observed flow rate Q in mgd (each variable referring to Equation 3 of the Ocean Plan).

b. The daily maximum shall apply to flow weighted 24-hour composite samples. The daily maximum mass emission shall be determined using the daily maximum effluent concentration limit as C_e and the observed flow rate Q in mgd (each variable referring to Equation 3 of the Ocean Plan).

c. The instantaneous maximum shall apply to grab sample determinations.

d. If the Discharger can demonstrate to the satisfaction of the Central Coast Water Board (subject to USEPA approval) that an analytical method is available to reliably distinguish between strongly and weakly complexed cyanide, effluent limitations for cyanide may be met by the combined measurement of free cyanide, simple alkali metal cyanides, and weakly complexed organometallic cyanide complexes. For the analytical method to be acceptable, the recovery of free cyanide from metal complexes must be comparable to that achieved by the approved method in 40 C.F.R. part 136, as revised May 14, 1999.

e. Endosulfan shall mean the sum of endosulfan-alpha and –beta and endosulfan sulfate.

f. HCH shall mean the sum of the alpha, beta, gamma (lindane) and delta isomers of hexachlorocyclohexane.

Table 4-17. SC WWTF Toxic Pollutant Limitations for Protection of Human Health			
		NPDES Effluent Limitations (Pre-Seawater Dilution)	Basin Plan Water Quality Objectives (Post-Seawater Dilution)
Parameter	Units	30-Day Average	30-Day Average
Non-Carcinogens			
Acrolein	µg/L	3.10E+04	2.20E+02
Antimony	µg/L	--	1.20E+03
Bis(2-Chloroethoxy)Methane	µg/L	6.20E+02	4.40E+00
Bis(2-Chloroisopropyl)Ether	µg/L	1.70E+05	1.20E+03
Chlorobenzene	µg/L	8.60E+04	5.70E+02
Chromium (III)	µg/L	--	1.90E+05
Di-n-Butyl Phthalate	µg/L	4.90E+05	3.50E+03
Dichlorobenzenes[a]	µg/L	7.10E+05	5.10E+03
Diethyl Phthalate	µg/L	4.60E+06	3.30E+04
Dimethyl Phthalate	µg/L	1.10E+08	8.20E+05
4,6-Dinitro-2-methylphenol	µg/L	3.10E+04	2.20E+02
2,4-Dinitrophenol	µg/L	5.60E+02	4.00E+00
Ethylbenzene	µg/L	5.70E+05	4.10E+03
Fluoranthene	µg/L	--	1.50E+01
Hexachlorocyclopentadiene	µg/L	8.10E+03	5.80E+01
Nitrobenzene	µg/L	6.90E+02	4.90E+00
Thallium	µg/L	--	2.00E+00
Toluene	µg/L	1.20E+07	8.50E+04
Tributylin	µg/L	2.00E-01	1.40E-03
1,1,1-Trichloroethane	µg/L	7.60E+07	5.40E+05
Carcinogens			
Acrylonitrile	µg/L	1.40E+01	1.00E-01
Aldrin	µg/L	3.10E-03	2.20E-05
Benzene	µg/L	8.30E+02	5.90E+00
Benzidine	µg/L	9.70E-03	6.90E-05
Beryllium	µg/L	4.60E+00	3.30E-02
Bis(2-chloroethyl) ether	µg/L	6.30E+00	4.50E-02
Bis(2-ethylhexyl) phthalate	µg/L	4.90E+02	3.50E+00
Carbon Tetrachloride	µg/L	1.30E+03	9.00E-01
Chlordane[b]	µg/L	3.20E-03	2.30E-05
Chlorodibromomethane	µg/L	1.20E+03	8.60E+00
Chloroform	µg/L	--	1.30E+02
DDT[c]	µg/L	2.40E-02	1.70E-04
1,4-Dichlorobenzene	µg/L	2.50E+03	1.80E+01
3,3-Dichlorobenzidine	µg/L	1.10E+00	8.10E-03

Table 4-17. SC WWTF Toxic Pollutant Limitations for Protection of Human Health			
		NPDES Effluent Limitations (Pre-Seawater Dilution)	Basin Plan Water Quality Objectives (Post-Seawater Dilution)
Parameter	Units	30-Day Average	30-Day Average
1,2-Dichloroethane	µg/L	3.90E+03	2.80E+01
1,1-Dichloroethylene	µg/L	1.30E+02	9.00E-01
Dichlorobromomethane	µg/L	8.70E+02	6.20E+00
Dichloromethane	µg/L	6.30E+04	4.50E+02
1,3-dichloropropene	µg/L	--	8.90E+00
Dieldrin	µg/L	5.60E-03	4.00E-05
2,4-Dinitrotoluene	µg/L	3.60E+02	2.60E+00
1,2-Diphenylhydrazine	µg/L	2.20E+01	1.60E-01
Halomethanes[d]	µg/L	1.80E+04	1.30E+02
Heptachlor	µg/L	7.00E-03	5.00E-05
Heptachlor Epoxide	µg/L	2.80E-03	2.00E-05
Hexachlorobenzene	µg/L	2.90E-02	2.10E-04
Hexachlorobutadiene	µg/L	2.00E+03	1.40E+01
Hexachloroethane	µg/L	3.50E+02	2.50E+00
Isophorone	µg/L	1.00E+05	7.30E+02
NDMA	µg/L	1.00E+03	7.30E+00
NDPA	µg/L	5.30E+01	3.80E-01
N-nitrosodiphenylamine	µg/L	3.50E+02	2.50E+00
Polynuclear aromatic hydrocarbons (PAHs)[e]	µg/L	1.20E+00	8.80E-03
PCBs[f]	µg/L	2.70E-03	1.90E-05
TCDD Equivalents[g]	µg/L	5.50E-07	3.90E-09
1,1,2,2-Tetrachloroethane	µg/L	3.20E+02	2.30E+00
Tetrachloroethylene	µg/L	2.80E+02	2.00E+00
Toxaphene	µg/L	2.90E-06	2.10E-04
Trichloroethylene	µg/L	3.80E+03	2.70E+01
1,1,2-Trichloroethane	µg/L	1.30E+03	9.40E+00
2,4,6-Trichlorophenol	µg/L	4.10E+01	2.90E-01
Vinyl Chloride	µg/L	5.00E+03	3.60E+01

a. Chlordane shall mean the sum of chlordane-alpha, chlordane-gamma, chlordene-alpha, chlordenegamma, nonachlor-alpha,nonachlor-gamma, and oxychlordane.

b. DDT shall mean the sum of 4,4'DDT, 2,4'DDT, 4,4'DDE, 2,4'DDE, 4,4'DDD, and 2,4'DDD.

c. Halomethanes shall mean the sum of bromoform, bromomethane (methyl bromide), and chloromethane (methyl chloride).

d. PAHs shall mean the sum of acenaphthylene, anthracene, 1,2- benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1,12-benzoperylene, benzo[a]pyrene, chrysene, dibenzo[ah]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene.

e. PCBs shall mean the sum of chlorinated biphenyls whose analytical characteristics resemble those of Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254 and Aroclor-1260.

f. TCDD Equivalents shall mean the sum of the concentrations of chlorinated dibenzodioxins (2,3,7,8-CDDs) and chlorinated dibenzofurans (2,3,7,8-CDFs) multiplied by their respective toxicity factors.

The SC WWTF NPDES permit requires minimum percent removals for BOD_5, TOC, and TSS, summarized in **Table 4-18**.

Table 4-18. SC WWTF NPDES Percent Removals

BOD_5	TOC	TSS
85%	85%	85%

Effluent percent removal from influent water quality.

The Ocean Plan has established receiving water standards to ensure the reasonable protection of beneficial uses and public health. Compliance with standards is determined from samples collected at stations representative of the area within the waste field where initial dilution is completed. **Table 4-19** summarizes the Ocean Plan standards for bacterial characteristics, physical characteristics, and chemical characteristics.

Table 4-19. Ocean Plan Receiving Water Standards

Bacterial Characteristics			
Sampling	**Total Coliform**	**Fecal Coliform**	**Enterococcus**
	CFU/100 mL	**CFU/100 mL**	**CFU/100 mL**
30-day Geometric Mean	1,000	200	35
Single Sample Maximum	10,000	400	104
Shellfish Harvesting Standard[a]	Median total coliform density shall not exceed 70 organisms per 100 mL, and in not more than 10 percent of samples shall coliform density exceed 2300 organisms per 100 mL.		
Physical Characteristics			
1. Floating particulate matter, and grease and oil shall not be visible.			
2. The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface.			
3. Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste.			
4. The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.			
5. Trash shall not be present in ocean waters, along shorelines or adjacent areas in amounts that adversely affect beneficial uses or cause nuisance.			
Chemical Characteristics			
Dissolved Oxygen	The dissolved oxygen concentration shall not be depressed more than 10 percent from natural occurring concentrations, as the result of discharge of oxygen demanding waste.		
pH	The pH shall not change more than 0.2 units from that which occurs naturally.		
Sulfide	The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions.		
Organic Materials	The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life.		
Nutrient Materials	Nutrient materials shall not cause objectionable aquatic growth or degrade indigenous biota.		
Water Quality Objective Substances	The concentration of water quality objective substances set forth in Chapter II, Table 3 shall not increase in marine sediments to levels which would degrade indigenous biota.		

a. At all areas where shellfish may be harvested for human consumption, as determined by the RWQCB. Bacterial samples shall be collected weekly.
CFU = colony-forming unit

If an Executive Officer from the California Central Coast RWQCB concludes that the bacterial discharge consistently exceeds receiving water limitations, the NPDES permit sets forth bacterial discharge limitations, summarized in **Table 4-20**.

Table 4-20. NPDES Bacteria Daily Maximum Density

Total Coliform	Fecal Coliform	*Enterococcus*
MPN/100 mL	MPN/100 mL	MPN/100 mL
139,000	27,800	4,879

Section 5: PWS Project Facilities

This section provides a description of the PWS Project facilities, which include:

- TTF at the SC WWTF
- Source Water Pipeline
- AWPF at the Chanticleer site
- ROC Pipeline
- Purified Water Pipeline
- SWIP recharge wells and monitoring wells

5.1 PWS Project Overview

The PWS Project will include recharge wells, monitoring wells, conveyance pipelines, and treatment facilities, including the TTF at the SC WWTF and AWPF at the Chanticleer site. Source water from the SC WWTF will be conveyed directly to the AWPF with a sidestream conveyed to the Santa Cruz NPR Project Facility. After treatment at Chanticleer, the purified water will be conveyed to three SWIP recharge wells to be injected into the groundwater basin.

The TTF at the SC WWTF site is comprised of the following systems:

- SWPS
- Source Water Strainers
- Source Water Surge Tank and Pigging Station
- ROC Pipeline Return and Pigging Station
- Santa Cruz NPR Project Facility
  - Title 22 Cloth Disk Filter
  - Title 22 UV System
- Title 22 Back-Up Storage Tank
- Chemical Storage and Feed Facilities
- Communications pole

The Santa Cruz TTF facilities are described in the City of Santa Cruz Non-potable Reuse Engineering Report.

2.37 mgd of secondary effluent will be dosed with sodium hypochlorite to form chloramines with ambient ammonia in the source water to mitigate biofouling in the approximately 5-mile conveyance line to the Chanticleer site. The AWPF at the Chanticleer site will include:

- Ozone System
- MF System
- RO System
- UV/AOP System
- Decarbonator
- Post-Treatment Stabilization
- Purified Water Storage Tank and Pump Station (PWPS)
- ROC Wetwell

- Sanitary Lift Station
- Chemical Storage and Feed Facilities
- Operations and Control Room
- Communications pole

The facilities at the SWIP wells at Monterey, Willowbrook, and TLC sites include:

- Wells and backwash system and facilities
- Communication equipment
- Related monitoring wells

Conveyance facilities include:

- Source Water pipeline: 16-inch pipe from SC WWTF conveying source water to the Chanticleer AWPF
- ROC pipeline: 16-inch pipe from AWPF to SC WWTF conveying ROC, MF backwash waste, pre-MF automatic strainer waste, and off-specification water to the City's ocean outfall
- Purified Water pipeline: 14-inch pipe from AWPF conveying purified water for recharge to the SWIP wells

The 1.67 mgd of purified water from the Chanticleer AWPF will be conveyed to three SWIP recharge wells to be injected into the Basin. These wells will be located at the TLC, Monterey Avenue, and Willowbrook Lane well sites. The TLC, Monterey Avenue, and Willowbrook Lane recharge wells are anticipated to have peak recharge rates of approximately 200-900 gallons per minute (gpm) each. An overview of the PWS Project facilities and locations is shown in **Figure 5-1**. The overall treatment train showing the process units and conveyance infrastructure is shown in **Figure 5-2**. Detailed process flow diagrams and P&IDs are provided in **Appendix C**.

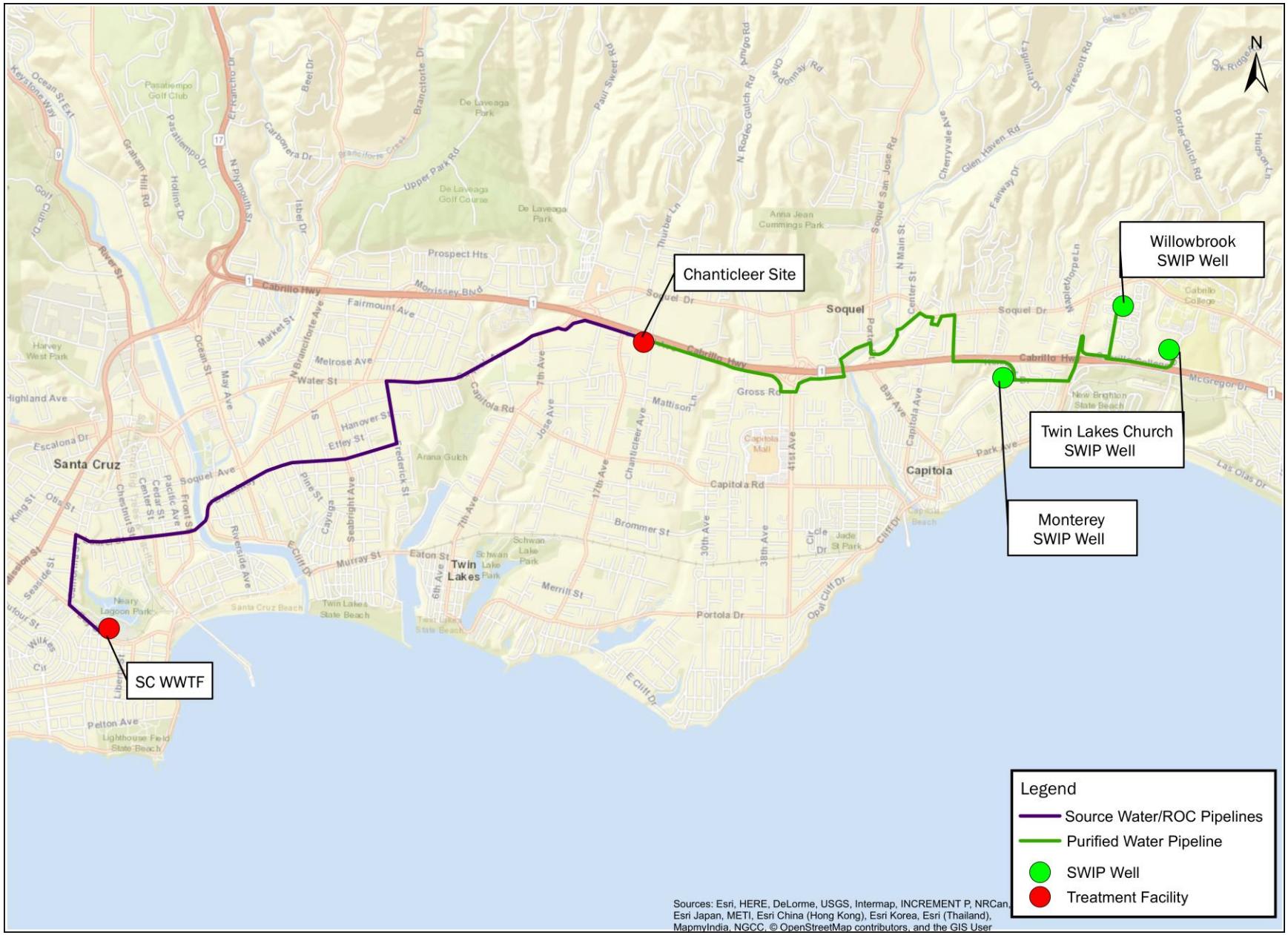

Figure 5-1. PWS facilities overview

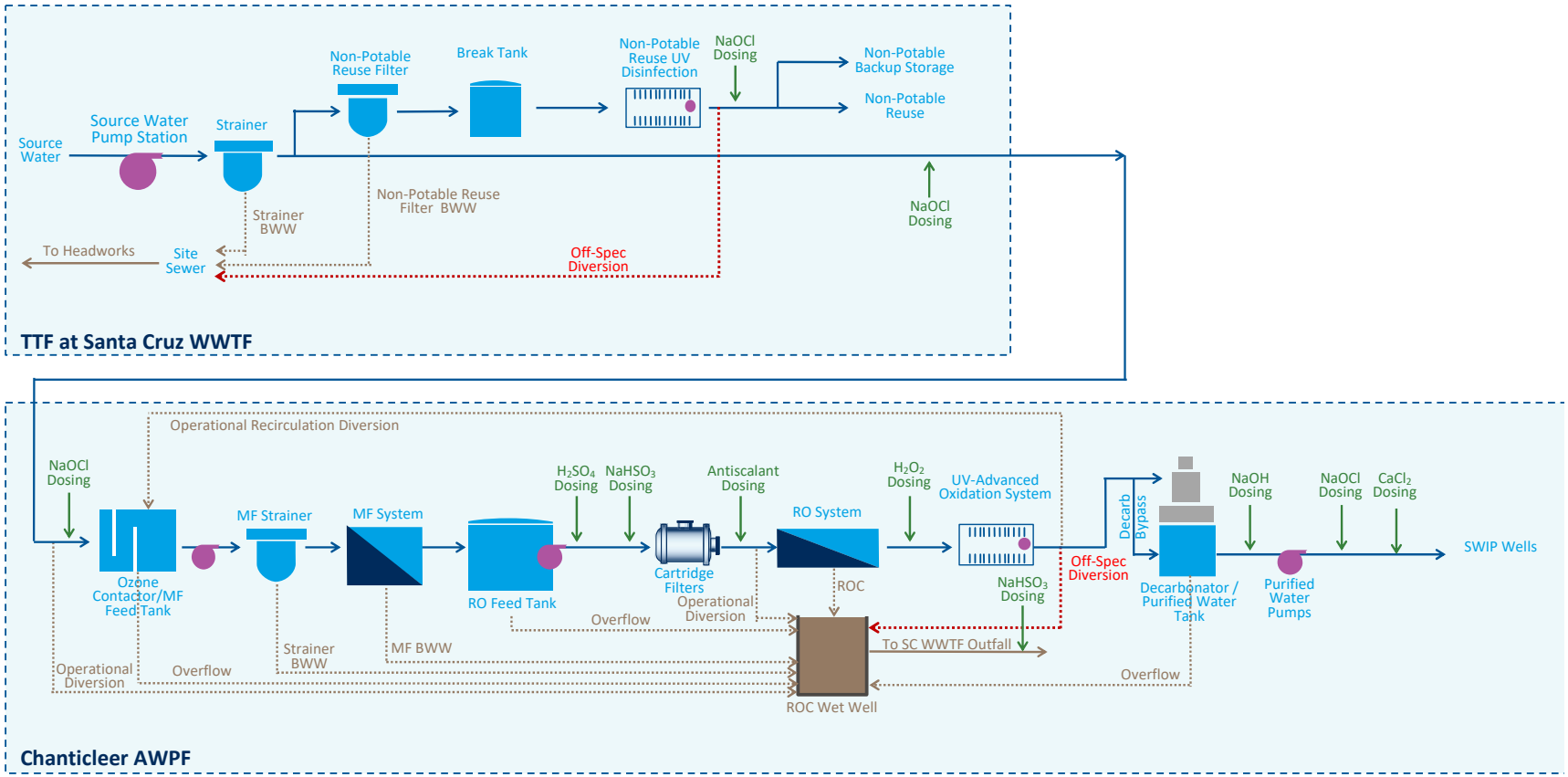

Figure 5-2. PWS process flow diagram

Table 5-1 summarizes the treatment strategy for the PWS Project. Each unit process removes specific constituents to meet regulatory criteria or stabilizes the treated water.

Table 5-1. Summary of Treatment Strategy

Constituent	Treatment Technology
Pathogenic microorganisms	MF, RO, UV-AOP, groundwater retention time
MCLs, NLs and Basin Plan	Ozone, RO, and UV-AOP
1,4-Dioxane and CECs	Ozone, RO, and UV-AOP
NDMA	RO and UV-AOP
Post-treatment stabilization	Post-treatment with decarbonation and addition of calcium chloride and sodium hydroxide

5.2 Facilities at the SC WWTF Site

5.2.1 Existing SC WWTF Overview

The SC WWTF is located in Santa Cruz, California and has an average dry weather flow design treatment capacity of 17 mgd and a peak wet weather flow design capacity of 81 mgd. It currently receives and treats 5 to 12.5 mgd on average. The SC WWTF treatment process includes screening, grit removal, flow equalization, primary sedimentation, trickling filters, solids contact tanks, secondary clarification, and UV disinfection. Biosolids removed from the wastewater stream are treated by gravity thickening, anaerobic digestion, a cogeneration process and dewatering by centrifuges. Treated secondary effluent from SC WWTF's secondary clarifiers is disinfected with UV light and discharged via an ocean outfall to Monterey Bay. **Figure 5-3** shows the annual average daily secondary effluent flow by hour that is discharged.

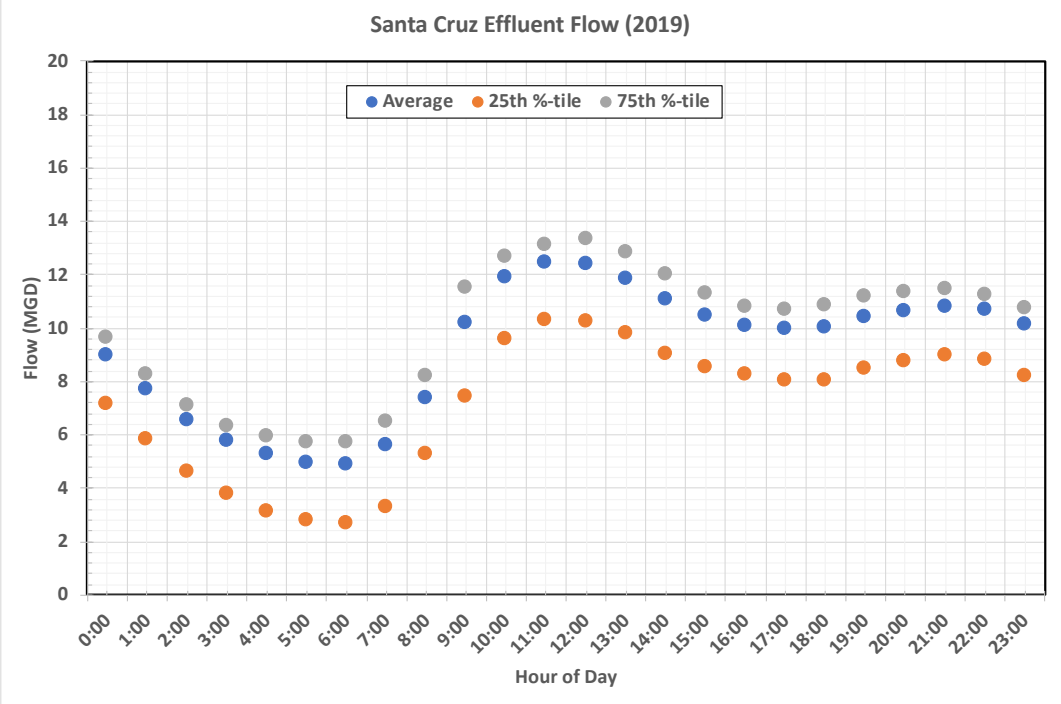

Figure 5-3. Annual average daily secondary effluent flow by hour discharged to Monterey Bay

5.2.2 Santa Cruz Tertiary Treatment Facility Site Overview

The SC WWTF UV-disinfected effluent will flow into the SWPS (**Section 5.2.3**) and then to the source water strainers (**Section 5.2.4**) prior to conveyance to the AWPF at the Chanticleer site. A small portion of the water will be diverted after the strainers to the new non-potable reuse facilities at the TTF at the SC WWTF (see the Santa Cruz Non-potable Reuse Engineering Report for more information).

Influent to the SWPS will flow from downstream of the Santa Cruz WWTF secondary effluent UV system. Influent demand to the PWS facility will be calculated as the sum of the TTF system influent demand and the AWPF influent demand. The PWS control system will receive a UV effluent channel level signal from a new SCWWTF effluent channel level sensor. During periods of low SC WWTF effluent flow, the effluent channel level will begin to drop, and the effluent channel volume will be used as influent flow equalization.

The following sections describe the TTF (SWPS and strainers) at the SC WWTF.

5.2.2.1 Location and Site Plan

The TTF at SC WWTF includes a 47 foot (ft) -8-inch by 60 ft area north of the existing primary sedimentation tanks. This 2,900 square foot (ft^2) area will be the main process area at SC WWTF that houses TTF Project facilities (cloth filtration and UV disinfection), source water strainers, static mixer, and surge tanks. Outside this main process area, the SWPS will be located where the existing chlorine contact tank is currently, and it will transfer the water from the existing UV facility to the main TTF area.

The existing sodium hypochlorite facility will be used with the addition of two sets of dosing pumps which will draw chemical from the existing storage tanks.

A new Pacific Gas and Electric (PG&E) service entrance will be installed outside the main gate.

The AWPF ROC pipeline return connection from the Chanticleer site will be connected to the existing tunnel portal box for discharge of the waste residuals and off-specification water through the tunnel and out to Monterey Bay. The AWPF waste residuals will be comprised of ROC, MF strainer backwash, and MF backwash. Because chloramines are formed in the source water feeding the AWPF, residual chloramine in the waste residuals will be monitored and quenched at the Chanticleer site to ensure that the discharge meets ocean discharge requirements for total chlorine residual.

A structural description of the various TTF components is included in **Table 5-2**. The tertiary facility layout and major yard piping routing within the TTF are shown in **Figure 5-4** and **Figure 5-5**, respectively.

Table 5-2. TTF Descriptions

Facility	Facility Structural Description
Source water pumps area	Three vertical turbine pumps in cans (2 + 1) plus installed cans for 2 future pumps
Source water strainers	Two automatic strainers (1 + 1) plus space for 1 future strainer
Filter area and break tank	One cloth filter (1 + 0) and one small break tank located above grade (refer to the Santa Cruz Non-potable Reuse Engineering Report for more information)
UV system area	One feed pump (1 + shelf spare) and two UV reactors (2 + 0) located on the ground floor, covered by a canopy (refer to the Santa Cruz Non-potable Reuse Engineering Report for more information)
Chemical storage and feed system areas	The existing SC WWTF Sodium Hypochlorite facility will be utilized with the addition of two sets of dosing pumps which will draw chemical from the existing storage tanks.
Storage tanks and pump station	One 8,000-gallon tank plus existing tank, and 1 + 1 pumps

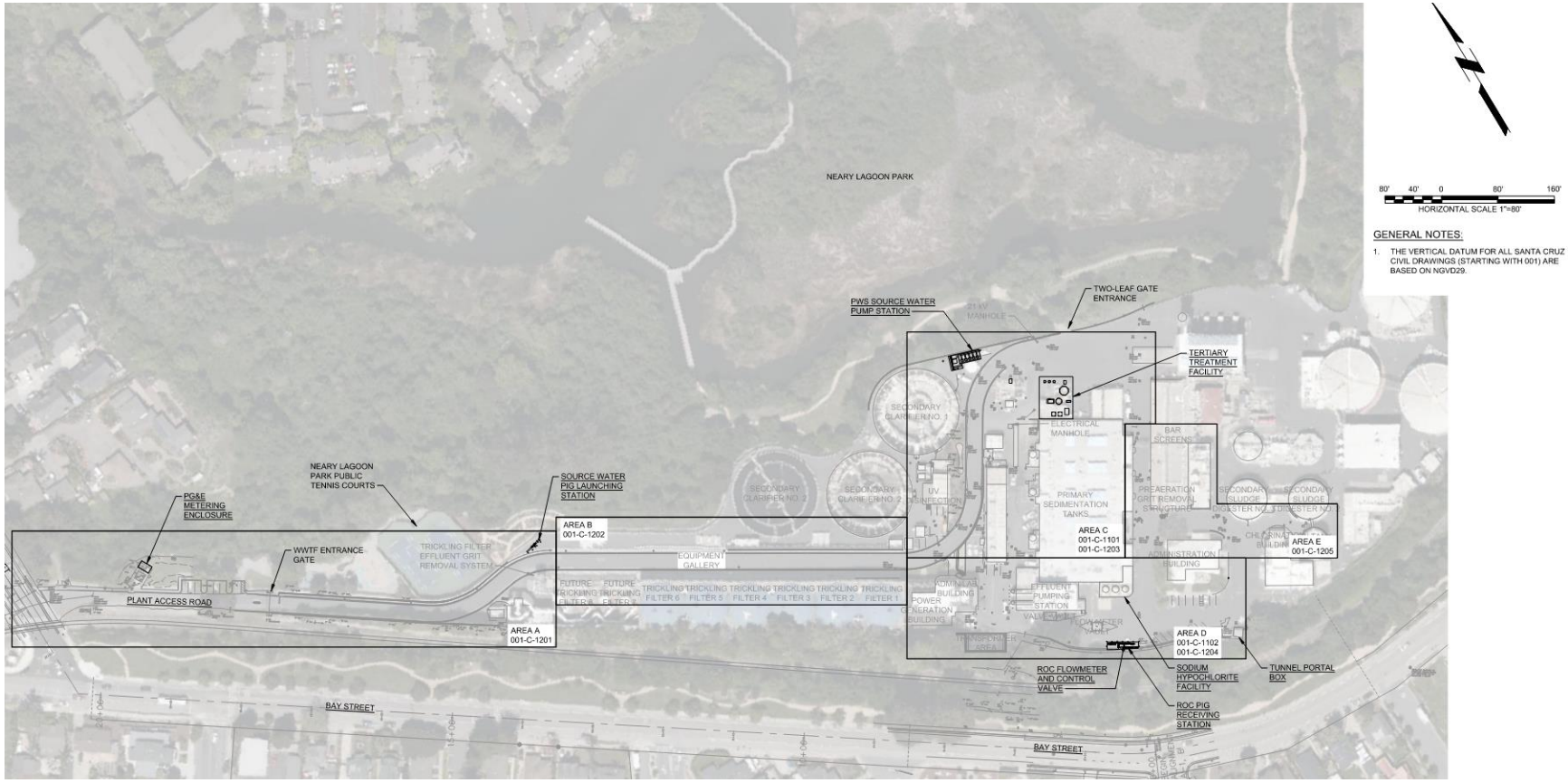

Figure 5-4. TTF layout



Figure 5-5. PWS Conveyance and TTF pipe routing and facilities at SCWWTF

5.2.2.2 Tertiary Treatment Facility Capacity

The SWPS and source water strainers are designed to meet the full capacity of the AWPF at the Chanticleer site and the non-potable reuse facilities at the TTF at the SC WWTF. **Table 5-3** provides the design capacity, accounting for the uptime target for the PWS Project, of each tertiary treatment unit process.

Table 5-3. Summary of TTF Design Capacities

Process	Units	Value
SWPS	mgd	2.77
Source Water Strainers	mgd	2.77
SC NPR Facilities	n/a[a]	n/a[a]

a. SC NPR Facilities are detailed separately in the SC Nonpotable Reuse Engineering Report

5.2.3 Source Water Pump Station

The SWPS will convey source water from the SC WWTF to the TTF and to the AWPF at Chanticleer. There is an operational diversion prior to ozone at the AWPF. The SWPS draws water from the existing SC WWTF UV effluent channel and consists of vertical turbine pumps in cans. The existing UV effluent channel and WWTF Effluent Pumping Station water levels can be drawn down during low-flow events through the WWTF, allowing the SWPS to ramp up and down based on level. Considering historical flow data, it is anticipated that low-flow events will occur less than two percent of the year on average. The low flow periods are expected to last between one to five hours at a time, with an event frequency range of zero to 40 times per year. These low flow periods typically occur during early morning hours when SC WWTF effluent flows reach their daily diurnal minimum. A majority of the time, the UV effluent channel will operate at its maximum level, allowing the SWPS to operate at full flow. The design criteria for the SWPS are shown in **Table 5-4**.

Table 5-4. SWPS Design Criteria

Parameter	Units	Value
Design Capacity, each pump	gpm (mgd)	961 (1.4)
No. of pumps	duty + standby	2 + 1
Type	--	Vertical Turbine (in cans)
Drive Type	--	Variable Speed
Total Dynamic Head Range	ft	175.3 - 364.0

5.2.4 Source Water Strainers

Automatic strainers at the SC WWTF (i.e., the "Source Water Strainers") are required ahead of the Title 22 System and pipeline to the AWPF at Chanticleer to protect the downstream processes from damage or blockage from particulate matter and microorganisms. The SC WWTF secondary effluent is known to sometimes contain snail shells detritus, red-worm larvae, midges, mayflies and similar material. The strainers are downstream of the SWPS. The strainers will automatically backwash when a pressure differential is measured across the strainer. The design criteria for the strainers are shown in **Table 5-5**.

Table 5-5. Source Water Strainers Design Criteria		
Parameter	**Units**	**Value**
Design Flow	gpm (mgd)	1,922 (2.77)
No. of strainers	duty + standby	1 + 1
Type	--	Automatic strainer
Screen size	mm	≤1

5.2.5 Non-Potable Reuse Facilities

The majority of the source water will be pumped by the SWPS to the AWPF at Chanticleer. The remaining approximately 0.3 mgd will be further treated to meet the Title 22 requirements for disinfected tertiary recycled water. The Santa Cruz TTF Project facilities include cloth filtration and UV disinfection. These non-potable reuse facilities will replace the current SC WWTF 2W treatment facilities system, which produces 0.2 mgd for in-plant reuse using media filtration and chloramine disinfection.

Design details for the Santa Cruz TTF Project facilities can be found in the City of Santa Cruz Non-Potable Reuse Engineering Report.

5.2.6 Chemical Storage and Delivery Systems

The PWS Project requires the addition of sodium hypochlorite at the TTF.

5.2.6.1 Sodium Hypochlorite

The sodium hypochlorite storage and feed system is described in **Table 5-6** below.

Table 5-6. Sodium Hypochlorite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Information		
Concentration	% as NaOCl (% as Cl_2)	12.5 (10.64)
Specific Gravity	-	1.175
Freezing Point	°F	-3.00
Chemical Dosage as 100% Cl_2 to AWPF		
Minimum	mg/L	2
Average	mg/L	6
Maximum	mg/L	35
Process Flow to AWPF		
Minimum	mgd	0.95
Average	mgd	2.37
Maximum	mgd	2.37
Chemical Feed Flow as 12.5% Sodium Hypochlorite, 10.64% as Cl_2 to AWPF		
Minimum	gph	0.63
Average	gph	4.75
Maximum	gph	27.74

Table 5-6. Sodium Hypochlorite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Existing Chemical Storage (also used for TTF)		
Tank Material	-	Fiber reinforced plastic (FRP)
Tank Quantity and Volume (Usable)	-	3 at 5,870 gallons = 17,610 gallons
Tank Diameter	ft	10
Tank Straight Side Height	ft	14
Days of Storage for PWS Project Only (excludes SC WWTF current usage)		
At Average Dose/Average Flow	days	137
At Maximum Dose/Maximum Flow	days	25
Full Truck Delivery Volume	gallons	4,600
Feed Equipment		
Pump Type	-	Diaphragm Metering Pump
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.63 to 27.74
Turndown Ratio	-	44:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual speed control with local override.
Double Contained Piping and Valves		
Pipe Material	-	Chlorinated polyvinyl chloride (CPVC), Hastelloy C
Carrier Yard Pipe Material	-	Polyvinyl chloride (PVC)
Internal Yard Pipe Material	-	Polytetrafluoroethylene (PTFE)
Valve Type	-	Diaphragm, Drilled Ball

5.3 AWPF at the Chanticleer Site

The AWPF at the Chanticleer site begins with an ozone system, ends at the PWPS, and includes residuals management. The source water for the AWPF is the disinfected secondary effluent from the TTF at the SC WWTF.

5.3.1 AWPF Overview

The major process components and their respective process descriptions at the Chanticleer AWPF are the following (see the simplified process flow diagram for the AWPF in **Figure 5-6**):

- **Ozone.** Ozone provides pretreatment for nitrite, a scavenger for radicals in the UV-AOP process that is only partially rejected by RO. Oxidation and transformation of TOC will reduce organic fouling of the MF system.
- **Membrane Filtration.** MF is effective at removing particles that cause RO membrane fouling, *Cryptosporidium* oocysts and *Giardia* cysts, as well as other suspended and colloidal constituents. Because MF is a cyclic process, upstream and downstream equalization is required. Membrane filtration yields backwash that will be sent to the ROC wet well for discharge through the ocean outfall. Chemical solutions used to clean the membranes will be neutralized and sent to the sewer via the Sanitary Lift Station.

- **Reverse Osmosis.** RO removes dissolved organic compounds and minerals from water. RO produces a residual concentrate stream (ROC). The RO system is designed to operate at 80-percent recovery. The concentrate stream will be sent to the ROC wet well for discharge through the ocean outfall. Chemical solutions used to clean the membranes will be neutralized and sent to the sewer via the Sanitary Lift Station.
- **UV-AOP.** UV-AOP involves applying high-dose UV light to hydrogen peroxide to produce hydroxyl radicals, which are effective at oxidizing trace organic contaminants. High-dose UV will also remove some contaminants (e.g., NDMA) through photolysis and is effective at inactivating all major pathogen groups present in the source wastewater (bacteria, protozoa, viruses).
- **Post-Treatment Stabilization.** Post-treatment includes decarbonation to remove dissolved carbon dioxide and raise the pH, along with chemical adjustment of pH by addition of sodium hydroxide. The addition of sodium hydroxide also increases alkalinity, and hardness is increased by addition of calcium chloride. These post-stabilization processes stabilize the purified water to prevent corrosion and to minimize leaching of metals in the aquifer. Post treatment also includes chloramine boosting to maintain a chloramine residual throughout the purified water pipeline.
- **Purified Water Pump Station.** The PWPS will pump the purified water to the SWIP recharge facilities.

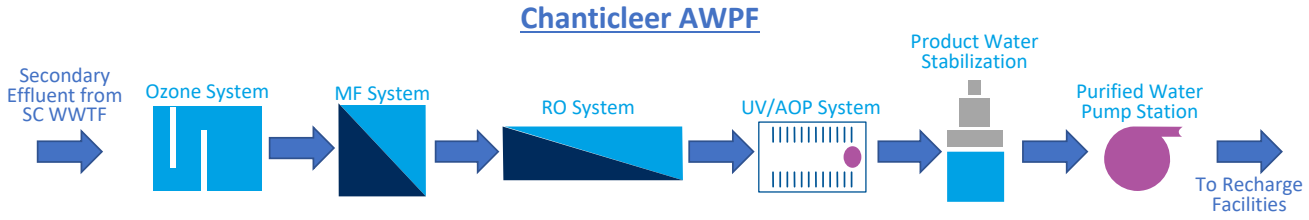

Figure 5-6. Chanticleer AWPF basic process flow schematic

5.3.1.1 Location and Site Plan

The Chanticleer AWPF will be built near the corner of Chanticleer Avenue and Soquel Avenue in the unincorporated area of Santa Cruz County between the City of Santa Cruz and the City of Capitola. The site plan for the Chanticleer AWPF is shown in **Figure 5-7** and main process layout is shown in **Figure 5-8**.

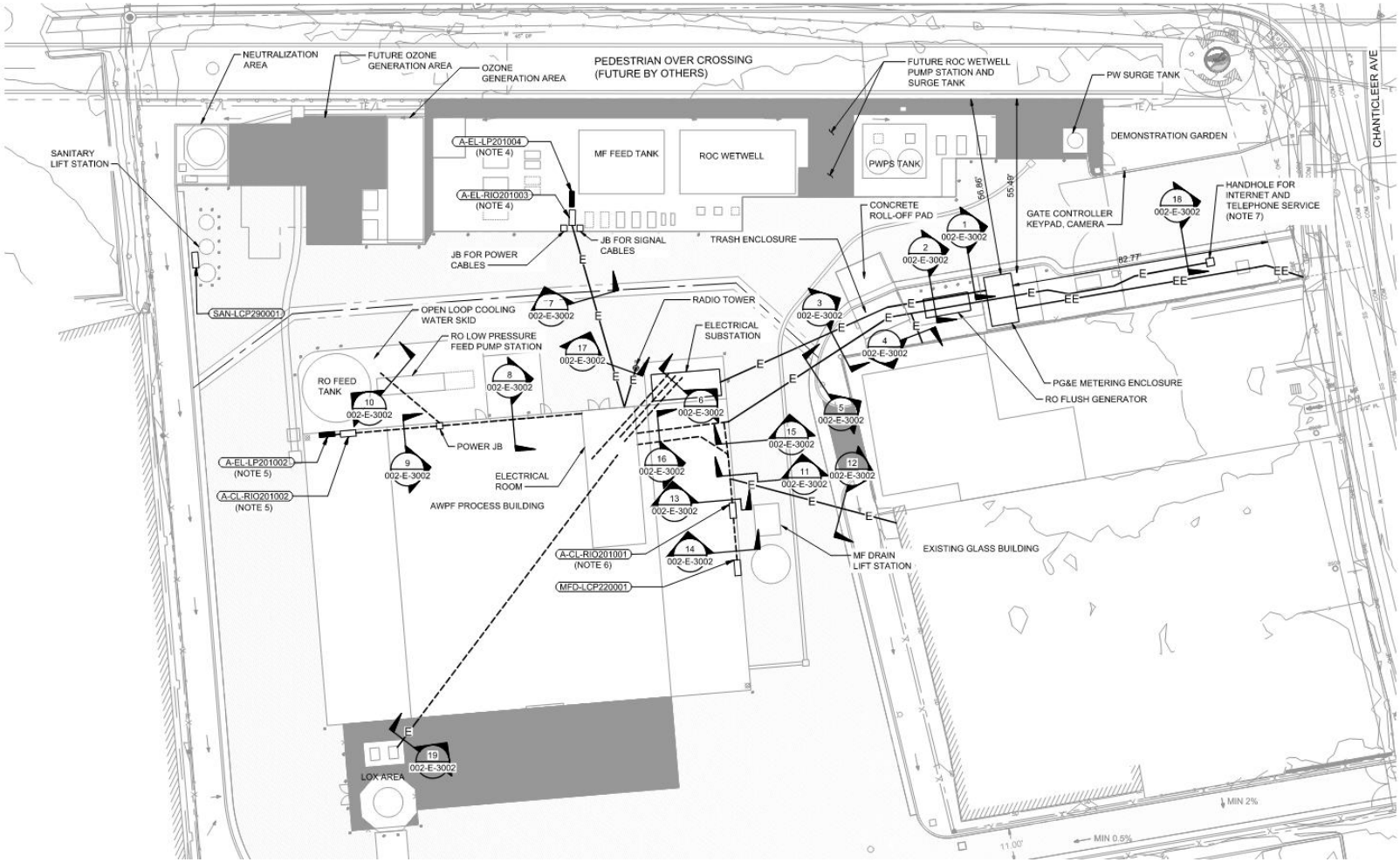

Figure 5-7. Chanticleer site layout (not to scale)

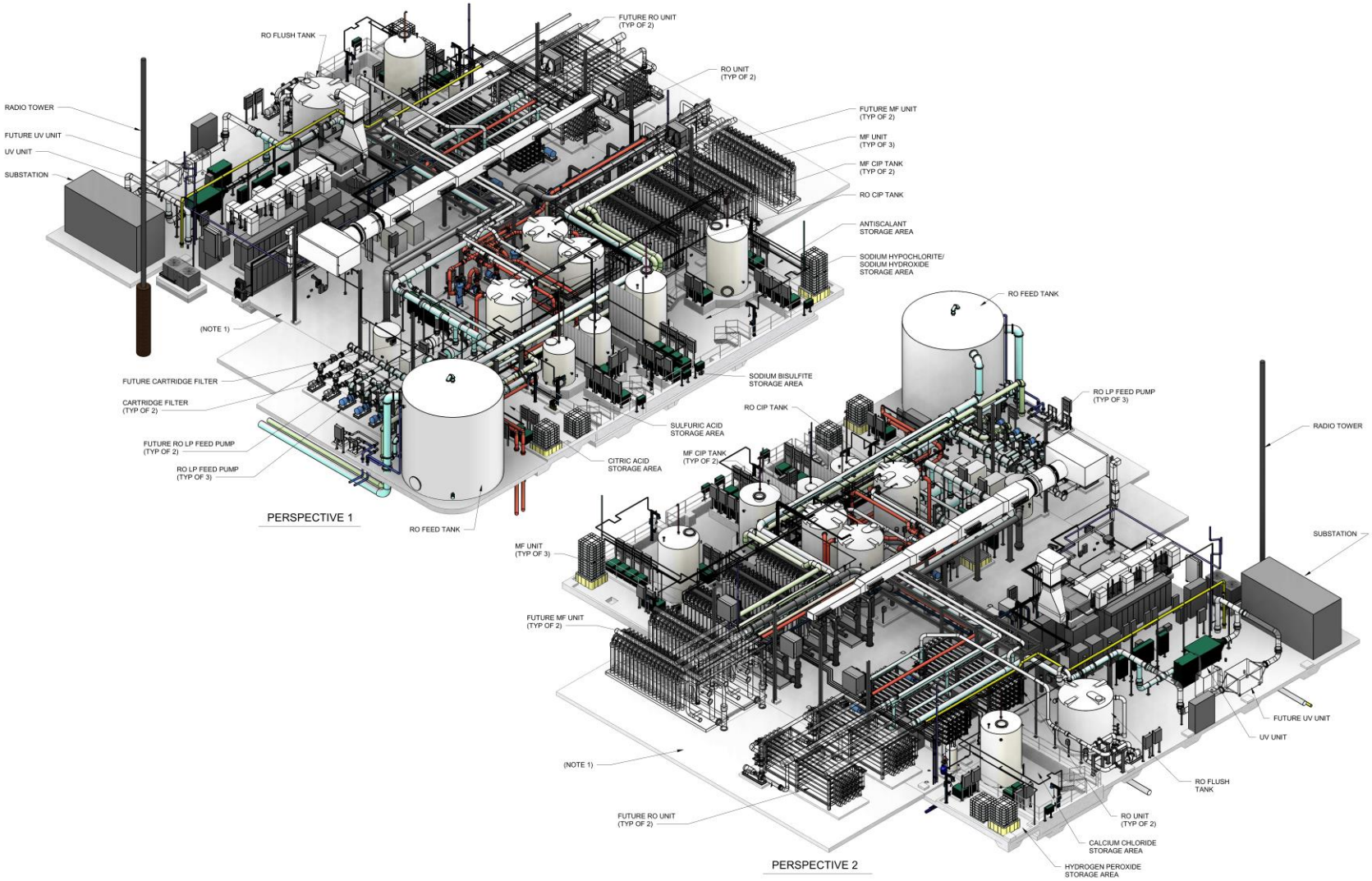

Figure 5-8. Chanticleer main process layout

5.3.1.2 Capacity

The planned purified water production capacity of the AWPF is 1.67 mgd. A process flow summary for the major treatment processes of the AWPF is provided in **Table 5-7**.

Table 5-7. AWPF Process Flow Summary

Process	Flow (mgd)
AWPF Feed	2.37
Ozone Feed Tank	2.37
MF Strainer Feed	2.37
MF Strainer Effluent	2.32
MF Feed	2.32
MF Filtrate	2.09
RO Feed	2.09
RO Permeate Including Cleaning Makeup	1.67
AOP Influent and Effluent	1.67
Post Treatment Stabilization Influent and Effluent	1.67

5.3.2 Chloramine Residual Boost System

Prior to entering the ozone system, the Source Water to the AWPF will be monitored continuously for total chlorine via an online analyzer. The chloramine residual will be boosted with sodium hypochlorite as needed to maintain a target setpoint chloramine residual for biofoulant mitigation of the MF and RO membranes. An additional total chlorine analyzer will be located at the RO feed for monitoring with an optional trim control to maintain chloramine residual to the RO system.

5.3.3 Ozone

Ozone is the first treatment process for the AWPF at the Chanticleer site. The ozone system will process the source water transported from the SC WWTF. The ozone system includes the following components:

- Liquid oxygen (LOX) storage and feed system
- Ozone generation
- Nitrogen system
- Ozone generation cooling system
- Ozone dissolution system
- Off-gas destruct system
- Ozone contact tank

Design criteria for equipment provided by Xylem/Wedeco, the Ozone System Supplier (OSS), are provided in the following subsections. P&IDs provided by Xylem/Wedeco showing ozone system details are provided in **Appendix C**.

5.3.3.1 Ozone Water Quality Basis of Design

The ozone influent water quality is listed in **Table 5-8**.

Table 5-8. Ozone Influent Water Quality [a]

Parameter	Units	Value
pH	-	7.22
TSS	mg/L	11
Turbidity	NTU	5
TDS	mg/L	1,430
Ammonia	mg/L as N	41.2
Nitrite	mg/L as N	3
Nitrate	mg/L as N	5.8
TOC	mg/L	20

a. Source water quality is based on 95th percentile historical concentrations for ammonia (with concentrations of pH, alkalinity, bicarbonate, and nitrate based on their relationship with ammonia), and design concentrations for all other constituents."

The design water quality shown in **Table 5-8** was defined based on historical water quality data. As discussed in Section 6.4, the average TOC was 14 mg/L with a 90th percentile of 17 mg/L and maximum of 33 mg/L. The design transferred maximum ozone dose of 20.2 mg/L for this project was selected based on the following:

- Ozone to TOC (O_3:TOC) ratio of 0.5 assuming a TOC concentration of 20 mg/L (based on historical 95th percentile value)
- Ozone to nitrite (O_3:NO_2) ratio of 3.4 assuming a nitrite concentration of 3 mg/L as N (based on historical 95th percentile value)

The design applied maximum ozone dose of 22.4 mg/L was based on a minimum 90% mass transfer efficiency. The ozone system will use real-time monitoring of TOC and nitrite to adjust the ozone dose and account for varying ozone demand. This control approach will ensure the minimum O_3:TOC ratio is achieved while oxidizing nitrite prior to RO and UV-AOP.

5.3.3.2 Liquid Oxygen Storage and Feed System

Ozone will be produced on-site using high purity oxygen stored on-site as LOX. LOX will be delivered via chemical delivery trucks and stored and maintained in a liquid form in an on-site storage tank. LOX from the storage tank will be conveyed to ambient vaporizers and converted to gaseous oxygen (GOX). Heat gain at the vaporizers will be provided from ambient air as the LOX flows through the vaporizing units. The pressure of the storage tank will provide the motive force for the flow of oxygen out of the tank, through the vaporizers and ozone generator, and to the ozone dissolution system.

The LOX storage tank will consist of an inner pressure vessel and an outer jacket. The space between the pressure vessel and outer jacket will be filled with Perlite or another similar insulating material and placed under vacuum to insulate the tank. The LOX storage tank will be located adjacent to the AWPF Building, south of the western chemical storage area canopy. Design criteria for the LOX storage tank are listed in **Table 5-9.**

Table 5-9. LOX Storage Tank Design Criteria		
Parameter	**Units**	**Value**
Manufacturer	--	Chart Industries, VS-9000SC-175CS
Total Storage Volume	gal	8,990
Storage (Avg Flow x Avg Dose)	days	39
Number of Tanks	--	1
Tank Type	--	Inner tank: stainless steel Outer tank: carbon steel
Tank Diameter	ft	9.5
Tank Height	ft	29

The LOX tank and LOX piping will be equipped with pressure relief valves between every pair of isolation valves in series to prevent over-pressurization of the tanks or lines due to vaporization of the LOX. Relief valves will also be provided in the GOX lines. The pressure vessel will be equipped with rupture discs. Each vaporizer is designed to deliver at least 110 percent of system demand at peak operation conditions (i.e., maximum flow and maximum dose). Design criteria are shown in **Table 5-10** for the LOX vaporizers and in **Table 5-11** for the GOX filters and pressure control.

Table 5-10. LOX Vaporizers Design Criteria		
Parameter	**Units**	**Value**
Manufacturer	--	Thermax, #SG50HF
Rated Capacity	standard cubic feet per hour (scfh)	2,052
Number of Vaporizers (duty + standby)	--	1 + 1
Vaporizer Type	--	Ambient Vaporizers
Duty Cycle Time	hr	To be provided in OOP
Minimum O_2 Outlet Temperature	F	To be provided in OOP
Continuous Freeze Period	days	To be provided in 00P

Table 5-11. GOX Filters and Pressure Control Design Criteria		
Parameter	**Units**	**Value**
Design Gas Flow Rate	standard cubic feet per minute (scfm)	34.2
Number of Filters (duty + standby)	--	1 + 0
Filter Manufacturer	--	Donaldson, P-EG0072 ANSI (housing), P-MFO 10/30 (filter)
Particulate Capture	--	99% for particles of 0.01µm
Number of Pressure Regulators (duty + standby)	--	1 + 1

5.3.3.3 Ozone Generation

The ozone generation system converts GOX into ozone by passing GOX through two electrodes powered by high voltage alternating current (AC). The high voltage AC for each ozone generator will be supplied by a dedicated power supply unit. Excess heat from the generators will be removed by a cooling system, described further in **Section 5.3.3.5**. Design criteria for the ozone generators are summarized in **Table 5-12**.

Table 5-12. Ozone Generator Design Criteria

Parameter	Units	Value
Total Rated Capacity at 12% Weight	lb/day	470
Number of Generators (duty + standby)	--	2 + 0
Total Minimum Capacity at 10% Weight	lb/day	52
Ozone Concentration	% weight	4 – 14
Manufacturer	--	Xylem/Wedeco SMOevo610
Power Supply Per Generator	V (3-phase)	460
Ambient Temperature Range	◦C	-5 to 40.5

5.3.3.4 Nitrogen System

Ozone generators that use LOX as the source gas operate more efficiently and reliably over a wider range when a small amount of nitrogen is added to the GOX gas stream. The Xylem ozone system uses supplemental air and membrane gas separation to supply the nitrogen. Xylem has optimized their equipment at a nitrogen concentration of 0.1 to 4 percent. The nitrogen system will be sized to deliver nitrogen at the concentration required for the maximum ozone production rate. Design criteria for the nitrogen system are shown in **Table 5-13**.

Table 5-13. Nitrogen System Design Criteria

Parameter	Units	Value
Nitrogen Supply Type	--	Nitrogen generator
Manufacturer	--	General Air Products, Nitro-G3-500-B4-M1-XYL
Nitrogen flow rate	scfm	0.54 at 95% N_2 purity
Minimum Discharge Pressure	psi	40

5.3.3.5 Ozone Generation Cooling System

Typically, less than 10 percent of electrical energy supplied to ozone generators is used to convert oxygen to ozone; the remaining energy is dissipated as heat and light. Heat must be conveyed away from the ozone generator to prevent auto-decomposition of the ozone.

An ozone cooling system will service the ozone generators and power supply units using the combination of one closed-loop and one open-loop cooling system. The closed-loop system consists of pumps that circulate water to transfer heat from the ozone generators and power supply units through double wall heat exchangers to the external, once-through open loop system. The open loop system takes up heat from

the closed loop system by circulating MF filtrate water from the RO Feed Tank through the heat exchangers back to the RO Feed Tank. The closed loop system will use treated water with corrosion-inhibiting chemicals to prevent microbial and galvanic corrosion and scale formation. Design criteria for the ozone cooling system are summarized in **Table 5-14**.

Table 5-14. Ozone Generation Cooling System Design Criteria

Parameter	Units	Value
Number of Closed Loop Cooling Water Skids (duty + standby)	--	2 + 0
Number of Heat Exchangers (duty + standby)	--	2 + 0
Heat Exchanger Type	--	Plate and frame, air-gap type
Heat Exchanger Manufacturer		Standard Exchange, P 14-23-TL
Number of Open Loop Cooling System Pumps (duty + standby)	--	2 + 0
Minimum Open Cooling Water Temperature	◦F	73
Maximum Open Cooling Water Temperature	◦F	10
Motor Control Type	--	Constant

5.3.3.6 Ozone Dissolution System

Ozone gas will be applied to the main process flow stream using a sidestream injection system consisting of two sequential pipeline flash reactors with injector nozzles fed by a sidestream pump system. Gas flow through the entire ozone system is controlled at the application point using gas valve train manifolds. The ozone dissolution system will be required to provide a minimum percent ozone mass transfer efficiency at design production rates. Design criteria for the ozone dissolution system are shown in **Table 5-15**.

Table 5-15. Ozone Dissolution System Design Criteria

Parameter	Units	Value
Minimum Mass Transfer Efficiency at Design Production Rate	percent	90
Gas Valve Train Manifold		
Number of Manifolds (duty + standby)	--	2 + 0
Design Gas Capacity, Each	scfm	31
Sidestream Pumps		
Number of Pumps (duty + standby)	--	2 + 0
Type	--	Centrifugal, end suction
Pipeline Flash Reactor		
Number of reactors	--	2
Arrangement	--	Series, separated by plate mixer
Size	in	14
Number of Nozzles (duty + standby)	--	2+ 0

Table 5-15. Ozone Dissolution System Design Criteria		
Parameter	**Units**	**Value**
Injectors		
Injector Model	--	Mazzei 3090
Number of Injectors (duty + standby)	--	2 + 0
Design Gas Capacity, Each	scfm	4 - 17
Design Ozone Injection Capacity at 12% Weight, Each	lb/day	235
In-Line Mixers		
Location	--	One between the 1st and 2nd PFRs One downstream of 2nd PFR
Number of Mixers	--	2 (one static, one variable)
Type	--	Westfall or equivalent

A common suction header downstream of the magnetic flow meter will pull water for the sidestream pumps. The water from the sidestream pumps passes through ozone injectors where the ozone gas is added, connecting to the flash reactors.

Each pipeline flash reactor (PFR) includes a pipeline injection spool with connections for four injection nozzle pairs. Two nozzle pairs on each PFR will be connected, one to each injector. The remaining two nozzle pairs will be blanked off and will be connected to new injectors during the future expansion. The pipeline flash reactors will be separated by a plate mixer, and downstream of the second PFR a variable mixer will ensure sufficient pressure in the PFRs during low flow scenarios.

5.3.3.7 Off-Gas Destruct System

The ozone off-gas destruct system will reduce the ozone concentration in the off-gas produced from the ozone system to levels suitable for discharge to the atmosphere. Ozone off-gas will be pulled from the top of the Ozone Contact Tank. Each ozone destruct unit consists of a skid-mounted preheater, catalyst chamber, and blower. In the event of a power loss to the facility, the ozone destruct system will run off the on-site generator. The destruct units will be provided with an atmospheric air intake to keep the blower within its operating range when ozone off-gas process flow is at its minimum. Design criteria for the ozone destruct system are summarized in **Table 5-16**.

Table 5-16. Off-Gas Destruct System Design Criteria		
Parameter	**Units**	**Value**
Manufacturer	--	Xylem/Wedeco
Number of Units (duty + standby)	--	1 + 1
Type	--	Thermal catalytic with 1 preheater and 1 blower per skid
Blower Spark Resistance Type	--	AMCA Type B
Blower Capacity, each	scfm	43
Static Pressure	in of water column (in WC)	24

5.3.3.8 Ozone Contact Tank

Following the pipeline flash reactors, ozonated source water will be routed into the Ozone Contact Tank. The Ozone Contact Tank provides sufficient contact time for ozone to react with constituents in the source water and allows for ozone off-gas to be collected in the headspace of the tank and routed to the off-gas destruct system. Following the Ozone Contact Tank, the ozonated source water will be routed over a weir and into the MF Feed Tank. The headspace of the Ozone Contact Tank and MF Feed Tank are separated by a separation wall that extends below the elevation of the Ozone Contact Tank effluent weir.

In addition to the off-gas destruct system connection to the top of the Ozone Contact Tank, the tank will be provided with a pressure vacuum relief valve to protect against pressurizing the contact tank in the event of a destruct system failure. Exhaust from the pressure vacuum relief valve will be routed to the south edge of the MF Feed Tank, away from the site boundary. An additional 2-inch port will be provided on the top of the Ozone Contact Tank for the ability to install foam control equipment if deemed necessary during start-up and operation.

Design criteria for the Ozone Contact Tank are summarized in **Table 5-17**.

Table 5-17. Ozone Contact Tank Design Criteria

Parameter	Units	Value
Operating Volume	gal	7,915
Number of Tanks	--	1
Material	--	Concrete with 3" concrete cover over rebar
Residence Time	min	4.8
Tank Interior Width	ft	3
Tank Interior Length	ft	17
Tank Sidewater Depth	ft	20.75
Total Tank Side Wall Height	ft	23.5

The design of the Ozone Contact Tank was informed in part by Monterey One Water's (M1W's) Pure Water Monterey (PWM) ozone contactor design. Piloting of the ozone system was not conducted for the PWS project. However, the wastewater treatment processes and AWPF influent water quality for PWS are similar to PWM, and so a conservative design approach was taken based on the PWM design. The hydraulic residence time of 4.8 minutes for the PWS project is longer than the PWM design of 3.9 minutes, allowing for a longer dissolved residual decay time. Additionally, the O_3:TOC ratio of 0.5 for the PWS project, which is less than the O_3:TOC ratio used at PWM, is not expected to generate a significant dissolved ozone residual. Since PWM typically does not detect an ozone residual after approximately 1 minute of hydraulic residence time due to the high ozone demand and decay exerted by the secondary effluent, it is anticipated that dissolved ozone residual will not be present at the effluent of the Ozone Contact Tank for PWS. In addition to the conservative residence time provided by PWS's Ozone Contact Tank, the ozone dose control described in **Section 5.3.3.1** will control the ozone dose to maintain the target O_3:TOC ratio while minimizing the risk of over-dosing such that a residual is detected at the effluent of the Ozone Contact Tank. The ozone residual will be monitored at the Ozone Contactor Tank inlet (immediately after ozone dissolution) as part of the dose control system, and an oxidation-reduction potential (ORP) analyzer located at the Ozone Contact Tank outlet will verify that no ozone remains as the water passes into the MF Feed Tank. In the unlikely event that dissolved ozone residual is present in the Ozone Contact Tank effluent, the ozone dose will be reduced and/or the ozone system will be shut down.

5.3.4 Membrane Filtration

The MF system will process water that was treated by the ozone system to condition it further for downstream treatment by the RO system. MF is proficient at removing particulate matter from the RO feed water that will otherwise foul the RO membranes. Additionally, MF serves as a key pathogen (e.g., protozoa) barrier for regulatory compliance (see **Section 9**). The MF system includes the following components:

- MF feed tank and pumps
- Automatic strainers
- MF units
- Backwash system
- Compressed air system
- Clean-in-place (CIP) system

The design criteria values and information stated in the following subsections are based on submittals from Wigen, the selected MF vendor.

5.3.4.1 Membrane Filtration Water Quality Basis of Design

Relevant influent water quality for the MF system is summarized in **Table 5-18**.

Table 5-18. MF Influent Water Quality

Parameter	Units	Value
pH	--	6.8 to 7.5
Temperature	◦C	17 to 20
TOC	mg/L	20
TSS	mg/L	11
Turbidity	NTU	5
Total Chlorine	mg/L	2.5
Iron	mg/L	0.54[a]
Manganese	mg/L	0.23[a]

a. No removal of iron and manganese by ozone was used as a conservative assumption for design of downstream systems. However, it is likely that the iron and manganese will be oxidized by ozone and will be well removed by MF; therefore, the design is conservative.

Through the MF unit process, the influent MF water quality will be improved to MF effluent water quality goals provided in **Table 5-19**.

Table 5-19. MF System Filtrate Water Quality Goals

Parameter	Units	Value
Silt Density Index	Silt Density Index Units (0.45-micron filter for 15 minutes at 30 psig)	≤ 3 (98% of time) ≤ 4.0 (100% of time)
Turbidity (95 % of time)	NTU	≤ 0.2
Turbidity (Maximum)	NTU	≤ 0.5
Pathogen Removal (see **Section 9**)	Log_{10} reduction of virus/*Giardia*/*Cryptosporidium*	0/4/4

5.3.4.2 Membrane Filtration Feed Tank and Pumps

The MF Feed Tank provides ozonated Source Water storage prior to the MF System and in-line equalization volume for the AWPF. The MF Feed Tank is fed by the Ozone Contact Tank effluent weir during normal operation. Overflows from the MF Feed Tank are discharged to the ROC Wetwell. Specific MF Feed Tank specifications are listed below in **Table 5-20**.

Table 5-20. MF Feed Tank Design Criteria

Parameter	Units	Value
Total Storage Volume	gal	45,375
Operating Volume	gal	36,525
Number of Tanks	--	1
Tank Type	--	Concrete
Tank Width	ft	12.33
Tank Length	ft	24
Tank Side Water Depth	ft	20.5
Total Tank Side Wall Height	ft	23.5

The MF feed pumps transfer water from the MF Feed Tank to the MF strainers and MF units. The MF feed pump station will also be utilized to drive the ROC pipeline pig from the pig launch station and for the initial section of the pipeline. Specific MF feed pump specifications are listed below in **Table 5-21**.

Table 5-21. MF Feed Pumps Design Criteria

Parameter	Units	Value
Design Capacity, each pump	gpm	925
Number of Pumps (duty + standby)	--	2+1
Pump Type	--	Horizontal End-Suction Centrifugal
Drive Type	--	Variable Speed
Total Dynamic Head Range	ft	77 – 118

5.3.4.3 Membrane Filtration Automatic Strainers

The automatic strainers are located downstream of the MF feed pumps and before the MF units to remove particles that could foul or damage the MF membranes. Automatic strainers periodically backwash on either differential head across the strainer or time, and the strainer waste will be sent to the ROC wet well. During the backwash of a strainer, it will continue to pass flow to the MF System. The design criteria for the MF strainers are shown in **Table 5-22**.

Table 5-22. MF Automatic Strainers Design Criteria		
Parameter	**Units**	**Value**
Design Capacity, each	gpm	1,850
Manufacturer/Model	--	Amiad, 12" EBS-10000
Number of Strainers (duty + standby)	--	1+1
Strainer Type	--	Automatic, Self-Cleaning Backwash
Maximum Backwash Flow Rate	gpm	220
Maximum Backwash Frequency	min	15
Maximum Backwash Duration	sec	151
Screen Size	microns	200
Minimum Strainer Recovery	%	98

5.3.4.4 Membrane Filtration Racks

The MF system has multiple units, or racks, operating in parallel. Individual MF racks are connected via a manifold from common headers. Each MF rack incorporates the following components mounted on a pre-assembled frame:

- Pressurized hollow fiber MF membrane modules mounted vertically
- Process flow piping and valves
- Instruments and analyzers
- Electrical and pneumatic panels

There will be a total of three MF racks installed. The design criteria for membrane flux are instantaneous design flux based on the design feed flow with N (3) racks in operation and a maximum instantaneous flux based on the design feed flow with N-1 (2) racks in operation. This reflects the operating philosophy of operating the MF system with all available racks online at a constant feed flow set point, trimmed based on the RO feed tank water level. The N-1 operating condition allows for one MF rack to go offline for a backwash, cleaning, or PDT while maintaining full production capacity with online units.

The units are all equipped with cleaning and enhanced maintenance wash capabilities, process and control air, drains, scrub air connections, and backwash headers to achieve the desired rate of production. The design criteria for the MF system are shown in **Table 5-23**.

Table 5-23. MF Racks Design Criteria		
Parameter	**Units**	**Value**
MF System Supplier	--	Wigen
Number of Racks (duty + standby)	--	2 + 1
Membrane Type	--	Pressurized, hollow fiber
Membrane Filtration Direction		Outside-to-inside
Membrane Material		Polyvinylidene fluoride (PVDF)
Membrane Manufacturer/Model	--	DuPont SFD-2880 XP (equivalent to Dow SFX-2880)
Average Active Membrane Area, per module (range provided encompasses all expected vendor designs)	sf	829
Pore Size	micron	0.03
Total Number of Modules	--	210
Spare Capacity	--	11. (8 spare spaces)
Number of Modules per Train	--	70
Net Daily Production Capacity, per duty train	mgd	0.7 (N) - 1.05 (N-1)
Net System Daily Production Capacity, total	mgd	2.1
Design Flux Rate	gallons per square foot per day (gfd)	14 (N) – 22.5 (N-1)
Maximum Flux Rate per Alt. Technology Acceptance Letter [a]	gfd	60
Design Maximum Transmembrane Pressure (TMP)	psi	6.11
Maximum TMP per Alt. Technology Acceptance Letter [b]	psi	30
Minimum Recovery Rate	%	93

*a. The maximum flux rate corrected to 20 ˚C as specified in the California Department of Public Health (CDPH) conditional acceptance letter dated December 3, 2009 and included as **Appendix D**.*

*b. The maximum TMP as specified in the CDPH conditional acceptance letter dated July 17, 2008 and included as **Appendix D**.*

According to California regulatory requirements and the federal Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), pathogen removal for MF systems is based on product-specific performance challenge tests conducted by the membrane manufacturer. Prior to the merger of Dow's membrane business with DuPont in 2017, the membrane model DOW SFX-2880 was approved by the California Department of Public Health (see **Appendix D**, December 2009 letter). Based on documentation provided by DuPont, the SFD-2880 XP provides equivalent performance to the Dow SFX-2880 (see **Appendix D**, May 2022 letter).

5.3.4.5 Membrane Filtration Backwash System

The MF backwash system removes suspended solids that have accumulated on the surface of the membranes during a duty cycle. MF backwashes will be initiated automatically if a train exceeds its runtime, transmembrane pressure (TMP), or filtrate volume produced setpoint. The system is configured such that only one train can be backwashed at a time. The first step in the backwashing process is air scour, which blows air bubbles to dislodge particles attached to the membrane fibers. The second step consists of a high-rate backwash with the MF filtrate from the RO feed tank to further remove particles. Backwash waste will be sent to the ROC wet well for discharge. Design criteria for the backwash system are shown in **Table 5-24** and design criteria for the air scour blowers are shown in **Table 5-25.**

Table 5-24. MF Backwash System Design Criteria		
Parameter	**Units**	**Value**
Number of Pumps (duty + standby)	--	1+1
Pump Type	--	End Suction Centrifugal
Capacity, each	gpm	1,900
Head	ft	95
Drive Type	--	Variable Speed
Backwash Flux Rate	gfd	50
Target Backwash Flow	gpm	2015
Air Scour/Backwash Cycle:		
Time between backwashing cycles per skid	min	55
Total valve cycle time lost per skid	sec	5
Air scour time per skid	sec	30
Drain down time per skid	sec	60
Backwashing time per skid	sec	60
Filling/forward flush time per skid	sec	60
Time off line for backwash sequence per skid	sec	185

Table 5-25. MF Air Scour Design Criteria		
Parameter	**Units**	**Value**
Number of Blowers (duty + standby)	--	1+1
Manufacturer/Model	--	Atlas Copco, ZL2VSD 22K
Max Capacity, each	cubic feet per minute (cfm)	523 at 10 psig
Air Scour Flow Rate	cfm	495 at 10 psi (per train)

5.3.4.6 Membrane Filtration Compressed Air System

Compressed air is used in the MF system as process air for the PDT and as control and valve operating air throughout the system. PDTs will be conducted on a daily basis to quantify the LRV for each train. The pressure decay rate and other parameters are used to calculate the LRV per the methodology of the Membrane Filtration Guidance Manual (USEPA, 2005). The primary components of the compressed air system are shown in **Table 5-26**.

Table 5-26. Compressed Air System Design Criteria		
Parameter	**Units**	**Value**
Number of Air Compressors (duty + standby)	--	1 + 1
Type of Air Compressor	--	Reciprocating
Capacity of Air Compressor, each (at 150 PSIG)	scfm	49.3
Design Pressure of Air Compressor	psig	116
Number of Air Receivers (duty + standby)	--	1 + 0
Volume of Air Receiver, each (at 150 PSIG)	gal	620
Design Pressure of Air Receiver	psi	150 American Society of Mechanical Engineers Code design

5.3.4.7 Membrane Filtration Clean-in-Place System

The purpose of the CIP and maintenance wash (MW) system is to clean the membranes when they become fouled with constituents that are not removed by the routine backwash/air scour sequences. The selected MF equipment is equipped to perform enhanced flux maintenance cleans. The system design and chemical storage sizing assumes that high pH sodium hypochlorite maintenance cleans will be performed every other day on each skid and assumes that low pH maintenance cleans will be performed weekly per skid. MW cleans are short duration, typically are conducted every one to three days, and may be initiated automatically based on TMP or manually by operators. CIPs are longer duration, may involve multiple cleaning solutions, and may be initiated manually by the operator based on observation of overall unit performance decline. Chemical makeup water for the MW and CIP system is fed by RO permeate. The MW and CIP system includes two tanks for chemical addition/cleaning (to separate acids and bases) and one tank common with the RO system for neutralization of waste. Neutralized MW and CIP wastes will be routed to the Sanitary Lift Station for discharge. The design criteria for the MW and CIP system are summarized in **Table 5-27**.

Table 5-27. MF CIP System Design Criteria		
Parameter	**Units**	**Value**
CIP Tanks		
Number of MF CIP Tanks	--	2 (1 Acid, 1 Caustic)
Tank Material	--	High density poly ethylene (HDPE)
Capacity per Tank	gal	2500
Number of CIP Heaters	--	2 (1 per tank)
CIP Pump		
Number of CIP Pumps (duty + standby)	--	1+0
Capacity, each	gpm	490
Pump Type	--	Centrifugal
Pump Drive Type	--	Variable Speed
Total Dynamic Head	ft	86
Maintenance Wash and CIP Frequency		
Maintenance Wash Interval, per skid	hours	48
Maintenance Washes Per Month, per skid	--	15
CIP Frequency, per skid	month	1
MF and RO Neutralization Tank		
Number of Tanks	--	1
Volume per Tank	gal	10,400
Usable Capacity per Tank	gal	7,800
Tank Material	--	HDPE
Tank Diameter	ft	12
Tank Side Water Depth	ft	13
Total Tank Side Wall Height	ft	15
MF Neutralization Recirculation and Discharge Pump		
Number of Pumps (duty + standby)	--	1+0
Capacity, each	gpm	300
Total Dynamic Head	ft	46.2
Pump Type	--	Centrifugal
Pump Drive Type	--	Constant Speed

5.3.5 Reverse Osmosis

RO follows MF and is used to remove dissolved constituents including dissolved salts, pathogens, organic carbon, and trace organic compounds such as CECs. Additionally, RO serves as a key pathogen barrier for regulatory compliance (see **Section 9**). The RO system includes the following components or subsystems:

- RO feed tank
- Low-pressure RO transfer pumps
- Pretreatment
- High-pressure RO feed pumps
- RO system
- RO CIP system
- Neutralization system (shared with MF)

The design criteria values and information stated in the following sub-sections are representative of the system components that will be provided by Wigen Water Technologies.

5.3.5.1 Reverse Osmosis Water Quality Basis of Design

Table 5-28 shows the defined maximum constituent RO influent water quality. **Table 5-29** shows the permeate water quality goals for the RO system.

Table 5-28. Assumed RO Influent Water Quality

Parameter	Units	Design Value
Aluminum	mg/L	0.060
Barium	mg/L	0.035
Strontium	mg/L	0.50
Sodium	mg/L	230
Potassium	mg/L	29
Alkalinity	mg/L as $CacCO_3$	300
Phosphate	mg/L as PO_4	10
Sulfate	mg/L	117
Fluoride	mg/L	6
Chloride	mg/L	354
Silica	mg/L	44
Nitrate	mg/L as N	8.75
Nitrite	mg/L as N	0.05
Calcium	mg/L	76
Iron	mg/L	0.13
Magnesium	mg/L	28
Manganese	mg/L	0.16
Chloramines	mg/L as Cl_2	2.5
TOC	mg/L	20
Ammonia	mg/L as N	41.2

Table 5-29. RO System Permeate Water Quality Goals			
Parameter	**Units**	**Value**	**Notes/Reference**
TOC	mg/L	≤ 0.5 ≤ 0.25 (first 20 weeks)	CCR Title 22, 60320.201; For first 20 weeks of operation, TOC concentration must be less than 0.25 mg/L. After 20 weeks of operation, TOC concentration must be less than 0.5 mg/L
TDS Reduction	%	95	--
EC Reduction	%	90	--
Pathogen Removal (see **Section 9** for details)	Log_{10}-reduction of virus/*Giardia*/*Cryptosporidium*	1.5/1.5/1.5	1.5-log reduction expected through TOC monitoring; 1.0-log reduction expected through EC monitoring

5.3.5.2 Reverse Osmosis Feed Tank

The RO feed tank receives MF filtrate and provides flow equalization and storage prior to the low-pressure RO transfer pumps to deliver a continuous, stable flow to the RO trains. Additionally, the RO feed tank serves as the backwash supply for the MF system and provides cooling water to the ozone generators. An overflow line will be included from the RO feed tank that will discharge to the ROC wet well. Specific RO feed tank specifications are listed below in **Table 5-30**.

Table 5-30. RO Feed Tank Design Criteria		
Parameter	**Units**	**Value**
Total Storage Volume	gal	57,000
Usable Working Volume	gal	45,000
Number of Tanks	--	1
Tank Diameter	ft	22
Tank Side Water Depth	ft	20
Total Tank Side Wall Height	ft	22.5
Tank Type	--	Bolted Steel
Hydraulic Residence Time	min	39

5.3.5.3 Low-Pressure Reverse Osmosis Transfer Pumps

The low-pressure RO transfer pumps convey water from the RO feed tank to the RO cartridge filters and RO trains. The design criteria for the low-pressure RO transfer pumps are shown in **Table 5-31**.

Table 5-31. Low Pressure RO Transfer Pumps Design Criteria		
Parameter	**Units**	**Value**
Design Capacity, each pump	gpm	730
Number of Pumps (duty + standby)	--	2+1
Pump Type	--	Horizontal End-Suction Centrifugal
Drive Type	--	Variable Speed
Total Dynamic Head Range		35 – 99

5.3.5.4 Reverse Osmosis Pretreatment

After the low-pressure RO transfer pumps, the RO feed is pretreated with chemicals and cartridge filtration. Chemicals are used to reduce scaling of the RO membranes. RO membranes are susceptible to fouling by scalants such as iron, calcium phosphate, aluminum, manganese, and silica. Some of these scalants are pH-dependent and can be minimized with pre-RO pH adjustment and/or antiscalant addition to RO feed water. The design criteria and chemical dosing for the scaling control is discussed in **Section 5.3.8**, Chemical Storage and Delivery Systems.

After chemical pretreatment, the low-pressure RO feed pumps push the RO feed through cartridge filters, which remove particles that could potentially damage the RO membrane. The design criteria for the cartridge filters are shown in **Table 5-32**.

Table 5-32. Cartridge Filter System Design Criteria

Parameter	Units	Value
Manufacturer	--	Fil-Trek l6MPH103-4-8F-150
Number of Cartridge Filter Vessels (duty + standby)	--	1+1
Quantity of Filters	--	103
Design Flow Rate per Vessel	gpm	730 (N) – 1,460 (N-1)
Design Loading Rate	gpm/10-inch	2.1 (N) – 4.2 (N-1)
Vessel Orientation	--	Horizontal
Pressure Rating	psi	150
Cartridge Filter Element Dimensions	--	2.5” diameter x 40” length
Cartridge Filter Element Rating	µm	5
Maximum Differential Pressure	psi	15

5.3.5.5 High-Pressure Reverse Osmosis Feed Pumps

After pretreatment, the RO feed water is conveyed to the high-pressure RO feed pumps that pass the RO feed through the RO train. Each high-pressure RO feed pump is dedicated to a single RO train. The design criteria for the high-pressure RO feed pumps are shown in **Table 5-33**.

Table 5-33. High Pressure RO Feed Pumps Design Criteria

Parameter	Units	Value
Design Capacity, each pump	gpm	580 – 725
Number of Feed Pumps	--	2 (1 duty per RO unit)
Pump Type	--	Horizontal End-Suction Centrifugal
Drive Type	--	Variable Speed
Total Dynamic Head	ft	385

5.3.5.6 Reverse Osmosis Trains

The RO system has multiple units, or trains, operating in parallel. Individual RO trains are connected via a manifold from common headers. Each RO train incorporates the following components mounted on a pre-assembled frame:

- Pressure vessels with RO modules mounted horizontally
- Process flow piping and valves
- Inter-stage booster pumps
- Instruments and analyzers
- Electrical and pneumatic panels

The RO trains are connected to common feed, permeate, concentrate, flush feed, flush waste, and cleaning system headers. The RO trains will receive the pretreated RO feed and will pass through two stages with a pressure boost before the second stage. RO permeate is then routed to the UV-AOP System for disinfection/advanced oxidation and ROC is discharged to the ROC wet well. ROC and other select waste streams are routed from the ROC wet well to an existing ocean outfall junction box by gravity through the ROC return line. The design criteria for the RO system are shown in **Table 5-34** and are representative of conditions at which the surrogate LRVs (EC and TOC) will be achieved, corresponding to the pathogen LRV credits described in **Section 9**.

Table 5-34. RO System Design Criteria

Parameter	Units	Value
RO System		
RO System Integrator	--	Wigen
Design Feed Temperature	°C	17 to 20
Number of RO Trains (duty + standby)	--	2+0
Design Feed Water Flow Rate, per train	gpm	725
Design Permeate Flow Rate, per train	gpm	580
Number of Stages per Train	--	2
Minimum Number of Pressure Vessels per Train (Stage 1: Stage 2)	--	17:8
Number of Elements per Pressure Vessel	--	7
Number of Elements per Train	--	175
Minimum RO System Recovery	%	75
Transmembrane Pressure (Delta-P)	psi	Typical Stage 1: 15 Typical Stage 2: 10 Max before CIP: 25 per stage
Flux		
System Flux	gfd	12[a]
RO Membrane Elements		
Manufacturer	--	Dupont, BW30XFRLE-400/34i with Protec housing
Membrane Diameter	in	8
Membrane Length	in	40
Membrane Area	ft^2	400

Table 5-34. RO System Design Criteria		
Parameter	**Units**	**Value**
Interstage Booster Pumps		
Design Capacity, each pump	gpm	330 gpm
Number of Pumps	--	2 (1 duty per train)
Pump Type	--	Vertical Multistage
Drive Type	--	Variable Speed
Total Dynamic Head	ft	108

a. Corresponds with the design feed flow rate of 725 gpm/train

5.3.5.7 Reverse Osmosis Clean-in-Place System

RO membranes will be cleaned with a CIP system that is used to make up and recirculate either high pH or low pH cleaning solution when the RO elements are fouled. Chemical makeup water for the CIP system is supplied from diverted RO permeate. The cleaning solution will enter the RO train via a common flush/CIP fill header and return the CIP tanks via a common flush/CIP return header. The RO trains will be cleaned individually. The RO CIP waste will divert to a neutralization tank common with the MF system where the neutralized waste will be diverted to the Sanitary Lift Station. Design criteria for the RO CIP storage tank are shown in **Table 5-35**.

Table 5-35. RO CIP System Design Criteria		
Description	**Units**	**Value**
CIP Tanks		
Number of Tanks	--	1
Total Storage Volume	gal	5,200
Usable Volume, minimum	gal	3,400
Tank Material	--	HDPE
Tank Diameter	ft	10
Tank Side Water Depth	ft	9
Total Tank Side Wall Height	ft	11
Heater	--	1
CIP Recirculation Pump		
Design Capacity	gpm	850
Number of Pumps (duty + standby)	--	1+0
Pump Type	--	Horizontal Centrifugal
Drive Type	--	Variable Speed
Total Dynamic Head	ft	139
CIP Chemical Doses		
Citric Acid (50% solution)	mg/L	20,000
Sulfuric Acid (93% solution)	mg/L	1,471
Sodium Hydroxide (25% solution)	mg/L	12,500

Degradation of membrane integrity is expected over time due to continuous use of chloramines for control of biofouling and due to periodic CIPs. Because of this normal and expected degradation, LRVs achieved by the RO System will decrease with membrane age. The continuously monitored surrogate parameters (EC and TOC) and tiered LRV approach described in **Section 9.1.2** ensure that the RO System complies with the minimum LRV requirement and accounts for this degradation. In addition, continuous use of chloramines and CIP procedures/frequency will be optimized to maintain performance and membrane longevity. Details regarding the operation and maintenance of the CIP process (including the CIP heater and temperature control) will be provided in the OOP.

5.3.5.8 Reverse Osmosis Flush System

The flush system for the RO system will be used to flush the RO skids with permeate in the case of a shutdown or when they are taken off-line so the membranes do not scale with stagnant ROC. Flush water will be stored in the RO flush tank and will enter the RO trains via a common flush/CIP fill header and return to the sewer via a common flush/CIP return header. A generator will supply power to the RO flush pumps to ensure that the RO membranes are flushed in the event of loss of power to the plant. Design criteria for the RO flush system are shown in **Table 5-36**.

Table 5-36. RO Flush System Design Criteria

Description	Units	Value
Flush Tanks		
Total Storage Volume	gal	5,000
Number of Tanks	--	1
Tank Type	--	Flat Bottom
Tank Material	--	HDPE
Tank diameter	ft	8.5
Tank Side Water Depth	ft	To be provided in OOP
Total Tank Side Wall Height	ft	12.9
Flush Pumps		
Design Capacity, each pump	gpm	510
Number of Pumps (duty + standby)	--	1+1
Pump Type	--	Horizontal Centrifugal
Drive Type	--	Variable Speed
Total Dynamic Head	ft	139
RO Flush Pumps Emergency Engine-Generator		
Engine-Generator Rated Power	kW	To be provided in OOP

5.3.6 Advanced Oxidation Process

UV-AOP is the final treatment step to provide a pathogen and chemical barrier at the AWPF. UV-AOP follows RO and is used to remove trace organic compounds including NDMA (via photolysis) and 1,4-dioxane (via AOP). Additionally, UV-AOP serves as a key pathogen barrier for regulatory compliance (see **Section 9**). The UV-AOP system includes the following components or subsystems:

- Oxidant delivery system
- UV reactors

The design criteria values and information stated in the following sub-sections are representative of the system that Trojan will provide for this project (described below).

5.3.6.1 AOP Water Quality Basis of Design

Table 5-37 summarizes the design water quality parameters for the UV-AOP influent.

Table 5-37. UV-AOP Feed Water Quality

Parameter	Units	Value
UVT at 254 nm, design minimum	%	95
UVT at 254 nm, operating range	%	95 to ~100
pH		5.0 to 6.0
Total Chlorine	mg/L	<4.0
Free Ammonia	mg/L as N	<4.56
Nitrite	mg/L as N	<0.05
Nitrate	mg/L as N	<3.6
Turbidity	NTU	<0.01
Alkalinity	mg/L as $CaCO_3$	<23.3
TOC	mg/L	<0.5
1,4-Dioxane	µg/L	<3.2
NDMA	ng/L	<1,000
Hardness	mg/L as $CaCO_3$	< 6.81
Calcium	mg/L	<2.43
Iron	mg/L	<0.01
Manganese	mg/L	<0.01
Magnesium	mg/L	<0.55
Temperature	°C	17 to 20

The UV-AOP system is designed to achieve target removal of 1,4-dioxane and NDMA based on DDW requirements for subsurface injection groundwater recharge. The UV-AOP system is also a significant treatment barrier to pathogens. 1,4-Dioxane is removed by advanced oxidation, while NDMA is predominantly removed by direct photolysis. Therefore, the hydrogen peroxide dosed at the inlet to the UV reactors will be selected to target 1,4-dioxane removal, while the UV dose will be selected to target pathogens, 1,4-dioxane, and NDMA removal, as summarized in **Table 5-38**.

Table 5-38. UV-AOP Water Quality Goals		
Parameter	**Units**	**Value**
1,4-Dioxane Log Removal	log_{10}	≥ 0.6
NDMA Log Removal	log_{10}	≥ 2.0
1,4-Dioxane	µg/L	< 1.0
NDMA	ng/L	< 10
Pathogen Reduction (see **Section 9**)	Log_{10}-reduction of virus/*Giardia*/*Cryptosporidium*	6/6/6

5.3.6.2 AOP Oxidant Delivery System

The UV-AOP system requires an oxidant such as hydrogen peroxide or free chlorine, so a high dose of UV light can photolyze the oxidant to generate hydroxyl radicals. Hydrogen peroxide will be used as the oxidant to generate the hydroxyl radicals. Hydrogen peroxide addition will be dosed upstream of the UV reactors via an injection quill followed by a static mixer in the common header from the RO permeate to achieve a target oxidant dose. The hydrogen peroxide storage and metering pumps are described in detail in **Section 5.3.8.7**. **Table 5-39** summarizes the design criteria for the AOP oxidant delivery system for the PWS Project.

Table 5-39. Oxidant Feed System Design Criteria		
Parameter	**Units**	**Value**
Oxidant	-	Hydrogen peroxide
Oxidant Dose, Average	mg/L	5.5
Oxidant Dose, Minimum	mg/L	1
Oxidant Dose, Maximum	mg/L	10
Trade Percent Strength of Chemical Solution	%	50
Type of Mixing	-	Static Mixer

The control and monitoring of the hydrogen peroxide dose will be achieved with regular pump calibration and periodic checks of the hydrogen peroxide concentration in the chemical storage tank. There will also be redundant hydrogen peroxide dosing pumps installed (see **Appendix C** drawing 287-X-7002). Additional information about pump calibration and maintenance will be provided in the OOP.

5.3.6.3 UV-AOP Reactors

The UV-AOP system has a single reactor with multiple banks, or rows of lamps that are perpendicular to the flow, operating in series. The UV reactor incorporates the following components:

- Reactor vessel with lamps, sleeves, and UV intensity sensors
- Ballast and power distribution enclosures
- Local control panel
- Instruments and supporting field devices

An influent flow meter will be used to monitor the flow from the RO system through the UV reactor. Influent UVT, lamp output and flowrate will be monitored to verify adequate UV dose delivery. The UV power and number of operating banks will be adjusted automatically based on changes in influent flow and UVT to provide the required dose. Two UVT analyzers (AIT-240001 and AIT-240002) at the influent to the

UV reactor will be installed to provide redundancy, and a shelf spare will also be provided. One dual UV intensity sensor will be installed per bank (for a total of four), and a shelf spare UV intensity sensor will also be provided. There is also a reference sensor that is periodically used to check the accuracy of the duty sensor. Operational setpoints for UV and hydrogen peroxide dose will be determined during challenge testing of the UV-AOP system per DDW requirements. The design criteria for the UV reactors are summarized in **Table 5-40**.

Table 5-40. UV Light System Design Criteria

Parameter	Units	Value
Design Capacity per UV Reactor	gpm	1,162
Maximum Treatment Flow, total	gpm	1,162
Number of Reactors (duty + standby)	--	1+0
Operating Configuration		>1 + 0.33 lamp banks
Number of Lamps per Reactor	--	128 (8 x 16-lamp sections)
Lamp Type	--	Low-pressure high-output
UV Unit Manufacturer	--	Trojan
UV Unit Model	--	UVFlex100 Closed Vessel
Power Supply per Reactor	kW	71.3
Power Demand for Duty Reactor at Design	kW	54.5
Lamp Power, each	W	500
Lamp Orientation	-	Horizontal
Lamp Aging Factor		
Supported by Report	--	0.88
Sleeve Fouling Factor	--	0.9
UV Dose	mJ/cm^2	2,702
Number of UV Intensity Sensors, per UV reactor	--	4 (1 sensor per lamp section)
Number of UVT Analyzers, per UV reactor	--	1 + 1
Design UVT at 254 nm, Minimum	%	95
Operating UVT Range at 254 nm	%	95-100

mJ/cm2 = millijoule(s) per square centimeter

The UV dose shown in Table 5-40 is subject to UV-AOP challenge testing to verify the system's ability to remove 1,4-dioxane and NDMA. The UV-AOP Challenge Test Protocol will be submitted to DDW for review and approval prior to conducting the test. The operating limits established by the challenge testing and the alarm setpoints will be described in the OOP.

End of lamp life will be monitored for timely replacement of lamps. Lamp operating hours will be tracked and are guaranteed for 15,000 hours (with associated 0.88 lamp aging factor). The lamps may be operated for longer (at reduced efficiency and increased potential for lamp failure). Average lamp hours for each section will be monitored and communicated to Supervisory Control and Data Acquisition (SCADA), and individual lamp hours will be assessed locally on the UV OIT. The UV System will also monitor and report a combined lamp aging and fouling (CAF) factor for each section of lamps (monitored by a single sensor). With minimal fouling expected in the RO permeate, this value should be a reliable indicator of the reduction of lamp output due to lamp aging. This approach will be confirmed by recording the CAF both prior to and after cleaning the lamps and sensor sleeves to assess the fouling that has occurred. In addition to lamp age

monitoring, the calculated UV dose is partially based on UV intensity (lamp output), which will account for lamp degradation and ensure the required dose for compliance.

5.3.7 Post Treatment Stabilization

Post treatment stabilization will condition the UV-AOP effluent to meet product water quality goals and decrease corrosivity prior to transport and injection at the SWIP recharge wells. Additionally, sodium hypochlorite will be added to the purified water to react with residual free ammonia and boost concentrations of chloramines to act as a residual disinfectant in the purified water pipeline. Post-treatment stabilization consists of the following elements:

- Decarbonator
- Calcium chloride addition system
- Sodium hydroxide addition system
- Sodium hypochlorite addition system

The primary goals of post treatment stabilization are to raise the pH and add hardness and alkalinity to stabilize the water. First, decarbonation removes carbon dioxide and raises the pH. The decarbonation effluent is mixed with the decarbonation tower bypass in the purified water storage tank. Downstream of storage, calcium chloride is dosed to raise calcium hardness. Sodium hydroxide is dosed to raise the pH and increase alkalinity, and sodium hypochlorite can be dosed to form chloramines to reduce biogrowth in the wells as needed.

This post treatment stabilization approach is also expected to protect the groundwater aquifer and mitigate aggravations that could cause geochemical contaminant releases. The addition of sodium hypochlorite will maintain an oxidized product water, and the pH adjustment approach will be controlled to limit potential mobilization of constituents such as arsenic that may occur naturally in the aquifer. Because the aquifer's oxidation state is mildly reducing, it is anticipated that the oxidized product water will both mobilize and subsequently bind arsenic present in the aquifer. By controlling the pH, the arsenic should remain bound in the aquifer. However, groundwater monitoring will include arsenic to confirm performance of the post treatment process. The OOP will provide more specific details of the stabilization strategy. At minimum, the details will include the parameters monitored and the approach for interpretation of the results for determining the stabilization treatment's performance. This performance evaluation will be used to assess needs for treatment change or modification including chemical and/or dose used for maintaining effective post treatment stabilization.

5.3.7.1 Post Treatment Stabilization Design Criteria

The post treatment stabilization influent water quality is summarized in **Table 5-41**. The post treatment stabilization design criteria are provided in **Table 5-42**.

Table 5-41. Post Treatment Stabilization Influent Water Quality

Parameter	Units	Value
pH	–	6
Temperature	°C	-17 - 20
Alkalinity	mg/L as $CaCO_3$	1.8 – 23.3
Calcium	mg/L	0.5 – 2.4
TDSs	mg/L	16 – 72
Total Chlorine Residual	mg/L Cl_2	0 – 2.5 mg/L

Table 5-42. Post Treatment Stabilization Water Quality Goals		
Parameter	**Units**	**Value**
pH	–	7.5 ≤ pH ≤8.5
Alkalinity	mg/L as $CaCO_3$	≥ 40
LSI	–	-1.0 ≤ LSI ≤ 0.5
TDSs	mg/L	≤ 200
Total Chlorine	mg/L	0.5-2.5[a]

a. Purified water design control range is 0.5 mg/L to 2.5 mg/L and will be refined during startup

5.3.7.2 Decarbonation Tower

Due to the acidification of RO feed water, RO permeate will contain excess carbon dioxide that would persist through the UV-AOP and cause excessive chemical doses for sodium hydroxide. Excess carbon dioxide will be removed using a decarbonation tower prior to the purified water tank and chemical dosing.

The decarbonation tower will be located on top of the purified water tank. The decarbonation tower feed will be piped to the top of the tower and distributed internally via an internal nozzle structure over packed media. Decarbonated water will then be routed into the purified water tank. A blower located next to the tower will direct ambient air into the bottom of the tower that will flow up through the packing media and strip carbon dioxide from the water before discharging to atmosphere through a vent with a moisture separator. The vent will be directed away from community spaces on the northern site boundary. A bypass around the decarbonation tower with a flowmeter and control valve will also discharge into the purified water tank. Partial to full flow bypass of the decarbonation tower is expected during normal operation during periods where RO permeate carbon dioxide concentrations are low and operations would like to preserve the carbon dioxide in the RO permeate for alkalinity contribution and pH stabilization during caustic addition. The bypass is sized to provide 0-100 percent bypass. Design criteria for the decarbonation tower are detailed in **Table 5-43**, and will be updated upon final selection of a vendor.

Table 5-43. Decarbonation Tower Design Criteria		
Parameter	**Units**	**Value**
Number of Decarbonation Towers (duty + standby)	--	1 + 0
Design Capacity, each	mgd	1.67
Design CO_2 Removal Efficiency	%	80
Minimum Air/Liquid Ration	cfm:gpm	4:1
Maximum Diameter	ft	8
Number of Blowers, per tower (duty + standby)	--	1 + 0
Minimum Blower Capacity, each	scfm	4,651
Decarbonator Inlet Diameter	in	10
Decarbonator Inlet Velocity at Design Flow	ft/s	<5
Distributor Type	--	DSS Recommendation
Minimum Distributor Turndown	--	4:1
Decarbonator Bypass Flow Control Valve	--	Electrically-operated butterfly valve

5.3.7.3 Sodium Hydroxide System

Sodium hydroxide (caustic soda, or caustic) will be added to the purified water to increase alkalinity, raise the pH, and increase the LSI. Sodium hydroxide will be dosed into the suction header of the PWPS, upstream of the PWPS pumps. Mixing energy from the PWPS pumps will be used to mix the sodium hydroxide into the purified water.

5.3.7.4 Calcium Chloride System

Calcium chloride will be added to the purified water to increase calcium hardness and the LSI. Calcium chloride will be dosed into the discharge header of the PWPS, downstream of the PWPS pumps and purified water sodium hypochlorite dosing location. The calcium chloride stream will be dosed directly into a wafer style static mixer.

5.3.7.5 Sodium Hypochlorite Addition System

Sodium hypochlorite (hypochlorite) will be added to the purified water to react with residual free ammonia and boost concentrations of chloramines to act as a residual disinfectant in the purified water pipeline. Hypochlorite will be dosed into the discharge header of the PWPS, downstream of the PWPS pumps but upstream of the calcium chloride dosing location. The hypochlorite stream will be dosed directly into a wafer style static mixer.

5.3.8 Chemical Storage and Delivery Systems

The PWS Project requires the addition of the following chemicals at the Chanticleer AWPF: sodium hypochlorite, sodium hydroxide, citric acid, sulfuric acid, anti-scalant, sodium bisulfite, hydrogen peroxide, and calcium chloride.

It is not a regulatory requirement for IPR projects to use NSF 60 chemicals. The chemicals that will be used for this project are not necessarily NSF 60 certified. Chemical suppliers have not been identified at this time. Chemical suppliers will be required to comply with detailed chemical specifications that will include shipping and receiving requirements to verify the quality of the chemical delivered.

For chemicals that are known to degrade over time, such as sodium hypochlorite and hydrogen peroxide, the concentration and quality of the chemical may be monitored if there are excessive storage times. Additional detail will be provided in the OOP.

Design criteria for the chemical storage and feed systems at the Chanticleer AWPF are summarized in **Table 5-44** to **Table 5-51**.

5.3.8.1 Sodium Hypochlorite

Table 5-44. Sodium Hypochlorite Storage and Feed System Design Criteria

Parameter	Units	Value
Chemical Information		
Concentration	% as NaOCl (% as Cl_2)	12.5 (10.64)
Specific Gravity	-	1.175
Freezing Point	°F	-3.00
Heat Tracing/Insulation Required	-	None

Table 5-44. Sodium Hypochlorite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Dosage as 100% Cl_2 at SW to AWPF		
Minimum	mg/L	2
Average	mg/L	5
Maximum	mg/L	10
Process Flow at MF Feed		
Minimum	mgd	0.95
Average	mgd	2.37
Maximum	mgd	2.37
Chemical Feed Flow as 12.5% Sodium Hypochlorite at SW to AWPF		
Minimum	gph	0.63
Average	gph	3.96
Maximum	gph	7.93
Chemical Dosage as 100% Cl_2 at Post Treatment Stabilization		
Minimum	mg/L	0.5
Average	mg/L	0.5
Maximum	mg/L	10
Process Flow at Post Treatment Stabilization		
Minimum	mgd	0.67
Average	mgd	1.67
Maximum	mgd	1.67
Chemical Feed Flow as 12.5% Sodium Hypochlorite at Post-Treatment Stabilization		
Minimum	gph	0.11
Average	gph	0.28
Maximum	gph	5.59
Chemical Feed Flow as 12.5% Sodium Hypochlorite at MF/UF CIP Chlorine/Base Tank Monthly CIP		
CIP Assumed Batch Volume[a]	gallons	3,400
CIP Dose[b]	mg/L as Cl_2	3,000
Average	gph as 12.5% NaOCl	81.5
Frequency (Estimated)	-	3 times monthly (Once per MF skid, per month)
Total Monthly Storage Volume (Estimated)	gallons	246
Chemical Feed Flow as 12.5% Sodium Hypochlorite at MF/UF CIP Chlorine/Base Tank Maintenance Wash		
MW Assumed Batch Volume[a]	gallons	3,400
MW Dose [b]	mg/L as Cl_2	500
Average	gph as 12.5% NaOCl	13.6
Frequency (Estimated)	-	45 times monthly (Every MF skid, every 48 hours)
Total Monthly Storage Volume (Estimated)	gallons	612

Table 5-44. Sodium Hypochlorite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Storage		
Tank Type	-	Vertical, Cylindrical
Tank Material	-	FRP
Tank Quantity and Volume (Usable)	-	1 at 5,700 gallons = 5,700 gallons
Tank Diameter	ft	9
Tank Straight Side Height	ft	13
Tank Total Height	ft	15
Days of Storage		
At Average Dose/Average Flow	days	43
At Maximum Dose/Maximum Flow	days	16
Full Truck Delivery Volume	gallons	4,592
Feed Equipment at Pure Water Pump Station		
Pump Type	-	Peristaltic Tube Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.63 to 7.93
Turndown Ratio	-	12.6:1 required per pump 100:1 pump acceptable range
Feed Equipment at Post Treatment Stabilization		
Pump Type	-	Diaphragm Metering Pump
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.11 to 5.59
Turndown Ratio	-	50:1 required per pump 50:1 pump acceptable range
Feed Equipment at MF CIP Make-up & MF MW Make-up Base Tank		
Pump Type	-	Peristaltic Tube Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	13.6 to 81.5
Turndown Ratio	-	6:1 required per pump 100:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual speed control with local override.
Double Contained Piping and Valves		
Pipe Material	-	CPVC, Hastelloy C
Carrier Yard Pipe Material	-	PVC
Internal Yard Pipe Material	-	PTFE
Valve Type	-	Diaphragm, Drilled Ball

a. For chemical storage sizing a worst-case scenario CIP and MW batch volume of 3,400 gallons was assumed. Batch volume sizing will be updated upon MF vendor selection.

b. For chemical storage sizing a worst-case CIP concentration of 3,000 mg/L and MW concentration of 500 mg/L as Cl_2 were assumed. Expected monthly sodium hypochlorite usage will be updated upon MF vendor selection.

5.3.8.2 Sodium Bisulfite

Table 5-45. Sodium Bisulfite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Information		
Concentration	%	25
Specific Gravity	-	1.19
Freezing Point	°F	15.00
Heat Tracing/Insulation Required	-	None
Chemical Dosage as 100% Sodium Bisulfite at ROC Return Flow		
Minimum	mg/L	3
Average	mg/L	10.5
Maximum	mg/L	15
Process Flow at ROC Return Flow		
Minimum	mgd	0.28
Average	mgd	0.70
Maximum	mgd	2.37
Chemical Feed Flow as 25% Sodium Bisulfite at ROC Return Flow		
Minimum	gph	0.10
Average	gph	1.03
Maximum	gph	4.95
Total Monthly Storage Volume for ROC Quench	gallons	741
Chemical Feed Flow as 25% Sodium Bisulfite at MF/UF Neutralization Tank CIP Neutralization		
Volume of Sodium Bisulfite to Neutralize CIP	gallons	60.5
Average	gph	60.5
Frequency (Estimated)	-	3 times monthly (Once per MF skid, per month)
Total Monthly Storage Volume (Estimated)	gallons	182
Chemical Feed Flow as 25% Sodium Bisulfite at MF/UF Neutralization Tank MW Neutralization		
Volume of Sodium Bisulfite to Neutralize MW	gallons	10.1
Average	gph	20.2
Frequency (Estimated)	-	45 times monthly (Every MF skid, every 48 hours)
Total Monthly Storage Volume (Estimated)	gallons	454
Chemical Feed Flow as 25% Sodium Bisulfite at Low Pressure RO Feed Pump Station		
Emergency Quench Dose	mg/L as 100% Sodium Bisulfite	19
Average During Emergency RO Quench	gph	5.58
Frequency (Estimated)	-	Emergency only
Total Monthly Storage Volume For Emergency Quenching	gallons	6

Table 5-45. Sodium Bisulfite Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Storage		
Tank Type	-	Vertical, Cylindrical
Tank Material	-	FRP
Tank Quantity and Volume (Usable)	-	1 at 1,700 gallons = 1,700 gallons
Tank Diameter	ft	7
Tank Straight Side Height	ft	7
Tank Total Height	ft	9
Days of Storage		
At Average Dose/Average Flow	days	32
At Maximum Dose/Maximum Flow	days	11
Full Truck Delivery Volume	gallons	4,534
Feed Equipment at ROC Return Flow		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.1 to 4.98
Turndown Ratio	-	50:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual stroke length control. Automatic and manual stroke speed control with local override.
Feed Equipment at MF/UF Neutralization Tank		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	20.2 to 60.5
Turndown Ratio	-	3:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control and manual stroke speed control.
Feed Equipment at Low Pressure RO Feed Pump Station		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	5.58
Turndown Ratio	-	50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control and manual stroke speed control.
Double Contained Piping and Valves		
Pipe Material	-	PVC
Carrier Yard Pipe Material	-	PVC
Internal Yard Pipe Material	-	PE
Valve Type	-	Ball

5.3.8.3 Citric Acid

Table 5-46. Citric Acid Storage and Feed System Design Criteria

Parameter	Units	Value
Chemical Information		
Concentration	%	50
Specific Gravity	-	1.24
Freezing Point	°F	32.00
Heat Tracing/Insulation Required	-	None
Chemical Feed Flow as 50% Citric Acid at MF/UF CIP Acid Tank for CIP		
MF CIP Assumed Batch Volume	gallons	3,400
MF CIP Average Dose	mg/L as 100% Citric Acid	20,000
Average	gph per batch	109.7
Frequency	-	3 times per month (Once per MF skid per month)
Total Monthly Storage Volume (Estimated)	gallons	330
Chemical Feed Flow as 50% Citric Acid at MF/UF CIP Acid Tank for MW		
MF MW Assumed Batch Volume	gallons	3,400
MF MW Average Dose	mg/L as 100% Citric Acid	1,000
Average	gph per batch	21.94
Frequency	-	13 times per month (Once per MF skid, per week)
Total Monthly Storage Volume (Estimated)	gallons	71
Chemical Feed Flow as 50% Citric Acid at RO CIP Acid Tank		
RO CIP Assumed Batch Volume	gallons	3,400
RO CIP Average Dose	mg/L as 100% Citric Acid	20,000
Average	gph per batch	109.7
Frequency	-	8 times per year (once every 3 months per skid)
Total Monthly Storage Volume (Estimated)	gallons	109.7
Chemical Storage		
Storage Type	-	Tote
Tote Quantity and Volume	-	2 at 330 gallons = 660 gallons
Days of Storage		
At Average Dose/Average Flow	days	32
Feed Equipment at MF/UF CIP Acid Tank		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	21.94 to 109.7
Turndown Ratio	-	5:1 required per pump 50:1 pump acceptable range

Table 5-46. Citric Acid Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Feed Equipment at RO CIP Acid Tank		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	21.9 - 109.7
Turndown Ratio	-	5:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control and manual stroke speed control. Automatic and manual stroke speed control with local override.
Piping and Valves		
Pipe Material	-	PVC
Valve Type	-	Ball

5.3.8.4 Sodium Hydroxide

Table 5-47. Sodium Hydroxide Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Information		
Concentration	%	25
Specific Gravity	-	1.28
Freezing Point	°F	0.00
Heat Tracing/Insulation Required	-	None
Chemical Feed Flow as 100% Sodium Hydroxide at Post Treatment Stabilization		
Minimum	mg/L	10
Average	mg/L	28
Maximum	mg/L	74
Process Flow at Post Treatment Stabilization		
Minimum	mgd	0.67
Average	mgd	1.67
Maximum	mgd	1.67
Chemical Feed Flow as 25% Sodium Hydroxide at Post Treatment Stabilization		
Minimum	gph	0.87
Average	gph	6.10
Maximum	gph	16.13

Table 5-47. Sodium Hydroxide Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Feed Flow as 25% Sodium Hydroxide at MF/UF CIP Chlorine/Base Tank Monthly CIP		
CIP Assumed Batch Volume	gallons	3,400
MF CIP Average Dose	mg/L as 100% NaOH	10,000
Average	gph per batch	106.4
Frequency	-	3 times per month (Once per MF skid, per month)
Total Monthly Storage Volume (Estimated)	gallons	319
Chemical Feed Flow as 25% Sodium Hydroxide at MF/UF Neutralization Tank Monthly CIP		
MF Neutralization Average Dose	mg/L as 100% NaOH	15,000
Average	gph per batch	159.2
Frequency	-	3 times per month (Once per MF skid, per month)
Total Monthly Storage Volume (Estimated)	gallons	477
Chemical Feed Flow as 25% Sodium Hydroxide at MF/UF Neutralization Tank Weekly CIP		
MF MW Neutralization Average Dose	mg/L as 100% NaOH	750
Average	gph per batch	32
Frequency	-	13 times per month (Once per MF skid, per week)
Total Monthly Storage Volume (Estimated)	gallons	103
Chemical Feed Flow as 25% Sodium Hydroxide at RO CIP Base Tank		
RO CIP Average Dose	mg/L as 100% NaOH	1,000
Average	gph per batch	42.6
Frequency	-	8 times per year (once every 3 months per skid)
Total Monthly Storage Volume (Estimated)	gallons	10.6
Chemical Feed Flow as 25% Sodium Hydroxide at RO Neutralization System		
RO Neutralization Average Dose	mg/L as 100% NaOH	15,000
Average	gph per batch	145.6
Frequency	-	8 times per year (once every 3 months per skid)
Total Monthly Storage Volume (Estimated)	gallons	146
Chemical Feed Flow as 25% Sodium Hydroxide at MF MW Make-Up		
MF MW Average Dose	mg/L as 100% NaOH	88
Average	gph per batch	28.2
Frequency	-	45 times monthly
Total Monthly Storage Volume (Estimated)	gallons	42
Chemical Storage		
Tank Type	-	Vertical, Cylindrical
Tank Material	-	Carbon Steel
Tank Quantity and Volume	-	1 at 5,700 gallons = 5,700 gallons

Table 5-47. Sodium Hydroxide Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Dimensions		
Diameter	ft	9
Straight Side Height	ft	13
Total Height	ft	15
Days of Storage		
At Average Dose/Average Flow	days	31
At Maximum Dose/Maximum Flow	days	13
Full Truck Delivery Volume	gallons	4,214
Feed Equipment at Post Treatment Stabilization		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.87 to 16.13
Turndown Ratio	-	18.5:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual stroke length control, and manual stroke speed control.
Feed Equipment at MF/UF CIP Base Tank & MF/UF Neutralization Tank & RO CIP Base Tank & RO Neutralization System		
Pump Type	-	Diaphragm Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	28.2 to 159.2
Turndown Ratio	-	5.6:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control, and manual stroke speed control.
Piping and Valves		
Plant Pipe Material	-	Carbon Steel
Carrier Pipe Material	-	PVC
Internal Pipe Material	-	Polyethylene (PE)
Valve Type	-	Plug

5.3.8.5 Sulfuric Acid

Table 5-48. Sulfuric Acid Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Information		
Concentration	%	93
Specific Gravity	-	1.84
Freezing Point	°F	-21.00
Heat Tracing/Insulation Required	-	None
Chemical Dosage as 100% Sulfuric Acid at Low Pressure RO Feed Pump Station		
Minimum	mg/L	16
Average	mg/L	44
Maximum	mg/L	140
Process Flow at Low Pressure RO Feed Pump Station		
Minimum	mgd	0.84
Average	mgd	2.09
Maximum	mgd	2.09
Chemical Feed Flow as 93% Sulfuric Acid at Low Pressure RO Feed Pump Station		
Minimum	gph	0.33
Average	gph	2.24
Maximum	gph	7.13
Total Monthly Storage Volume (Estimated)	gallons	1,614
Chemical Feed Flow as 93% Sulfuric Acid at Neutralization Tank for MF CIP Base Neutralization		
MF Neutralization Average Dose	mg/L as 100% sulfuric acid	14,712
Average	gph per batch	29.2
Frequency	-	3 times monthly (Once per MF skid, per month)
Total Monthly Storage Volume (Estimated)	gallons	87.6
Chemical Feed Flow as 93% Sulfuric Acid at Neutralization Tank for RO CIP Base Neutralization		
RO Neutralization Average Dose	mg/L as 100% sulfuric acid	1,471
Average	gph per batch	3.70
Frequency	-	8 times per year (once every 3 months per skid)
Total Monthly Storage Volume (Estimated)	gallons	3.7
Chemical Storage		
Storage Type	-	Vertical, Cylindrical
Tank Quantity and Volume	-	1 at 1,700 gallons = 1,700 gallons

Table 5-48. Sulfuric Acid Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Days of Storage		
At Average Dose/Average Flow	days	32
At Maximum Dose/Maximum Flow	days	10
Full Truck Delivery Volume	gallons	2,932
Feed Equipment at Low Pressure RO Feed Pump Station		
Pump Type	-	Solenoid Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.33 to 7.13
Turndown Ratio	-	21.6:1 required per pump 5:1 electronic stroke speed 10:1 manual stroke length 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control and automatic and manual stroke speed control.
Feed Equipment at Neutralization Tank		
Pump Type	-	Solenoid Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	3.00 to 29.2
Turndown Ratio	-	10:1 required per pump 5:1 electronic stroke speed 10:1 manual stroke length 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length control and manual stroke speed control.
Piping and Valves		
Plant Pipe Material	-	Alloy 20
Carrier Pipe Material	-	PVC
Internal Pipe Material	-	PE
Valve Type	-	Ball

5.3.8.6 Anti-Scalant

Table 5-49. Anti-Scalant Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Chemical Information		
Delivered Chemical	-	TBD (Chemical Vendor Specific)
Concentration	%	100
Specific Gravity	-	1.09
Freezing Point	°F	To be determined (TBD)
Chemical Dosage as 100% Anti-Scalant at Low Pressure RO Feed Pump Station		
Minimum	mg/L	1
Average	mg/L	6.5
Maximum	mg/L	18
Process Flow at Low Pressure RO Feed Pump Station		
Minimum	mgd	0.83
Average	mgd	2.09
Maximum	mgd	2.09
Chemical Feed Flow as 100% Anti-Scalant at Low Pressure RO Feed Station		
Minimum	gph	0.03
Average	gph	0.52
Maximum	gph	1.44
Total Monthly Storage Volume for ROC Quench	gallons	374
Chemical Storage		
Storage Type	-	Tote
Tote Quantity and Volume (Usable)	-	2 totes at 330 gallons = 660 gallons
Days of Storage		
At Average Dose/Average Flow	days	53
At Maximum Dose/Maximum Flow	days	19
Feed Equipment at Low Pressure RO Feed Pump Station		
Pump Type	-	Solenoid Metering Pumps
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per pump)	gph	0.03 to 1.44
Turndown Ratio	-	48:1 required per pump 5:1 electronic stroke speed 10:1 manual stroke length 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Manual stroke length, and automatic and manual stroke speed control with local override.
Piping and Valves		
Pipe Material	-	PVC
Valve Type	-	Ball

5.3.8.7 Hydrogen Peroxide

Table 5-50. Hydrogen Peroxide Storage and Feed System Design Criteria

Parameter	Units	Value
Chemical Information		
Concentration	%	50
Specific Gravity	-	1.19
Heat Tracing/Insulation Required	-	Required
Chemical Dosage as 100% Hydrogen Peroxide at UV/AOP Influent		
Minimum	mg/L	1
Average	mg/L	6
Maximum	mg/L	10
Process Flow at UV/AOP Influent		
Minimum	mgd	0.67
Average	mgd	1.67
Maximum	mgd	1.67
Chemical Feed Flow as 50% Hydrogen Peroxide at UV/AOP Influent		
Minimum	gph	0.05
Average	gph	0.70
Maximum	gph	1.17
Total Monthly Storage Volume	gallons	504
Chemical Storage		
Storage Type	-	Tote
Tote Quantity and Volume (Usable)	-	2 totes at 330 gallons = 660 gallons
Days of Storage		
At Average Dose/Average Flow	days	39
At Maximum Dose/Maximum Flow	days	23
Feed Equipment at UV-AOP Influent		
Feeder Type	-	Peristaltic Tube Pump
Feeder Quantity	-	2 (1 duty, 1 standby)
Feeder Capacity Range (per pump)	gph	0.05 to 1.17
Turndown Ratio	-	23.4:1 required per pump 100:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual speed control with local override.
Piping and Valves		
Pipe Material	-	Stainless Steel
Valve Type	-	Vented Ball

5.3.8.8 Calcium Chloride

Table 5-51. Calcium Chloride Storage and Feed System Design Criteria

Parameter	Units	Value
Chemical Information		
Concentration	%	35
Specific Gravity	-	1.35
Freezing Point	°C	-15 (estimated)
Heat Tracing/Insulation Required	-	None
Chemical Dosage as 100% Calcium Chloride at PWPS		
Minimum	mg/L	35
Average	mg/L	36.3
Maximum	mg/L	150
Process Flow at PWPS		
Minimum	mgd	0.67
Average	mgd	1.67
Maximum	mgd	1.67
Chemical Feed Flow as 35% Calcium Chloride at PWPS		
Minimum	gph	2.07
Average	gph	5.36
Maximum	gph	22.1
Total Monthly Storage Volume	gallons	3,858
Chemical Storage		
Tank Type	-	Vertical, Cylindrical
Tank Material	-	FRP
Tank Quantity and Volume (Usable)	-	1 at 4,800 gallons = 4,800 gallons
Dimensions		
Diameter	ft	9
Straight Side Height	ft	12
Total Height	ft	14
Days of Storage		
At Average Dose/Average Flow	days	37
At Maximum Dose/Maximum Flow	days	9
Full Truck Delivery Volume	gallons	3,994
Feed Equipment at Decarb Effluent		
Pump Type	-	Diaphragm Metering Pump
Pump Quantity	-	2 (1 duty, 1 standby)
Pump Capacity Range (per feeder)	gph	2.07 to 22.14
Turndown Ratio	-	10.7:1 required per pump 50:1 pump acceptable range
Pump Control	-	Automatic and manual start/stop. Automatic and manual stroke length control, and automatic and manual stroke speed control with local override.

Table 5-51. Calcium Chloride Storage and Feed System Design Criteria		
Parameter	**Units**	**Value**
Piping and Valves		
Pipe Material	-	PVC
Carrier Pipe Material	-	PVC
Internal Tube Material	-	PE
Valve Type	-	Ball

5.3.9 AWPF Residual Management

The AWPF will have several residual streams from strainers, MF system, RO system, off-specification diversions, tank and wet well overflows, and facility washdowns. A summary of the residual flows that will be collected in the ROC wet well and discharged through the ROC pipeline is provided in **Table 5-52**. A summary of the residual flows that will be discharged to the sewer at Chanticleer is provided in **Table 5-53**.

Table 5-52. Summary of Residual Flows to ROC Wet Well		
Parameter	**Daily Flow (mgd) (Typical)**	**Daily Flow (mgd) (Max)**
AWPF Feed Operational Off-Specification Diversion	0.000	2.37
MF Feed Tank Overflow	0.000	2.37
Automatic Strainer Waste	0.048	0.048
MF Backwash Waste	0.134	0.134
RO Feed Tank Overflow	0.000	2.22
ROC	0.42	0.42
UV-AOP Effluent Regulatory Off-Specification Diversion	0.000	1.67
Purified Water Storage Tank Overflow	0.000	1.67
Total Residuals to ROC Wet Well	0.70	4.46[a]

a. It is unlikely that more than one of the off-specification diversion or overflow flows will occur at the same time. Therefore, the worst instantaneous scenario (entire AWPF influent + RO permeate + RO concentrate) was used.

Table 5-53. Summary of Residual Flows to Sewer		
Parameter	**Daily Flow (mgd) (Typical)**	**Daily Flow (mgd) (Max)**
Total Residuals to Sewer	0.028	0.043[a]

a. Maximum daily flow to the sewer is based on a current maximum flow capacity of 30 gpm.

5.3.10 Sanitary Lift Station

The Sanitary Lift Station will convey site wastewater (see **Table 5-54**) to the Santa Cruz County Sanitary System via a 4-inch line to the existing manhole at the Chanticleer site. The Sanitary Lift Station discharge line will include continuous monitoring of flow to show compliance with the County's 30 gpm limit. Design criteria for the Sanitary Lift Station and Wet Well are shown in **Table 5-54** and **Table 5-55**, respectively.

Table 5-54. Sanitary Lift Station Design Criteria		
Parameter	**Units**	**Value**
Design Capacity, total	gpm	30
Number of Pumps (duty + standby)		1 + 1
Pump Type		Submersible
Total Dynamic Head	ft	25
Drive Type		Constant Speed

Table 5-55. Sanitary Lift Station Wet Well Design Criteria		
Parameter	**Units**	**Value**
Total Equalization Storage	gal	1,500
Operating Volume	gal	1,100
Number of Tanks		1
Tank Diameter	ft	5
Tank Length	ft	N/A
Tank Side Water Depth	ft	9.5
Total Tank Side Wall Height	ft	10.5

5.3.11 RO Concentrate

5.3.11.1 RO Concentrate Pump Station and Wet Well

The ROC pump station will allow ROC and other residuals (see **Table 5-52**) to flow by gravity through the ROC pipeline to the City ocean outfall. The ROC discharge line will include continuous monitoring of total chlorine along with the ability to add sodium bisulfite for quenching. The pump station will include a ROC Wet Well for flow equalization of the various residual streams. All flows entering the ROC Wet Well include an air gap, compliant with DDW requirements. The ROC Wet Well is sized to provide flow buffering capacity for a worst-case scenario to accommodate the entirety of the AWPF influent flow plus UV-AOP effluent and ROC for approximately 30 minutes. Design criteria for the ROC Wet Well are shown in **Table 5-56**.

Table 5-56. ROC Wet Well Design Criteria		
Parameter	**Units**	**Value**
Operating Volume	gal	45,000
Tank Material	--	Concrete
Number of Tanks	--	1
Tank Width	ft	18.33
Tank Length	ft	35
Tank Side Water Depth	ft	11
Total Tank Side Wall Height	ft	12

5.3.11.2 RO Concentrate Pipeline

The ROC pipeline conveys water from the ROC Pump Station at the Chanticleer AWPF to the Santa Cruz effluent outfall at the SC WWTF. A summary of the ROC pipeline design criteria is presented in **Table 5-57**.

Table 5-57. ROC Pipeline Design Criteria

Parameter	Value/Type
Pipe Material	PVC
Pipe Diameter, inches	16
Length, ft (approximate)	21,600
Assumed Hazen-Williams Coefficient	130-150
Maximum velocity (fps)	5.24
Maximum head loss gradient (ft per 1,000 ft)	6

The ROC pipeline will terminate at the tunnel portal box at the SC WWTF. At this location, the ROC pipeline flow will be monitored by a total chlorine analyzer, flow meter, and sample stations for regulatory monitoring. These sample stations will include an autosampler to collect 24-hour and 30-day composite samples as well as sample taps for grab sample collection.

5.3.12 Purified Water

5.3.12.1 Purified Water Pump Station and Tank

The PWPS will pump stabilized product water to the SWIP recharge wells via the Purified Water Pipeline. The PWPS is designed to deliver the flow (firm capacity) and control to a discharge pressure setpoint required by the SWIP recharge wells. The PWPS discharge line will be equipped with a surge tank to provide surge mitigation during a transient event. The PWPS discharge line will also include continuous monitoring of flow, pressure, total chlorine, and pH along with a composite sampler for regulatory monitoring. The PWPS will include a Purified Water Tank for flow equalization of the AWPF product water. Overflows from the Purified Water Tank will be passively discharged to the ROC Wet Well. Design criteria for the PWPS and Purified Water Tank are summarized in **Table 5-58** and **Table 5-59**, respectively.

Table 5-58. PWPS Design Criteria

Parameter	Units	Value
Design Capacity, total (each pump)	gpm	1,180 (590)
Number of Pumps (duty + standby)		2 + 1
Pump Type		Horizontal End Suction Centrifugal
Total Dynamic Head	ft	71 - 118
Drive Type		Variable Speed

Table 5-59. Purified Water Tank Design Criteria		
Parameter	**Units**	**Value**
Total Equalization Storage	gal	33,500
Operating Volume	gal	25,000
Number of Tanks		1
Tank Width	ft	15
Tank Length	ft	18
Tank Side Water Depth	ft	16.5
Total Tank Side Wall Height	ft	19

5.3.12.2 Purified Water Pipeline Design Criteria

The Purified Water pipeline conveys water from the PWPS at the Chanticleer AWPF to the recharge wells. A summary of the Purified Water pipeline design criteria is presented in **Table 5-60**.

Table 5-60. Purified Water Pipeline Design Criteria	
Parameter	**Value/Type**
Pipe Material	PVC
Pipe Diameter, inches	14
Length, ft (approximate)	~20,000
Assumed Hazen-Williams Coefficient	130-150
Maximum velocity (fps)	5
Maximum head loss gradient (ft per 1,000 ft)	6
Minimum pressure at discharge points (psi)	15

5.4 SWIP Wells

Three SWIP wells will be used to deliver purified water into the Purisima Formation to prevent further seawater intrusion. The three SWIP wells are TLC, Monterey and Willowbrook. All three wells have common construction including 16-inch inner diameter 304L stainless steel casing, 16-inch inner diameter 304L stainless steel wire-wrapped screen and glass bead filter media. The TLC SWIP well was installed in 2019 as a pilot recharge well; installation of the Monterey and Willowbrook SWIP wells occurred in fall of 2020 through the summer of 2021.

The TLC SWIP well is completed with screened intervals in two aquifer units, including the Purisima BC (shallower) and Purisima A (deeper) aquifer units (**Figure 5-9**). A spinner (flowmeter) survey was conducted at the TLC SWIP well in May 2019 during constant rate injection testing to evaluate relative recharge capabilities in both the Purisima A and Purisima BC units. The average recharge rate during the test was 470 gpm. Analysis of the spinner log concluded that approximately 7 percent of recharged water was accepted by the upper Purisima BC unit and 93 percent was accepted by the lower Purisima A screened interval.

The Willowbrook SWIP well was drilled in late 2020 and includes a single screened interval in the Purisima A (deeper) aquifer unit only. The Monterey SWIP well was drilled in 2021 and also includes a screened interval in the Purisima A (deeper) aquifer unit only. As-built drawings of the Willowbrook and Monterey wells are shown on **Figure 5-10** and **Figure 5-11**, respectively. The most recent pumping tests at the three SWIP wells result in estimated peak recharge rates of 235 gpm at the Monterey well, 720 gpm at the Willowbrook, and 900 gpm at the TLC well. However, recharging up to 400 gpm at the Monterey well will be tested after startup.

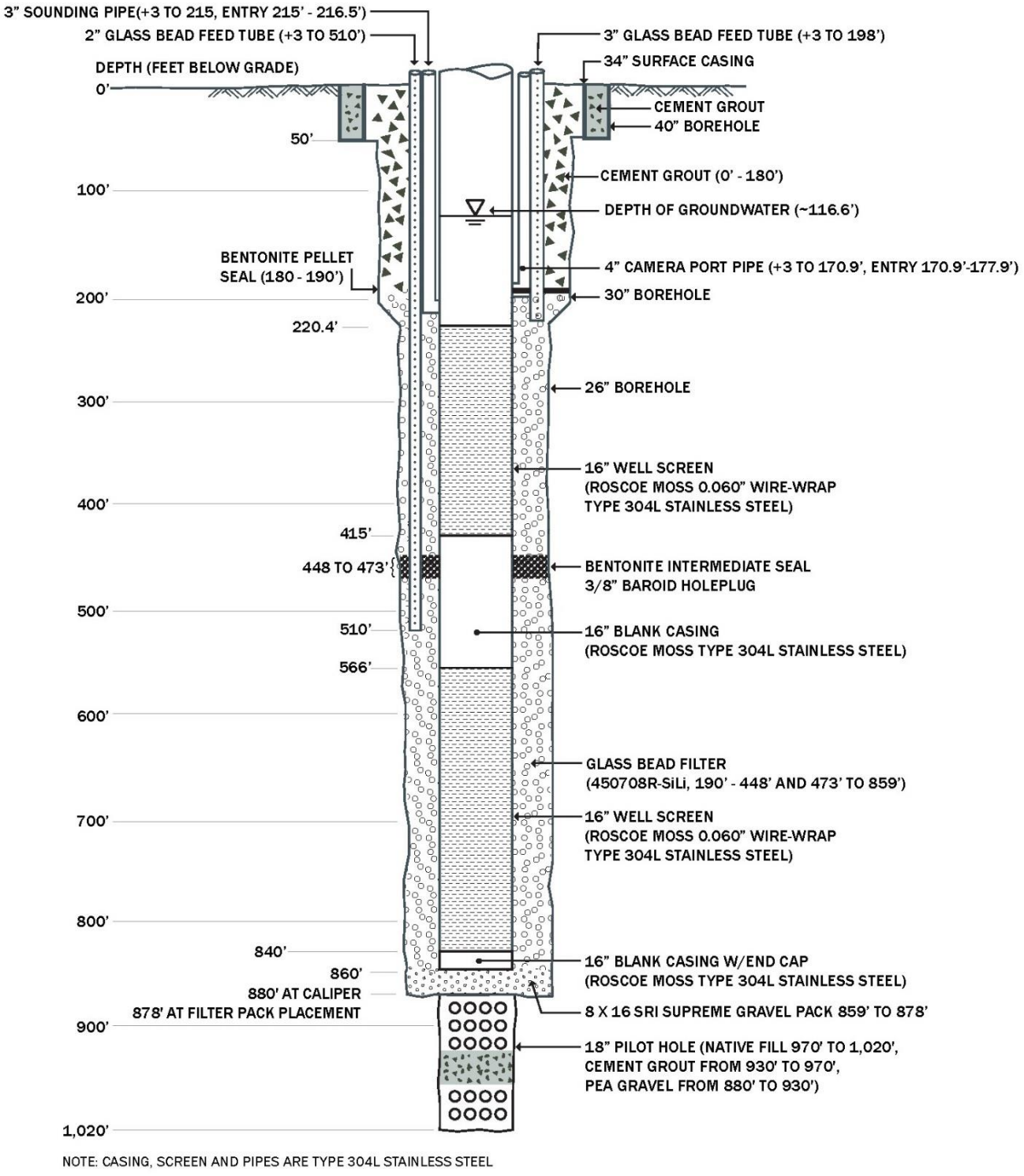

Figure 5-9. As-built diagram for TLC SWIP well

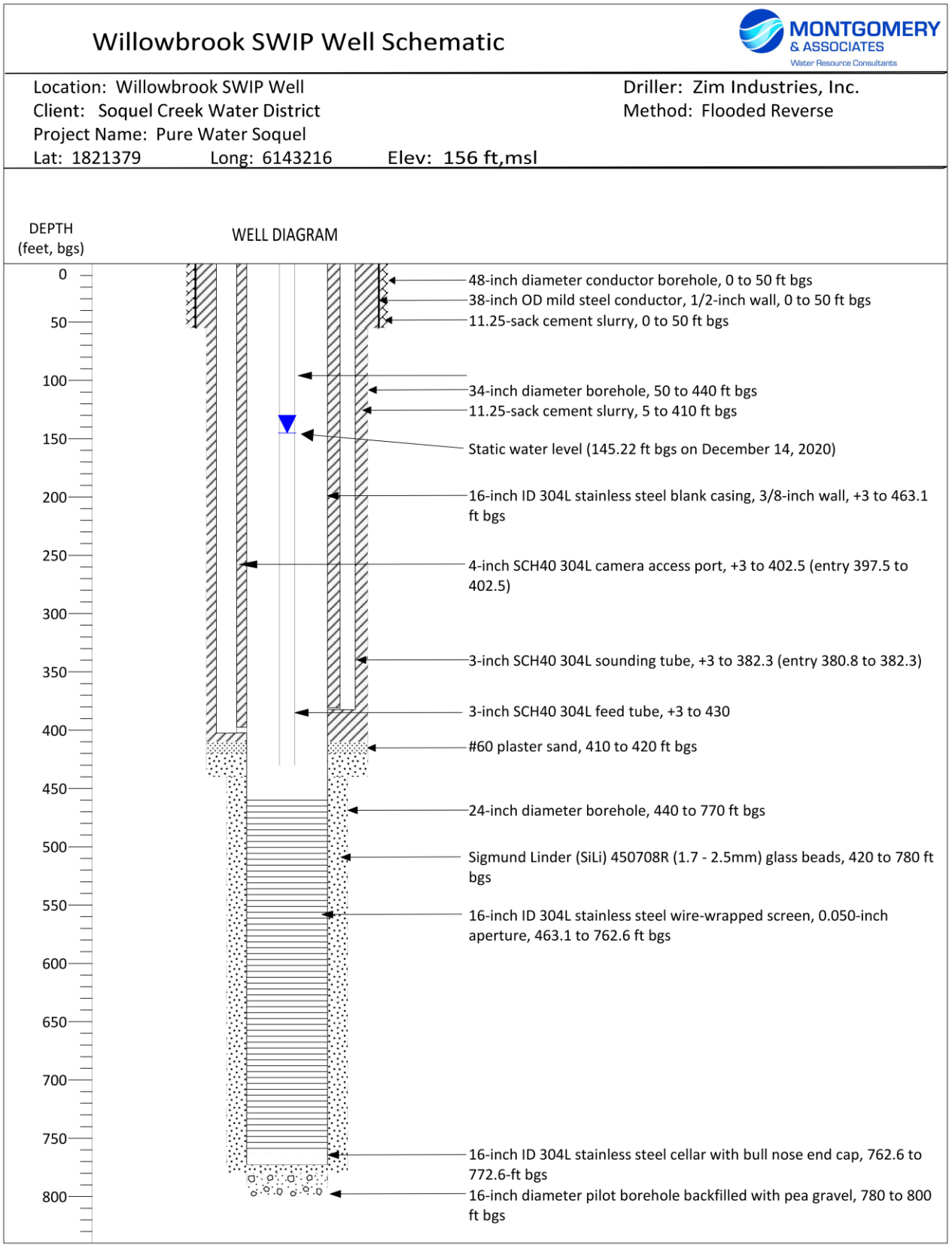

Figure 5-10. As-built diagram for Willowbrook SWIP well

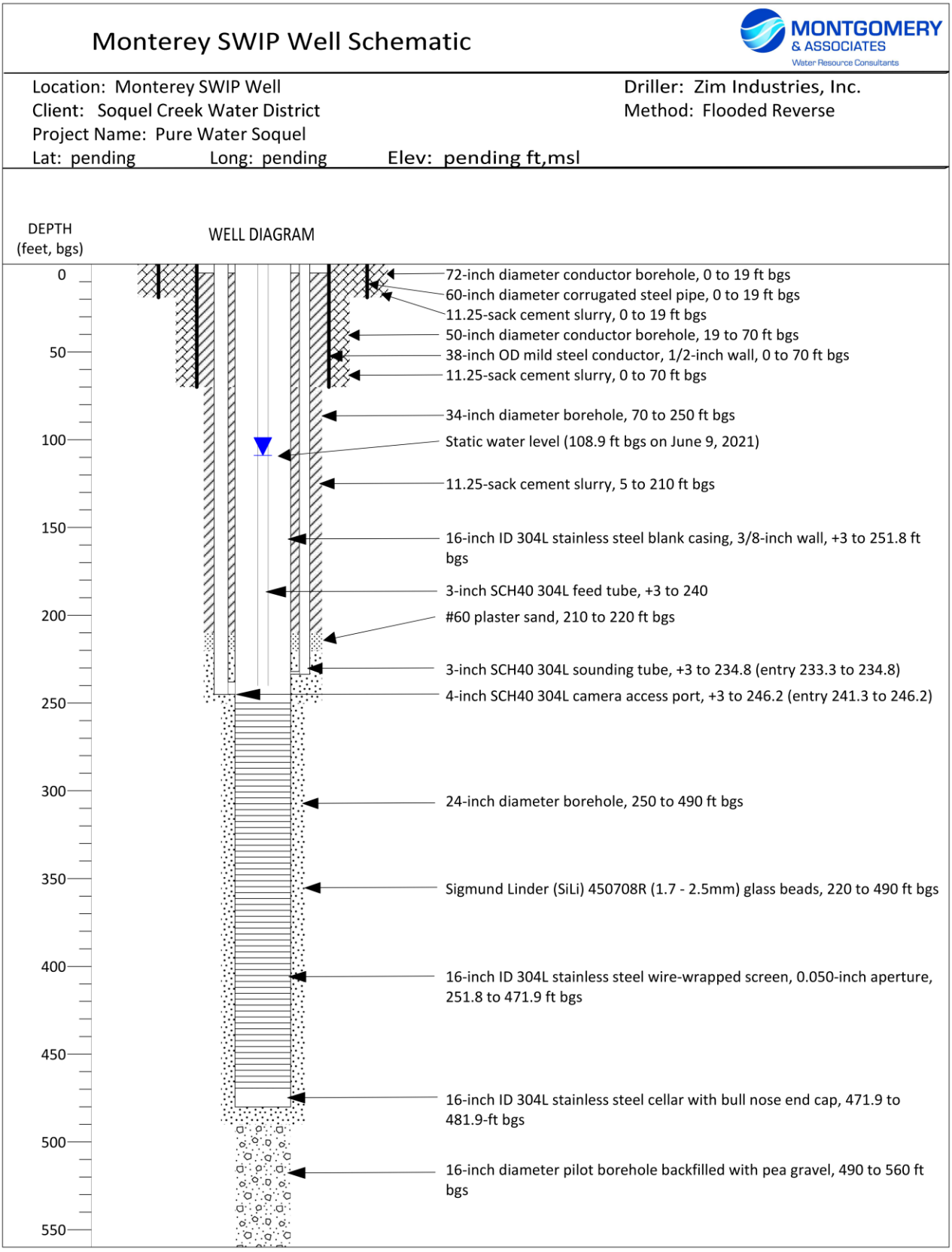

Figure 5-11. As-built diagram of Monterey SWIP well

5.5 Monitoring Wells

A total of eight monitoring wells have been installed in support of meeting Title 22 requirements for the PWS program, including four near TLC, two near Monterey, and two near Willowbrook. In addition, a fifth monitoring well near was installed by SqCWD to monitor the BC unit but is not required to meet Title 22 regulations. These monitoring well locations are supported by groundwater modeling results and analytical estimates for travel times of recharged water and are described in **Section 14**. Monitoring wells will be used in support of tracer study programs and measure water quality of the purified recycled water in the aquifer. The construction of these wells were completed in spring 2022. As described in **Section 14.5.1**, at least four quarters of background monitoring will occur at these wells before start-up of the recharge program.

Conceptual monitoring well designs are shown in **Table 5-61** below. Details are based on interpolation of Basin groundwater model layer elevations; the actual depth and screened intervals were determined based on borehole information collected during drilling activities. Each well includes at least 60 ft of screened interval placed in a high transmissive portion of the aquifer. This approach is intended to monitor the groundwater with the highest horizontal velocity, as representative of the recharge water which arrives soonest following injection. Each monitoring well was completed in its own borehole and constructed with 4-inch diameter Schedule 80 PVC casing and an 8x16 filter pack (**Figure 5-12**).

Table 5-61. Planned Monitoring Well Location Characteristics

Monitoring Well Name	Purisima Unit	Unit Top (ft below ground surface [bgs])	Unit Bottom (ft bgs)	Thickness (ft)	As-Built Well Screen Location (ft bgs)
TLC					
TLM-1A	A	554	851	297	675 - 735
TLM-2A	A	643	948	305	745 – 825
TLM-2BC (Optional)[a]	BC	323	513	190	270 - 350
TLM-3BC	BC	207	397	190	200 - 280
TLM-4BC	BC	191	381	190	210 – 290
Monterey					
MM-1	A	259	511	252	330 – 410
MM-2	A	254	505	251	320 - 400
Willowbrook					
WM-1	A	454	748	294	560 – 640
WM-2	A	354	626	272	490 - 570

a. Monitoring Well TLM-2BC was installed by SqCWD to monitor the BC unit but is not required to meet Title 22 requirements.

The exact location of these monitoring wells was based on property access negotiations and other considerations.

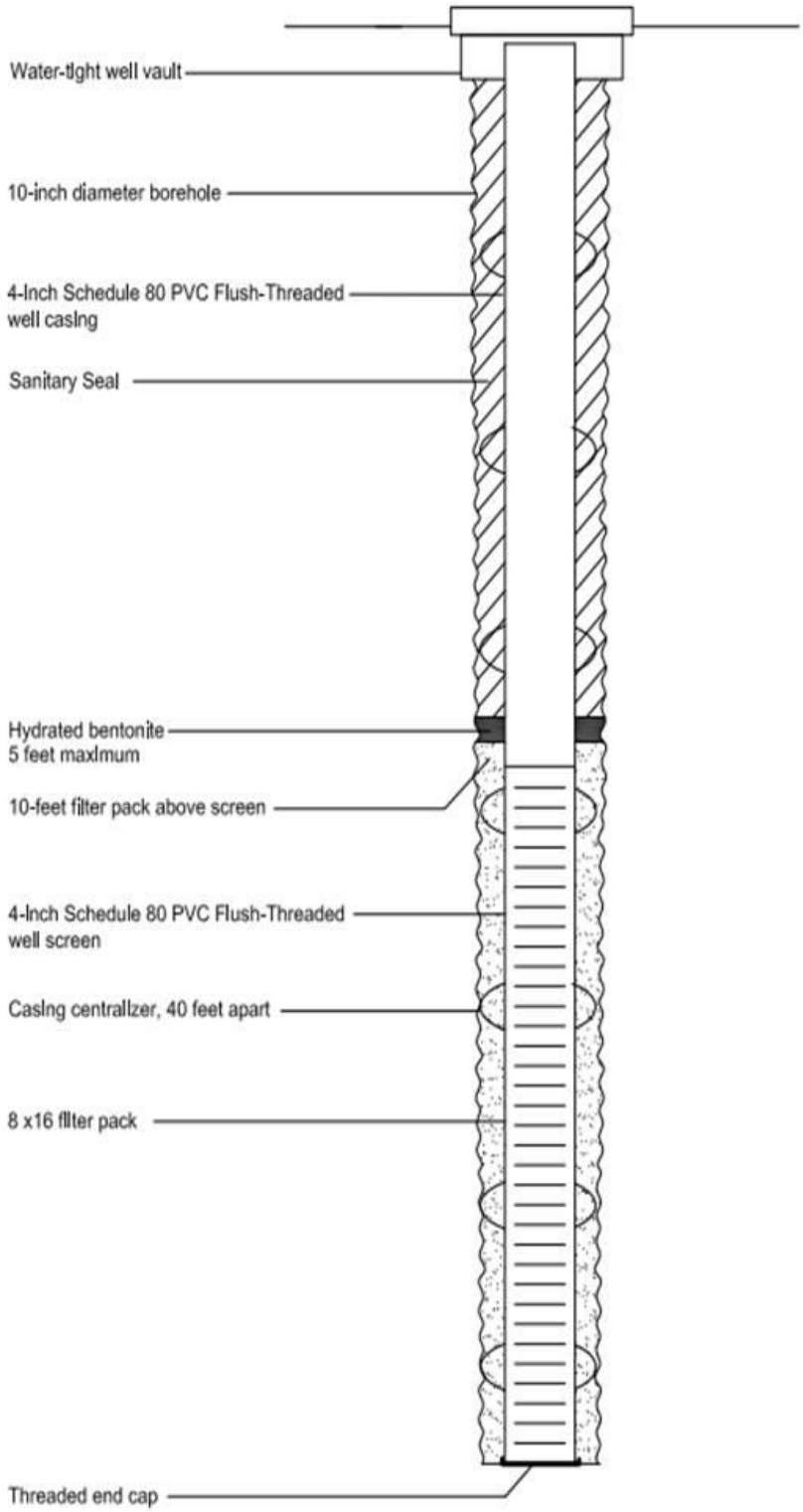

Figure 5-12. Conceptual design for monitoring wells

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Section 6: Secondary Effluent Water Quality

The PWS Project will include recharge wells, monitoring wells, conveyance pipelines, and treatment facilities, including the TTF at the SC WWTF and AWPF at the Chanticleer site. Disinfected secondary effluent from the SC WWTF will be conveyed directly to the AWPF with a sidestream conveyed to the Santa Cruz NPR Project Facility. After treatment at Chanticleer, the purified water will be conveyed to three SWIP recharge wells to be injected into the groundwater basin. This section summarizes available secondary effluent water quality data.

The secondary effluent water quality was assessed to understand the level of additional treatment required at the AWPF to produce a product water that meets the regulatory requirements described in **Section 3**. Secondary effluent water quality data for key constituents, including those with MCLs and NLs, lead and copper, TOC, total nitrogen (TN), priority pollutants, and other monitored constituents are summarized in the subsections below. Each table of water quality data includes the median and maximum concentrations detected in the secondary effluent as well as the required concentration for the AWPF product water. The majority of the constituents measured in the secondary effluent already meet the required concentration for the AWPF product water. **Section 8** focuses on the constituents identified in this section that require additional treatment at the AWPF to comply with the regulations, the anticipated treatment achieved at the AWPF, and the estimated concentrations of these key constituents in the AWPF product water.

The data were compiled from three sources:

1. SC WWTF Electronic Self-Monitoring Reports (eSMRs), submitted between July 2010 and April 2020, located in the California Integrated Water Quality System (CIWQS) Project database (CIWQS, 2010-2020)
2. Results from the composite sampling study conducted between April 2019 and April 2020
3. Results from the additional sampling study conducted between August and September 2020

The April 2019 to April 2020 sampling study was conducted following the Pure Water Soquel Proposed Enhanced Source Control Sampling Plan to characterize secondary effluent water quality over a 12-month period to capture seasonal variability. Autosamplers were used to collect the 24-hour composite samples. Additional sampling with grab samples was conducted in August and September 2020 to collect information for various constituents with MCLs and NLs that were not included in the first composite sampling study. Both sampling studies analyzed samples of undisinfected secondary effluent, prior to the existing UV disinfection system at the SC WWTF.

6.1 Constituents with Maximum Contaminant Levels

Secondary effluent water quality data for constituents or parameters with primary MCLs and sMCLs are shown in **Table 6-1** and **Table 6-2**, respectively. MCLs for acrylamide and epichlorohydrin require "treatment techniques" for compliance rather than meeting a treated effluent concentration goal. If these chemicals are used in treatment, they will be dosed to ensure that they do not exceed the dose and monomer levels specified by the USEPA (i.e., 0.05 percent acrylamide at 1 mg/L and 0.01 percent epichlorohydrin at 20 mg/L).

Table 6-1. Constituents with Primary MCLs								
Parameter	**Units**	**MCL Value[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**MCL Met? (Med/Max)**
Inorganics								
Aluminum, total	mg/L	1	0.060	0.18	20 (5)	1, 2, 3	EPA 200.8	Y/Y
Antimony, dissolved	mg/L	0.006	<0.0005	0.0009	14 (9)	1	EPA 200.8	Y/Y
Arsenic, total	mg/L	0.010	0.0019	0.015	29 (1)	1,2	EPA 200.8	Y/N
Asbestos	MFL	7	<0.42	<0.42	3 (3)	3	EPA 100.2	Y/Y
Barium, dissolved	mg/L	1	0.018	0.039	27 (1)	1,2	EPA 200.8	Y/Y
Beryllium, total	mg/L	0.004	<0.0005	<0.0025	29 (29)	1,2	EPA 200.8	Y/Y
Cadmium, total	mg/L	0.005	<0.0005	0.0025	29 (28)	1,2	EPA 200.8	Y/Y
Chromium, total	mg/L	0.05	0.00053	0.0041	32 (12)	1,2	EPA 200.8	Y/Y
Cyanide, total (as CN)	mg/L	0.15	0.0047	0.0069	8 (0)	1	Method 4500-CN-B-2016 or C-2016	Y/Y
Fluoride	mg/L	2	0.22	0.29	13 (0)	2	SM 4500-F C	Y/Y
Lead, total	mg/L	0.015	0.00029	0.0032	29 (25)	1,2	EPA 200.8	Y/Y
Mercury, total	mg/L	0.002	<0.0002	0.00015	28 (26)	1,2	EPA 200.8	Y/Y
Nickel, total	mg/L	0.1	0.0034	0.018	29 (2)	1,2	EPA 200.8	Y/Y
Nitrate	mg/L as N	10	9.3	24.6	233 (0)	1,2	EPA 353.2	Y/N
Nitrite	mg/L as N	1	1.4	5.4	230 (0)	1,2	EPA 353.2	N/N
Nitrate + Nitrite	mg/L as N	10	10.9	26.1	230 (0)	1,2	Calculation	N/N
Perchlorate	mg/L	0.006	<0.004	<0.004	3 (3)	3	EPA 314.0	Y/Y
Selenium, total	mg/L	0.05	0.00047	0.018	29 (9)	1,2	EPA 200.8	Y/Y
Thallium	mg/L	0.002	<0.005	<0.005	27 (27)	1,2	EPA 200.8	-/-
Radionuclides								
Uranium	pCi/L	20	<0.00067	<0.00067	12 (12)	2	EPA 200.8	Y/Y
Combined Radium – 226 + 228	pCi/L	5	<2.0	<2.0	12 (12)	2	GA Institute of Tech	Y/Y
Radiation, gross alpha	pCi/L	15	2.3	3.9	18 (12)	1,2	EPA 900.0	Y/Y
Radiation, gross beta	pCi/L	50	17.5	25.0	18 (3)	1,2	EPA 900.0	Y/Y
Strontium-90	pCi/L	8	<3	<3	3 (3)	3	EPA 905.0	Y/Y
Tritium	pCi/L	20,000	<500	<500	3 (3)	3	EPA 906.0	Y/Y

Table 6-1. Constituents with Primary MCLs								
Parameter	**Units**	**MCL Value[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**MCL Met? (Med/Max)**
Volatile Organic Compounds (VOCs)								
Benzene	mg/L	0.001	<0.0005	<0.0005	7 (7)	1	EPA 624	Y/Y
Carbon Tetrachloride	mg/L	0.005	<0.0005	<0.0005	7 (7)	1	EPA 624	Y/Y
1,2-Dichlorobenzene	mg/L	0.6	<0.0097	<0.0097	21 (21)	1,2	EPA 524.2	Y/Y
1,4-Dichlorobenzene	mg/L	0.005	<0.0097	<0.0097	21 (21)	1,2,3	EPA 524.2	-/-
1,1-Dichloroethane	mg/L	0.005	<0.0005	<0.0005	7 (7)	1	EPA 624	Y/Y
1,2-Dichloroethane	mg/L	0.0005	<0.0005	<0.0005	7 (7)	1	EPA 624	Y/Y
1,1-Dichloroethylene	mg/L	0.006	<0.0005	<0.0005	7 (7)	1	EPA 624	Y/Y
cis-1,2-Dichloroethene	mg/L	0.006	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
trans-1,2-Dichloroethene	mg/L	0.01	<0.0005	<0.0005	7 (7)	1	EPA 8260	Y/Y
Dichloromethane	mg/L	0.005	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
1,3-Dichloropropene	mg/L	0.0005	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
1,2-Dichloropropane	mg/L	0.005	<0.0005	<0.0005	7 (7)	1	CAS 78-87-5	Y/Y
Ethylbenzene	mg/L	0.3	<0.0005	0.00035	7 (6)	1	EPA 624	Y/Y
Methyl-tert-butyl ether	mg/L	0.013	<0.0005	<0.0005	3 (3)	1	EPA 624	Y/Y
Monochlorobenzene	mg/L	0.07	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Styrene	mg/L	0.1	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
1,1,2,2-Tetrachloroethane	mg/L	0.001	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
Tetrachloroethylene	mg/L	0.005	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
Toluene	mg/L	0.15	<0.0005	0.0005	4 (3)	1,3	EPA 524.2	Y/Y
1,2,4-Trichlorobenzene	mg/L	0.005	<0.0048	<0.0048	24 (24)	1,2,3	EPA 524.2	Y/Y
1,1,1-Trichloroethane	mg/L	0.2	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
1,1,2-Trichloroethane	mg/L	0.005	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
Trichloroethylene	mg/L	0.005	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
Trichlorofluoromethane	mg/L	0.15	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
1,1,2-Trichloro-1,2,2-Trifluoroethane	mg/L	1.2	<0.01	<0.01	3 (3)	3	EPA 524.2	Y/Y
Vinyl Chloride	mg/L	0.0005	<0.0005	<0.0005	4 (4)	1,3	EPA 524.2	Y/Y
Xylenes	mg/L	1.750	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Synthetic Organic Chemicals (SOCs)								
Alachlor	mg/L	0.002	<0.0001	<0.0001	3 (3)	3	EPA 525.2	Y/Y
Atrazine	mg/L	0.001	$<5 \times 10^{-6}$	$<5 \times 10^{-6}$	11 (11)	2	EPA 525.2	Y/Y
Bentazon	mg/L	0.018	<0.0005	<0.0005	3 (3)	3	EPA 515.4	Y/Y
Benzo(a)pyrene	mg/L	0.0002	$<4.8 \times 10^{-5}$	$<4.8 \times 10^{-5}$	16 (16)	2,3	EPA 525.2	Y/Y
Carbofuran	mg/L	0.018	<0.0005	<0.0005	3 (3)	3	EPA 531.2	Y/Y
Chlordane	mg/L	0.0001	<0.0001	<0.0001	7 (7)	1	EPA 625	Y/Y
Dalapon	mg/L	0.2	<0.001	<0.001	3 (3)	3	EPA 515.4	Y/Y
Di(2-ethylhexyl)adipate	mg/L	0.4	<0.0006	<0.0006	3 (3)	3	EPA 525.2	Y/Y

Table 6-1. Constituents with Primary MCLs								
Parameter	**Units**	**MCL Value[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**MCL Met? (Med/Max)**
Di(2-ethylhexyl)phthalate	mg/L	0.004	<0.0006	<0.0006	3 (3)	3	EPA 525.2	Y/Y
2,4-D	mg/L	0.07	<0.050	0.021	14 (12)	2,3	EPA 515.4	Y/Y
Dinoseb	mg/L	0.007	<0.0002	<0.0002	3 (3)	3	EPA 515.4	Y/Y
Diquat	mg/L	0.02	<0.0004	<0.0004	3 (3)	3	EPA 549.2	Y/Y
Endothall	mg/L	0.1	<0.02	<0.02	3 (3)	3	EPA 548.1	Y/Y
Endrin	mg/L	0.002	$<1 \times 10^{-5}$	<0.001	9 (9)	1	EPA 608	Y/Y
Ethylene Dibromide	mg/L	5×10^{-5}	$<1 \times 10^{-5}$	$<1 \times 10^{-5}$	3 (3)	3	EPA 504.1	Y/Y
Glyphosate	mg/L	0.7	<0.006	<0.006	3 (3)	3	EPA 547	Y/Y
Heptachlor	mg/L	1×10^{-5}	$<1 \times 10^{-5}$	<0.001	9 (9)	1	EPA 8080	Y/-
Heptachlor Epoxide	mg/L	1×10^{-5}	$<1 \times 10^{-5}$	<0.001	8 (8)	1	EPA 8080	Y/-
Hexachlorobenzene	mg/L	0.001	<0.000024	<0.000024	23 (23)	1,2	EPA 525.1	Y/Y
Hexachlorocyclopentadiene	mg/L	0.05	<0.024	<0.024	22 (22)	1,2	EPA 525.1	Y/Y
Lindane	mg/L	0.0002	$<1 \times 10^{-5}$	$<1 \times 10^{-5}$	3 (3)	3	EPA 525.1	Y/Y
Methoxychlor	mg/L	0.04	<0.001	<0.001	7 (7)	1	EPA 8081B	Y/Y
Molinate	mg/L	0.02	<0.0005	<0.0005	3 (3)	3	EPA 525.2	Y/Y
Oxamyl	mg/L	0.05	<0.0005	<0.0005	3 (3)	3	EPA 531.2	Y/Y
Pentachlorophenol	mg/L	0.001	<0.0012	<0.0074	31 (31)	1,2,3	EPA 515.4	-/-
Picloram	mg/L	0.5	<0.001	<0.001	3 (3)	3	EPA 515.4	Y/Y
Polychlorinated Biphenyls	mg/L	0.0005	<0.001	<0.001	3 (3)	3	EPA 505	Y/Y
Simazine	mg/L	0.004	$<5 \times 10^{-6}$	$<5 \times 10^{-6}$	11 (11)	2	EPA 525.2	Y/Y
Thiobencarb	mg/L	0.001	<0.002	<0.002	3 (3)	3	EPA 525.2	Y/Y
1,2,3-Trichloropropane	mg/L	0.003	$<5 \times 10^{-6}$	7.5×10^{-6}	3 (2)	3	EPA 524.2	Y/Y
2,3,7,8-TCDD	mg/L	5×10^{-5}	7.9×10^{-12}	8.9×10^{-10}	4 (2)	1,3	EPA 1613	Y/Y
2,4,5-TP (Silvex)	mg/L	3×10^{-8}	<0.0002	<0.0002	3 (3)	3	EPA 515.4	Y/Y
DBPs								
Total Trihalomethanes	mg/L	0.080	0.0006	0.0009	3 (0)	3	EPA 524.2	Y/Y
Total Haloacetic acids	mg/L	0.060	0.0054	0.0064	3 (0)	3	EPA 552.3	Y/Y
Bromate	mg/L	0.010	<0.001	<0.001	3 (3)	3	EPA 317.0	Y/Y
Chlorite	mg/L	1.0	$<1 \times 10^{-6}$	2.7×10^{-6}	3 (2)	3	EPA 300.1	Y/Y
Treatment Technique								
Acrylamide	-	TT	-	-	-	-	-	-
Epichlorohydrin	-	TT	-	-	-	-	-	-

a. California Primary MCLs last updated October 2018

b. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020, (2) Composite Sampling Study, April 2019 to April 2020, and (3) Sampling Study, August to September 2020.

Table 6-2. Constituents with sMCLs								
Parameter	**Units**	**sMCL Level[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**sMCL Met? (Med/Max)**
Aluminum, total	mg/L	0.2	0.060	0.18	20 (5)	1, 2, 3	EPA 200.8	Y/Y
Color	Units	15	65	65	3 (0)	3	SM2120C	**N/N**
Copper, total	mg/L	1.0	0.0067	0.014	29 (1)	1,2	EPA 200.8	Y/Y
Foaming agents (methylene blue active substances or MBAS)	mg/L	0.5	0.19	0.28	3 (0)	3	SM5540C	Y/Y
Iron, total	mg/L	0.3	0.22	0.54	34 (1)	1,2	EPA 200.7	Y/**N**
Manganese	mg/L	0.05	0.16	0.23	13 (0)	2	EPA 200.7	**N/N**
MTBE	mg/L	0.005	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Odor – threshold	Units	3	2	3	3 (0)	3	SM2150B	Y/Y
Silver, total	mg/L	0.1	5.0×10^{-5}	0.0015	29 (25)	1,2	EPA 200.8	Y/Y
Turbidity	NTU	5	3.3	106	830 (0)	1,2	SM2130B	Y/**N**
Zinc	mg/L	5.0	0.029	0.095	29 (2)	1,2	EPA 200.8	Y/Y
TDS	mg/L	1,000 [c]	727	1,050	13 (0)	2	SM2540C	Y/**N**
Specific Conductance	µS/cm	1,600 [c]	1,300	1,930	13 (0)	2	SM2510B	Y/**N**
Chloride	mg/L	500 [c]	184	354	13 (0)	2	EPA 300.0	Y/Y
Sulfate	mg/L	500 [c]	74	95	13 (0)	2	EPA 300.0	Y/Y

a. California sMCLs last updated October 2018
b. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020, (2) Composite Sampling Study, April 2019 to April 2020, and (3) Sampling Study, August to September 2020.
c. Values shown represent the upper limit of the Consumer Acceptance Contaminant Level Range shown in Table 64449-B of the CCR Title 22 Criteria.

6.2 Lead and Copper

The ALs for lead and copper are 0.015 mg/L and 1.3 mg/L, respectively. The maximum concentrations of lead and copper measured in the raw wastewater to the SC WWTF between 2015 and 2019 were 0.0022 mg/L and 0.1 mg/L, respectively. The concentration of lead and copper in the secondary effluent also falls below the ALs, as summarized in **Table 6-3**.

Table 6-3. Lead and Copper								
Parameter	**Units**	**AL[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**AL Met? (Med/Max)**
Copper, total	mg/L	1.3	0.0067	0.014	29 (1)	1,2	EPA 200.8	Y/Y
Lead, total	mg/L	0.015	0.00029	0.0032	29 (25)	1,2	EPA 200.8	Y/Y

a. ALs from the CFR Lead and Copper Rule (40 CFR Part 141 Subpart I) last updated June 1991
b. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020 and (2) Composite Sampling Study, April 2019 to April 2020.

6.3 Constituents with NLs

Secondary effluent water quality data for constituents or parameters with NLs are summarized in **Table 6-4**.

Table 6-4. Constituents with NLs

Parameter	Units	NL Value[a]	Median	Max	# of Samples (# of ND)	Data Source[b]	Analytical Method	NL Met? (Med/Max)
Boron, Dissolved	mg/L	1	0.305	0.450	20 (0)	1,2	EPA 200.7	Y/Y
n-Butylbenzene	mg/L	0.26	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
sec-Butylbenzene	mg/L	0.26	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
tert-Butylbenzene	mg/L	0.26	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Carbon Disulfide	mg/L	0.16	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Chlorate	mg/L	0.8	<0.01	0.014	3 (2)	3	EPA 300.1	Y/Y
2-Chlorotoluene	mg/L	0.14	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
4-Chlorotoluene	mg/L	0.14	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Diazinon	mg/L	0.0012	<0.001	<0.001	3 (3)	3	EPA 525.2	Y/Y
Dichlorodifluoromethane (Freon 12)	mg/L	1	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
1,4-Dioxane	mg/L	0.001	<0.005 (0.00088 for quantifiable results)	0.0019	13 (7)	2	EPA 624.1	Y/N
Ethylene glycol	mg/L	14	<0.0005	<0.0005	3 (3)	3	EPA 8015B	Y/Y
Formaldehyde	mg/L	0.1	0.0086	0.014	3 (0)	3	EPA 556	Y/Y
Cyclotetramethylene tetranitramine (HMX)	mg/L	0.35	<0.0002	<0.0002	3 (3)	3	EPA 8330A	Y/Y
Isopropylbenzene	mg/L	0.77	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Manganese	mg/L	0.5	0.16	0.23	13 (0)	2	EPA 200.7	Y/Y
Methyl isobutyl ketone (MIBK)	mg/L	0.12	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
Naphthalene	mg/L	0.017	$<4.8 \times 10^{-5}$	8×10^{-5}	13 (12)	2	EPA 524.2	Y/Y
N-Nitrosodiethylamine (NDEA)	mg/L	1×10^{-5}	5.9×10^{-6}	1.7×10^{-5}	3 (1)	3	EPA 521	N/N
NDMA	mg/L	1×10^{-5}	$<2.4 \times 10^{-5}$	5.8×10^{-5}	24 (20)	1,2,3	EPA 521	N/N
NDPA	mg/L	1×10^{-5}	$<2 \times 10^{-6}$	$<2 \times 10^{-6}$	3 (3)	3	EPA 521	Y/Y
Perfluorobutane sulfonic acid (PFBS)	mg/L	5×10^{-4}	$<8.8 \times 10^{-7}$	8.8×10^{-7}	14 (11)	2,3	EPA 537.1	Y/Y
Perfluorooctanoic acid (PFOA)	mg/L	5.1×10^{-6}	5.7×10^{-6}	6.5×10^{-6}	3 (0)	3	EPA 537.1	N/N
Perfluorooctanesulfonic acid (PFOS)	mg/L	6.5×10^{-6}	3.6×10^{-6}	4.4×10^{-6}	3 (0)	3	EPA 537.1	Y/Y
Propachlor	mg/L	0.09	<0.0005	<0.0005	3 (3)	3	EPA 508	Y/Y
n-Propylbenzene	mg/L	0.26	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y

Table 6-4. Constituents with NLs								
Parameter	**Units**	**NL Value[a]**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[b]**	**Analytical Method**	**NL Met? (Med/Max)**
Cyclotrimethylene tetranitramine (RDX)	mg/L	0.0003	<0.0002	<0.0002	3 (3)	3	EPA 8330A	Y/Y
Tertiary butyl alcohol (TBA)	mg/L	0.012	0.0039	0.0040	3 (0)	3	EPA 524.2	Y/Y
1,2,4-Trimethylbenzene	mg/L	0.33	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
1,3,5-Trimethylbenzene	mg/L	0.33	<0.0005	<0.0005	3 (3)	3	EPA 524.2	Y/Y
2,4,6-Trinitrotoluene (TNT)	mg/L	0.001	<0.0001	<0.0001	3 (3)	3	EPA 8330A	Y/Y
Vanadium	mg/L	0.05	0.00066	<0.005	14 (2)	1	EPA 200.8	Y/Y

a. California Drinking Water NLs last updated February 2020.

b. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020, (2) Composite Sampling Study, April 2019 to April 2020, and (3) Sampling Study, August to September 2020.

6.4 Total Organic Carbon

The TOC concentration in the AWPF product water may not exceed 0.5 mg/L, based on the 20-week running average of all TOC results and the average of the last four TOC results (CCR Title 22 Criteria, Section 60320.218, analytical method SM 5310B). The AWPF's RO permeate may not exceed 0.25 mg/L more than five percent of the time during the first twenty weeks of operation. The historical TOC levels in the secondary effluent are summarized in **Table 6-5** and are anticipated to be significantly reduced through the AWPF to achieve the regulatory requirements for the RO permeate and AWPF product water.

Table 6-5. TOC		
Parameter	**Units**	**Value**
TOC, min	mg/L	8
TOC, 10th percentile	mg/L	11
TOC, average	mg/L	14
TOC, 90th percentile	mg/L	17
TOC, max	mg/L	33
Number of Samples	-	1,488

Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020 and (2) Composite Sampling Study, April 2019 to April 2020.

6.5 Total Nitrogen

TN concentrations in the AWPF product water may not exceed 10 mg/L (CCR Title 22 Criteria, Section 60320.210). TN is the sum of NO_3-N, nitrite-nitrogen (NO_2-N), and TKN, which is the sum of NH_3-N and organically bonded nitrogen. The historical concentrations of NO_3-N, NO_2-N, and TKN in the secondary effluent are summarized in **Table 6-6** and are anticipated to be significantly reduced through the AWPF to achieve the regulatory requirements for the RO permeate and AWPF product water.

Table 6-6. Total Nitrogen						
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
Nitrate	mg/L as N	9.3	24.6	233 (0)	1,2	EPA 353.2
Nitrite	mg/L as N	1.4	5.4	230 (0)	1,2	EPA 353.2
TKN	mg/L	38.9	48.6	13 (0)	2	EPA 351.2
TN[b]	mg/L	49.1	60.0	13 (0)	1,2	Calculation

a. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020 and (2) Composite Sampling Study, April 2019 to April 2020. Total Nitrogen average and maximum calculated only for samples that were analyzed for all three parameters: nitrate, nitrite, and TKN.

b. TN includes nitrate-N, nitrite-N, ammonia-N, and organic-N

6.6 Other Priority Pollutants

There are 126 constituents included in the EPA's priority pollutants list last updated December 2014. As mentioned in **Section 4.2.4** of this Report, some of the inorganic and organic constituents that are on the priority pollutants list were detected in the raw wastewater to the SC WWTF. The tables in the sections above summarize the historical secondary effluent water quality data for all of the inorganic priority pollutants and many of the organic priority pollutants because all of the inorganic priority pollutants have secondary or primary MCLs or NLs in CA. Historical secondary effluent data for the organic priority pollutants not included in the tables above are summarized in **Table 6-7**.

Table 6-7. Other Organic Priority Pollutants						
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
1,2-Diphenylhydrazine	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
1,3-Dichlorobenzene	µg/L	<9.7	<9.7	21 (21)	1,2	EPA 625.1
2-chloroethyl Vinyl Ether	µg/L	<1	<1	1 (1)	1	EPA 624
2-Chloronaphthalene	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
2-Chlorophenol	µg/L	<0.097	60	29 (28)	1,2	EPA 625.1
2-methyl-4,6-dinitrophenol (4,6-dinitro-o-cresol)	µg/L	<16	<50	11 (11)	1	EPA 625
2-Nitrophenol	µg/L	<24	<24	13 (13)	2	EPA 625.1
2,4-Dichlorophenol	µg/L	<0.048	0.10	13 (8)	2	EPA 625.1
2,4-Dimethylphenol	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
2,4-Dinitrophenol	µg/L	<2.4	<2.4	13 (13)	2	EPA 625.1
2,4-Dinitrotoluene	µg/L	<0.12	<0.12	16 (16)	2,3	EPA 525.2
2,4,6-Trichlorophenol	µg/L	0.18	0.34	13 (3)	2	EPA 625.1
2,6-Dinitrotoluene	µg/L	<0.048	0.88	16 (13)	2,3	EPA 625.1
3-methyl-4-chlorophenol (P-chloro-m-cresol)	µg/L	<2	<10	16 (16)	1	EPA 625
3,3-Dichlorobenzidine	µg/L	<4	<10	8 (8)	1	EPA 625
4,4-DDD	µg/L	<1	<1	4 (4)	1,3	EPA 525.2

Table 6-7. Other Organic Priority Pollutants						
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
4,4-DDE	µg/L	<1	<1	4 (4)	1,3	EPA 525.2
4,4-DDT	µg/L	<1	<1	4 (4)	1,3	EPA 525.2
4-Bromophenyl Phenyl Ether	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
4-Chlorophenyl Phenyl Ether	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
4-Nitrophenol	µg/L	<24	<24	13 (13)	2	EPA 625.1
Acenaphthene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
Acenaphthylene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
Acrolein	µg/L	<5	<5	1 (1)	1	EPA 624
Acrylonitrile	µg/L	<2	<2	1 (1)	1	EPA 624
Aldrin	µg/L	<0.01	<0.01	3 (3)	3	EPA 525.2
Alpha-BHC	µg/L	<1	<1	3 (3)	3	EPA 525.2
Alpha-endosulfan	µg/L	<1	<1	3 (3)	3	EPA 525.2
Beta-endosulfan	µg/L	<1	<1	3 (3)	3	EPA 525.2
Beta-BHC	µg/L	<1	<1	3 (3)	3	EPA 525.2
Benzidine	µg/L	<24	<24	13 (13)	2	EPA 625.1
Benzo (a) anthracene	µg/L	<0.097	<0.097	16 (16)	2,3	EPA 525.2
Benzo (b) fluoranthene	µg/L	<0.024	0.032	16 (15)	2,3	EPA 525.2
Benzo (g,h,i) perylene	µg/L	<0.097	0.065	16 (15)	2,3	EPA 525.2
Benzo (k) fluoranthene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
Bis (2-chloroethoxyl) Methane	µg/L	<4.8	<4.8	13 (13)	2	EPA 525.2
Bis (2-chloroethyl) Ether	µg/L	<0.024	0.015	13 (12)	2	EPA 625.1
Bis (2-chloroisopropyl) Ether	µg/L	<0.048	<0.048	13 (13)	2	EPA 625.1
Bis (2-Ethylhexyl) Phthalate	µg/L	1.5	10	21 (8)	1,2	EPA 625.1
Bromoform	µg/L	<0.5	<0.5	3 (3)	3	EPA 524.2
Butylbenzyl Phthalate	µg/L	<0.97	<0.97	16 (16)	2,3	EPA 525.2
Chloroform	µg/L	0.6	0.7	7 (1)	1	EPA 624
Chloroethane	µg/L	<0.5	<0.5	3 (3)	3	EPA 524.2
Chromium III	mg/L	<5	<5	1 (1)	1	Calculation
Chromium VI	µg/L	<0.02	<0.02	3 (3)	3	EPA 218.7
Chrysene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
delta-BHC	µg/L	<1	<1	8 (8)	1	EPA 625
Dibenzo (a,h) anthracene	µg/L	<0.048	0.11	13 (12)	2	EPA 625.1
Dieldrin	µg/L	<0.01	<0.01	3 (3)	3	EPA 505
Diethyl Phthalate	µg/L	<0.097	0.25	20 (15)	1,2	EPA 525.2
Dimethyl Phthalate	µg/L	<0.097	<0.097	13 (13)	2	EPA 525.2

Table 6-7. Other Organic Priority Pollutants						
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
Di-n-butyl Phthalate	µg/L	<0.097	0.18	21 (14)	1,2	EPA 525.2
Di-n-octyl Phthalate	µg/L	<0.6	<20	21 (21)	1,2	EPA 525.2
Endosulfan sulfate	µg/L	<1	<1	3 (3)	3	EPA 525.2
Endrin aldehyde	µg/L	<1	<1	3 (3)	3	EPA 525.2
Fluoranthene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
Fluorene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 525.2
Hexachlorobutadiene	µg/L	<0.048	<0.048	16 (16)	2,3	EPA 524.2
Hexachloroethane	µg/L	<0.048	<0.048	13 (13)	2	EPA 625.1
Indeno (1,2,3-cd) pyrene	µg/L	<0.097	0.056	16 (15)	2,3	EPA 525.2
Isophorone	µg/L	<4.8	<4.8	16 (16)	2,3	EPA 525.2
Methyl Chloride	µg/L	0.63	0.70	3 (0)	3	EPA 524.2
Methyl Bromide	µg/L	<0.5	<0.5	3 (3)	3	EPA 524.2
N-Nitrosodiphenylamine	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
Nitrobenzene	µg/L	<4.8	54	21 (20)	1,2	EPA 625.1
Phenanthrene	µg/L	<0.097	<0.097	16 (16)	2,3	EPA 525.2
Phenols, Total	µg/L	<0.097	120	32 (12)	1,2	EPA 625.1
Pyrene	µg/L	<0.097	<0.097	16 (16)	2,3	EPA 525.2

a. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020 and (2) Composite Sampling Study, April 2019 to April 2020

6.7 Other Constituents of Emerging Concern

Historical secondary effluent data for CECs, collected during the Composite Sampling Study conducted between April 2019 and April 2020, that are not included in the tables above are summarized in **Table 6-8**.

Table 6-8. Other Constituents of Emerging Concern					
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Analytical Method**
1,7-Dimethylxanthine	ng/L	590	2,000	12 (0)	LC-MS-MS SPE
1H-Benzotriazole	ng/L	1,200	2,500	11 (1)	LC-MS-MS SPE
4-Chloro-3-methylphenol	µg/L	<4.8	<4.8	13 (13)	EPA 625.1
4-nonylphenol (semi quantitative)	ng/L	<4000	5,700	11 (5)	LC-MS-MS SPE
4-tert-Octylphenol	ng/L	220	450	11 (3)	LC-MS-MS SPE
Acesulfame-K	ng/L	6,600	12,000	12 (0)	LC-MS-MS SPE
Acetaminophen	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
Albuterol	ng/L	26	34	11 (3)	LC-MS-MS SPE
Amoxicillin (semi-quantitative)	ng/L	1,500	3,500	11 (0)	LC-MS-MS SPE
Androstenedione	ng/L	<10	<10	11 (11)	LC-MS-MS SPE

Table 6-8. Other Constituents of Emerging Concern					
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Analytical Method**
Atenolol	ng/L	600	990	11 (0)	LC-MS-MS SPE
Bezafibrate	ng/L	12	26	11 (0)	LC-MS-MS SPE
BPA	ng/L	200	320	11 (0)	LC-MS-MS SPE
Bromide	mg/L	0.30	0.71	13 (0)	EPA 300.0
Caffeine	ng/L	990	7,100	11 (0)	LC-MS-MS SPE
Carbamazepine	ng/L	350	540	11 (0)	LC-MS-MS SPE
Carisoprodol	ng/L	12.5	21	12 (2)	LC-MS-MS SPE
Chloramphenicol	ng/L	<50	<50	11 (11)	LC-MS-MS SPE
Chloridazon	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
Cimetidine (semi-quantitative)	ng/L	57	670	11 (0)	LC-MS-MS SPE
Clofibric Acid	ng/L	<50	<50	11 (11)	LC-MS-MS SPE
Cotinine	ng/L	190	310	11 (0)	LC-MS-MS SPE
DEA	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
DEET	ng/L	860	1,700	11 (0)	LC-MS-MS SPE
Dehydronifedipine	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
Diazepam	ng/L	<5	8.5	11 (9)	LC-MS-MS SPE
Diclofenac	ng/L	330	390	11 (0)	LC-MS-MS SPE
Dilantin	ng/L	51	86	11 (1)	LC-MS-MS SPE
Diltiazem	ng/L	280	460	11 (0)	LC-MS-MS SPE
Diuron	ng/L	120	150	12 (0)	LC-MS-MS SPE
Erythromycin	ng/L	<10	170	11 (6)	LC-MS-MS SPE
Estradiol	ng/L	<50	<50	11 (10)	LC-MS-MS SPE
Estriol	ng/L	<50	<50	11 (11)	LC-MS-MS SPE
Estrone	ng/L	180	340	11 (0)	LC-MS-MS SPE
Ethinyl Estradiol – 17 alpha	ng/L	<50	<50	11 (11)	LC-MS-MS SPE
Fluoxetine	ng/L	58	120	11 (2)	LC-MS-MS SPE
Gemfibrozil	ng/L	880	1,200	11 (1)	LC-MS-MS SPE
Ibuprofen	ng/L	280	1,800	11 (3)	LC-MS-MS SPE
Iohexol	ng/L	8,350	37,000	12 (0)	LC-MS-MS SPE
Iopromide	ng/L	<50	<50	11 (11)	LC-MS-MS SPE
Isoproturon	ng/L	<100	<100	12 (12)	LC-MS-MS SPE
Ketoprofen	ng/L	27	58	11 (3)	LC-MS-MS SPE
Lincomycin	ng/L	<10	<10	11 (11)	LC-MS-MS SPE
Linuron	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
Lopressor (metoprolol)	ng/L	620	1,400	11 (2)	LC-MS-MS SPE

Table 6-8. Other Constituents of Emerging Concern					
Parameter	**Units**	**Median**	**Max**	**# of Samples (# of ND)**	**Analytical Method**
Meprobamate	ng/L	65	170	11 (0)	LC-MS-MS SPE
Naproxen	ng/L	910	2,900	12 (2)	LC-MS-MS SPE
Nifedipine (semi-quantitative)	ng/L	<20	51	11 (9)	LC-MS-MS SPE
Norethisterone (norethindrone)cbh	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
Pentoxifylline	ng/L	21	32	12 (3)	LC-MS-MS SPE
Phenazone	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
Primidone	ng/L	115	170	12 (0)	LC-MS-MS SPE
Progesterone	ng/L	<5	<5	11 (11)	LC-MS-MS SPE
Pyridine	µg/L	<0.097	<0.097	13 (13)	EPA 625.1
Quinoline	ng/L	<5	110	12 (9)	LC-MS-MS SPE
Strontium Total ICAP	mg/L	0.44	0.54	12 (0)	EPA 200.7
Sucralose	ng/L	37,000	68,000	12 (0)	LC-MS-MS SPE
Sulfadiazine	ng/L	32	130	11 (4)	LC-MS-MS SPE
Sulfadimethoxine	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
Sulfamethazine	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
Sulfamethizole	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
Sulfamethoxazole	ng/L	1,300	2,700	12 (0)	LC-MS-MS SPE
Sulfathiazole	ng/L	<5	<5	12 (12)	LC-MS-MS SPE
TCEP	ng/L	180	280	12 (0)	LC-MS-MS SPE
Testosterone	ng/L	<10	<10	12 (12)	LC-MS-MS SPE
Triclocarban	ng/L	<200	120	11 (7)	LC-MS-MS SPE
Triclosan	ng/L	203	560	12 (3)	LC-MS-MS SPE
Trimethoprim	ng/L	320	520	12 (0)	LC-MS-MS SPE
Warfarin	ng/L	<50	9	12 (8)	LC-MS-MS SPE

Data compiled from Composite Sampling Study, April 2019 to April 2020.

6.8 SWRCB Recycled Water Policy

The SWRCB "Water Quality Control Policy for Recycled Water" (referred to as the Recycled Water Policy in this report) requires that the AWPF product water be monitored for the constituents in **Table 6-9**. To understand the levels of each constituent in the secondary effluent, these parameters were included in the sampling efforts described in this section. The concentrations detected in the secondary effluent are presented in **Table 6-9**. Note that some constituents have been reported in other tables in this section but are included in the table below for completeness.

Table 6-9. Recycled Water Policy Constituents								
Parameter	**Units**	**Monitoring Trigger Level**	**Median**	**Max**	**No. of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**	**Trigger Level Met? (Median/Max)**
1,4-Dioxane	mg/L	0.001	0.00088	0.0019	13 (7)	2	EPA 624.1	Y/N
NDMA	mg/L	1×10^{-5}	2.9×10^{-5}	5.8×10^{-5}	4 (0)	2,3	EPA 521	N/N
N-Nitrosomorpholine (NMOR)	ng/L	12	39	93	15 (2)	2,3	EPA 521	N/N
PFOS	mg/L	1.3×10^{-5}	3.6×10^{-6}	4.4×10^{-6}	3 (0)	3	EPA 537.1	Y/Y
PFOA	mg/L	1.4×10^{-5}	5.7×10^{-6}	6.5×10^{-6}	3 (0)	3	EPA 537.1	Y/Y
Sucralose	ng/L	--	37,000	68,000	12 (0)	2	LC-MS-MS SPE	--
Sulfamethoxazole	ng/L	--	1,300	2,700	12 (0)	2	LC-MS-MS SPE	--
EC	µS/cm	--	1,380	2,650	67(0)	1,2	EPA 120.1/ SM 2510B	--
DOC	mg/L	--	14.7	16.7	13 (0)	2	SM 5310C	--
UV Absorbance at 254 nm	cm^{-1}	--	0.23	0.27	13 (0)	2	SM 5910B	--

a. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020, (2) Composite Sampling Study, April 2019 to April 2020, and (3) Sampling Study August to September 2020.

6.9 Other Monitored Constituents

In addition to the constituents summarized in **Tables 6-1 to 6-9** above, other constituents were monitored in the secondary effluent as part of the composite sampling studies conducted between April 2019 and April 2020 and August to September 2020. The water quality data collected as part of this study is summarized in **Table 6-10**.

Table 6-10. Other Monitored Constituents						
Parameter	**Units**	**Median**	**Max**	**No. of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
2-Methylnaphthalene	µg/L	<0.048	0.04	13 (12)	2	EPA 625.1
2-Methylphenol (o-Cresol)	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
2-Nitroaniline	µg/L	<24	<24	13 (13)	2	EPA 625.1
3 & 4-Methylphenol (m,p-Cresol)	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
3-Nitroaniline	µg/L	<24	<24	13 (13)	2	EPA 625.1
3,3-Dichlorobenzidine	µg/L	<0.097	<0.097	13 (13)	2	EPA 625.1
4-Chloroaniline	µg/L	<0.097	<0.097	13 (13)	2	EPA 625.1
4-Nitroaniline	µg/L	<24	<24	13 (13)	2	EPA 625.1
4,6-Dinitro-2-methylphenol	µg/L	<12	<12	13 (13)	2	EPA 625.1
Alkalinity	mg/L as $CaCO_3$	293	358	13 (0)	2	SM 2320B
Bendroflumethiazide	ng/L	<50	<50	11 (11)	2	LC-MS-MS SPE

Table 6-10. Other Monitored Constituents						
Parameter	**Units**	**Median**	**Max**	**No. of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
Benzyl Alcohol	µg/L	<24	<24	13 (13)	2	EPA 625.1
Bis (2-ethylexyl) Adipate	µg/L	<15	<15	13 (13)	2	EPA 625.1
BOD_5	mg/L	35	53	13 (1)	2	SM 5210B
Bromacil	ng/L	<5	<5	14 (14)	2,3	LC-MS-MS SPE
Butalbital	ng/L	29	43	11 (2)	2	LC-MS-MS SPE
Butylparaben	ng/L	<50	<50	11 (11)	2	LC-MS-MS SPE
Calcium	µg/L	70,000	76,000	13 (0)	2	EPA 200.7
Carbadox	ng/L	<50	<50	11 (11)	2	LC-MS-MS SPE
Chlorotoluron	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
COD	mg/L	58	71	13 (0)	2	SM 5220D
Cyanazine	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
DACT	ng/L	<10	54	12 (11)	2	LC-MS-MS SPE
DIA	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
Dibenzofuran	µg/L	<4.8	<4.8	13 (13)	2	EPA 625.1
Ethylparaben	ng/L	<200	<200	11 (11)	2	LC-MS-MS SPE
Flumequine	ng/L	<10	<10	11 (11)	2	LC-MS-MS SPE
Free Chlorine	mg/L	<0.02	0.04	13 (8)	2	SM 4500 Cl
Hardness	mg/L as $CaCO_3$	241	289	12 (0)	2	SM 2340B
Isobutylparaben	ng/L	<50	<50	11 (11)	2	LC-MS-MS SPE
Ketorolac	ng/L	27	47	11 (2)	2	LC-MS-MS SPE
Lidocaine	ng/L	710	980	11 (0)	2	LC-MS-MS SPE
Magnesium	µg/L	19,000	28,000	13 (0)	2	EPA 200.7
Meclofenamic Acid	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
Metazachlor	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
Methylparaben	ng/L	<200	31	12 (11)	2	LC-MS-MS SPE
NEtFOSAA	µg/L	<0.088	<0.088	11 (11)	2	EPA 537.1
NMeFOSAA	µg/L	<0.088	<0.088	11 (11)	2	EPA 537.1
Oil and Grease	mg/L	<5	5	13 (12)	2	EPA 1664B
Orthophosphate as PO_4	mg/L	8.3	9.8	13 (0)	2	EPA 300.0
OUST (Sulfometuron, methyl)	ng/L	<5	<5	12 (12)	2	LC-MS-MS SPE
Oxolinic acid	ng/L	<5	260	11 (10)	2	LC-MS-MS SPE
Perfluorodecanoic acid (PFDA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1
Perfluorododecanoicacid (PFDoA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1
Perfluoroheptanoic acid (PFHpA)	µg/L	<0.088	0.0033	14 (10)	2,3	EPA 537.1
Perfluorohexane sulfonic acid (PFHxS)	µg/L	<0.088	0.0054	14 (10)	2,3	EPA 537.1
Perfluorohexanoic acid (PFHxA)	µg/L	<0.088	0.046	14 (9)	2,3	EPA 537.1
Perfluorononanoic acid (PFNA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1

Table 6-10. Other Monitored Constituents						
Parameter	**Units**	**Median**	**Max**	**No. of Samples (# of ND)**	**Data Source[a]**	**Analytical Method**
Perfluorotetradecanoic acid (PFTA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1
Perfluorotridecanoic acid (PFTrDA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1
Perfluoroundecanoic acid (PFUnA)	µg/L	<0.088	<0.088	14 (14)	2,3	EPA 537.1
pH	-	7.06	7.52	3332 (0)	1,2	SM 4500H
Potassium	µg/L	23,000	29,000	13 (0)	2	EPA 200.7
Propazine	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
Propylparaben	ng/L	<50	10	10 (8)	2	LC-MS-MS SPE
Silica	µg/L	31,000	35,000	13 (0)	2	EPA 200.7
Sodium	µg/L	130,000	230,000	13 (0)	2	EPA 200.7
Sulfachloropyridazine	ng/L	<5	<5	11 (11)	2	LC-MS-MS SPE
Sulfamerazine	ng/L	<5	400	12 (9)	2	LC-MS-MS SPE
SUVA	L/mg-M	1.6	1.9	13 (0)	2	SM 5910B
TCPP	ng/L	1,200	7,300	12 (0)	2	LC-MS-MS SPE
TDCPP	ng/L	225	630	12 (3)	2	LC-MS-MS SPE
Temperature	C	18.5	25.1	3333 (0)	1,2	SM 2550B
Theobromine	ng/L	310	750	12 (2)	2	LC-MS-MS SPE
Theophylline (semi-quantitative)	ng/L	855	2,500	12 (0)	2	LC-MS-MS SPE
Thiabendazole	ng/L	17	31	12 (0)	2	LC-MS-MS SPE
Total Phosphorus as P	mg/L	3.2	3.7	13 (0)	2	EPA 365.1
Total Residual Chlorine	mg/L	0.04	0.76	13 (1)	2	SM 4500 Cl
TSS	mg/L	6	52	3,335 (0)	1,2	SM 2540D
Venlafaxine	ng/L	560	900	12 (0)	2	LC-MS-MS SPE

a. Data compiled from (1) SC WWTF eSMRs, July 2010 to April 2020, (2) Composite Sampling Study, April 2019 to April 2020, and (3) Sampling Study August to September 2020b.

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Section 7: Collaboration with The Santa Cruz NPR Project

As described in previous sections of this Engineering Report, the City will provide source water for Pure Water Soquel as part of a strategic partnership to meet water supply objectives for both agencies. For the City, one of those goals includes producing disinfected tertiary recycled water in compliance with Title 22 Criteria. The Santa Cruz NPR Project is described in detail separately in the City of Santa Cruz Non-Potable Reuse Engineering Report. A brief summary is provided in this section to describe the Santa Cruz NPR Project facilities that will be built by the design-builder that is constructing the Pure Water Soquel treatment facilities at the SC WWTF and at the Chanticleer site.

The SC WWTF currently produces recycled water which does not meet the definition of disinfected tertiary under Title 22 Criteria, but does not distribute the water outside of the facility. The SC WWTF uses this recycled water on site for operations and maintenance activities such as tank cleaning, chemical dilution, and providing water for on-site pump seals. On average, the on-site recycled water demand is approximately 126,000 gpd with peak demands of approximately 193,000 gpd. On-site recycled water use has reduced the SC WWTF potable water demand by about 90 percent.

Recycled water production is being expanded to provide 324,000 gpd of Title 22 disinfected tertiary recycled water for on-site and external applications. A portion of the flow from the SWPS will feed the new non-potable recycled water facilities, which will include additional filtration and disinfection. The intended external uses for recycled water are non-agricultural irrigation, truck fill station and dust suppression, and internal use is expected to stay the same.

The Santa Cruz NPR Project facilities that are being built as part of the PWS treatment facilities construction include cloth disk filtration and UV disinfection.

The City of Santa Cruz Non-Potable Reuse Engineering Report documents details of the Santa Cruz NPR Project, including:

- Feed water quality
- Compliance with NPDES Permit and applicable regulations
- Compliance with Title 22 Criteria
  - Filtration Requirements
  - Disinfection Requirements
- Design criteria for the filtration and UV systems
- NPR recycled water quality
- Monitoring and Reporting Requirements

As discussed in **Section 1**, separate Title 22 Engineering Reports are being prepared to facilitate SWRCB review, as follows and illustrated in **Figure 7-1**:

- Pure Water Soquel Engineering Report, for conditional approval of the PWS Project for water recycling requirements intended for IPR through groundwater recharge (this document).
- City of Santa Cruz Non-Potable Reuse Engineering Report, for conditional approval of the Santa Cruz NPR Project within an updated NPDES permit encompassing these facilities (separate engineering report submittal).

The NPR distribution system and customers will be described in a separate report in the future.

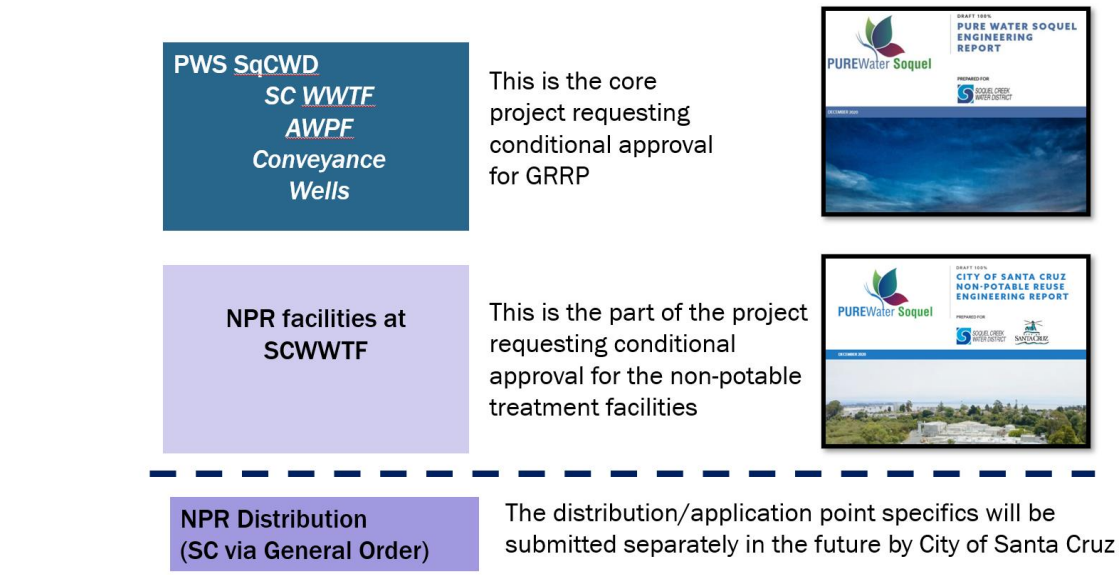

Figure 7-1. Engineering report organization

Section 8: Purified Water Quality

The PWS Project includes multiple treatment processes to improve the water quality of the SC WWTF secondary effluent to meet the requirements for a GRRP. Source water from SC WWTF will be pumped to the AWPF at the Chanticleer site, where it will undergo ozonation, membrane filtration, and FAT prior to injection. **Section 6** described the historical secondary effluent water quality for all regulated constituents. This section provides discussion on the PWS Project's design purified water quality and compliance with DDW and RWQCB requirements.

8.1 Introduction

The PWS Project's purified water is subject to water quality requirements from the following documents:

- Title 22
- Basin Plan, and
- SWRCB Water Quality Control Policy for Recycled Water (Recycled Water Policy).

Table 8-1 provides a summary of the water quality objectives for the PWS Project. Detailed information describing the water quality monitoring approach for compliance purposes will be provided in the OOP. Preliminary information regarding the constituents that will be monitored to meet the water quality objectives shown in **Table 8-1** and an option for the analytical methods to be used is provided in **Section 14**. The monitoring approach and analytical methods will be finalized during the development of the OOP.

Table 8-1. Summary of Water Quality Objectives

Parameter	Units	Purified Water Quality Goal	Basis
Regulated Constituents			
Primary Drinking Water Standards	-	≤ MCL (see **Section 8.2.1**)	Title 22 CCR
Secondary Drinking Water Standards	-	≤ sMCL (see **Section 8.2.2**)	
Lead and Copper	-	≤ ALs (see **Section 8.2.3**)	
NL Contaminants	-	≤ NL (see **Section 8.2.4**)	
Pathogens (see Section 9)			
Enteric virus	Log reduction	≥ 12	Title 22 CCR
Giardia cysts	Log reduction	≥ 10	
Cryptosporidium oocysts	Log reduction	≥ 10	
Organic Constituents			
TOC	mg/L	≤ 0.5[a] (see **Section 8.2.5**)	Title 22 CCR
1,4-Dioxane	Log reduction with UV-AOP	≥ 0.5	
Inorganic Constituents			
TN	mg/L as N	≤ 10[b] (see **Section 8.2.6**)	Title 22 CCR
Basin Plan			
Water Quality Objectives for the Basin	--	≤ WQ Objective (see **Section 8.3**)	Water Quality Control Plan for the Central Coastal Basin

Table 8-1. Summary of Water Quality Objectives			
Parameter	**Units**	**Purified Water Quality Goal**	**Basis**
Finished Water Stabilization (see Section 5)			
pH	--	7.5 – 8.5	Corrosion mitigation and groundwater aquifer leaching minimization
Alkalinity	mg/L as CaCO3	≥ 40	
TDS	Mg/L	< 200 mg/L	
LSI	--	-1.0 – 0.5	

a. TOC concentration of 0.5 mg/L shall not be exceeded by the 20-week running average of all TOC results and the average of the last four TOC results, and the permeate shall not exceed 0.25 mg/L more than 5% of the time during the first 20 weeks of operation.

b. A total nitrogen concentration of 10 mg/L as N shall not be exceeded by the average of two consecutive samples taken at least three days apart, every week.

The water quality of the feed water to the AWPF has been well characterized (**Section 6**). To estimate the purified water quality, typical removal rates of the constituents through advanced treatment were used. Through this evaluation, all the regulated constituents detected in the secondary effluent are expected to be below regulatory limits in the product water. Compliance for each regulatory category is summarized in the following sections.

8.2 Compliance with Title 22

This section describes the PWS Project's expected compliance with Title 22 Criteria. The Title 22 Criteria include requirements for the following:

- Primary MCLs
- sMCLs
- Lead and copper ALs
- NLs
- TOC
- Total nitrogen
- Priority toxic pollutants, and
- CECs

8.2.1 Constituents with Primary MCLs

The Title 22 Criteria specify that prior to injection, the purified water must comply with the primary MCLs. The following sub-sections show how the purified water will comply with each MCL category.

8.2.1.1 Inorganic Chemicals

As shown in **Table 6-1**, fourteen of the inorganic chemicals with MCLs were measured at concentrations below the MCLs and four of the inorganic chemicals were measured at concentrations higher than the MCL. The four compounds that exceeded the MCL in the SC WWTF secondary effluent are summarized in **Table 8-2**. Given the water quality data and typical removal of these compounds through advanced treatment, all regulated inorganic chemicals are expected to remain below the MCLs in the product water.

Table 8-2. Inorganic Primary MCL Exceedances in SC WWTF Secondary Effluent

Parameter	Units	MCL Value	Median SC WWTF Secondary Effluent Value	Maximum SC WWTF Secondary Effluent Value	No. of Samples (# of ND)	Minimum Removal Needed to Meet MCL	Estimated to Meet MCL? (Median/Max)[a]
Arsenic, total	mg/L	0.010	0.0019	0.015	29 (1)	33%	Y/Y
Nitrate	mg/L as N	10	9.3	24.6	233 (0)	59%	Y/Y
Nitrite	mg/L as N	1	1.4	5.4	230 (0)	81%	Y/Y
Nitrate + Nitrite	mg/L as N	10	10.9	26.1	230 (0)	62%	Y/Y

a. Based on observed removal rates during pilot testing for Pure Water Monterey Groundwater Replenishment Project AWPF, unless otherwise noted (Nellor Environmental Associates, Inc. et al. 2019).

8.2.1.2 Radionuclides

As shown in **Table 6-1**, all six of the radionuclides with MCLs were measured at concentrations below the MCLs in the SC WWTF secondary effluent. Given the water quality data and typical removal of these compounds through advanced treatment, radionuclides are expected to remain below the MCLs in the product water.

8.2.1.3 Volatile Organic Chemicals

As shown in **Table 6-1**, twenty-six of the VOCs were measured at concentrations below the MCL and one of the VOCs (1,4-dichlorobenzene), while non-detect, was analyzed with a method that has a higher detection limit than the MCL (EPA 524.2). Breitner et al. reported an RO rejection for 1,4-dichlorobenzene of 59 percent, and so considering the method detection limit (9.7 µg/L), this constituent would be removed to at least below the MCL of 5 µg/L (Breitner et al., 2019). Given the water quality data and typical removal of all the VOCs with MCLs through advanced treatment, all regulated VOCs are expected to remain below the MCLs in the product water.

8.2.1.4 Synthetic Organic Chemicals

As shown in **Table 6-1**, thirty-one of the SOCs were measured at concentrations below the MCL and one of the SOCs (pentachlorophenol), while non-detect, was measured using a method with detection limits greater than the MCL of 1 µg/L (detection limit of 1.2 µg/L, EPA 625.1). Pentachlorophenol has a relatively high molecular weight (266 gram-molecular [g/mol]) and is therefore expected to be well rejected through RO. Given the water quality data and typical removal of these compounds through advanced treatment, all regulated SOCs are expected to remain below the MCLs in the product water.

8.2.1.5 Disinfection Byproducts

These constituents will be monitored during operation of the AWPF. The treatment facilities are being designed to meet the MCL requirements for these constituents.

8.2.2 Constituents with sMCLs

As shown in **Table 6-2**, nine of the sMCL parameters were measured at concentrations below the sMCL and seven of the sMCL parameters were measured at concentrations higher than the sMCL. The seven compounds that exceeded the sMCL in the SC WWTF secondary effluent are summarized in **Table 8-3**. Given the water quality data and typical removal of these compounds through advanced treatment, all sMCL standards are expected to be met in the product water.

Table 8-3. Secondary MCL Exceedances in SC WWTF Secondary Effluent

Parameter	Units	sMCL Value	Median SC WWTF Secondary Effluent Value	Maximum SC WWTF Secondary Effluent Value	No. of Samples (# of ND)	Minimum Removal Needed to Meet sMCL	Estimated to Meet sMCL? (Median/Max)[a]
Color	Units	15	65	65	3 (0)	77%	Y/Y[b]
Odor-Threshold	TON	3	2	3	3 (0)	0%	Y/Y
Iron, Total	mg/L	0.3	0.19	0.54	34 (1)	44%	Y/Y
Manganese	mg/L	0.05	0.16	0.23	13(0)	78%	Y/Y
Turbidity	NTU	5	3.3	106	830 (0)	95%	Y/Y
TDS	mg/L	1000[c]	727	1,050	13 (0)	5%	Y/Y
Specific Conductance	µS/cm	1600[c]	1,300	1,930	13 (0)	17%	Y/Y

a. Based on observed removal rates during pilot testing for Pure Water Monterey Groundwater Replenishment Project AWPF, unless otherwise noted (Nellor Environmental Associates, Inc. et al., 2019).

b. Over 90% color removal by RO is expected (Abid et al., 2012).

c. Values shown represent the upper limit of the Consumer Acceptance Contaminant Level Range shown in Table 64449-B of the CCR Title 22 Criteria.

8.2.3 Lead and Copper ALs

The ALs for lead and copper are 0.015 mg/L and 1.3 mg/L, respectively. The maximum concentrations of lead and copper measured in the *raw wastewater* to the SC WWTF between 2015 to 2019 were 0.0022 mg/L and 0.1 mg/L, respectively. Additionally, all samples of lead and copper in the secondary effluent were below their respective ALs as shown in **Table 6-3**. Given that the concentrations of lead and copper in the secondary effluent were below the ALs and that RO will provide significant removal of lead and copper, the concentrations of these constituents in the purified water are also expected to be below the ALs.

8.2.4 Constituents with NLs

As shown in **Table 6-4**, twenty-eight of the constituents with NLs were measured at concentrations below the NL and four of the constituents with NLs were measured at concentrations higher than the NL. The four compounds that exceeded the NLs in the SC WWTF secondary effluent are summarized in **Table 8-4**. Given the water quality data and typical removal of these compounds through advanced treatment, constituents with NLs are expected to remain below the NLs in the product water.

Table 8-4. Notification Level Exceedances in SC WWTF Secondary Effluent

Parameter	Units	NL Value	Median SC WWTF Secondary Effluent Value	Maximum SC WWTF Secondary Effluent Value	No. of Samples (# of ND)	Minimum Removal Needed to Meet NL	Estimated to Meet NL? (Median/Max)[a]
1,4-Dioxane	µg/L	1.0	< 5 (0.88 for quantifiable results)	1.9[b]	13 (7)	0.3-log	Y/Y[c]
NDEA	ng/L	10	5.9	17	3 (1)	0.2-log	Y/Y[d]
NDMA	ng/L	10	<24	58	24 (20)	0.8-log	Y/Y[c]
PFOA	ng/L	5.1	5.7	6.5	3 (0)	22%	Y/Y[e]

a. Based on observed removal rates during pilot testing for Pure Water Monterey Groundwater Replenishment Project AWPF, unless otherwise noted (Nellor Environmental Associates, Inc. et al., 2019).

b. The seven non-detect results had a detection limit of 5 µg/L.

c. UV-AOP system is designed to achieve 0.6-log removal of 1,4-Dioxane and 2-log removal of NDMA.

d. Similar UV-AOP removal rates have been observed for NDEA and NDMA (Plumlee and Reinhard, 2007).

e. Over 90% rejection by RO is expected for constituents with a molecular weight greater than 200 g/mol (Zhang et al., 2020), where PFOA molecular weight = 414 g/mol and PFBS molecular weight = 300 g/mol.

It is known that ozonation and chloramination of secondary effluent can produce NDMA. However, 30-70% removal through RO is expected, and the PWS UV-AOP system has been designed to achieve an additional 2-log removal (99%) of NDMA after RO. Because pilot testing was not conducted for the PWS Project, the UV-AOP system was conservatively designed to provide 2-log reduction of NDMA based on experience from the PWM project (which was designed for 1.5-log reduction). This is a relevant point of comparison because the feed water quality and ozone system design for the PWS are similar to the PWM project. Based on the data collected during piloting for the PWM project, the maximum NDMA formation from ozone and chloramine exposure through the MF was 78 ng/L (See **Table 8-5**), whereas the maximum RO permeate concentration was 32 ng/L (Trussell 2016).

Table 8-5. Maximum NDMA Concentration Through the AWPF from M1W's Piloting (Trussell 2016)

Parameter	Units	Secondary Effluent	Ozone Effluent	MF Effluent	RO Permeate	UV-AOP Effluent Design
NDMA Concentration	ng/L	26	60	78	32	1[a]

a. The PWM project's UV-AOP system was designed to achieve 1.5-log reduction of NDMA considering the maximum detected RO permeate concentration with a target effluent concentration of 1 ng/L NDMA

The PWS design considered the potential for additional NDMA formation compared to the M1W piloting due to the longer pipeline between the SC WWTF and AWPF site at Chanticleer. The PWS UV-AOP system is designed to achieve 2.0-log removal of NDMA, which would allow for a maximum NDMA concentration in the RO permeate of 1,000 ng/L to achieve the notification level of 10 ng/L in the UV-AOP effluent. Based on the 32 ng/L of NDMA in the RO permeate in the M1W pilot along with allowing for significant potential NDMA formation in the pipeline between the SC WWTF and AWPF site at Chanticleer, the PWS UV-AOP design is sufficiently conservative to achieve a product water NDMA concentration of ≤ 10 ng/L.

8.2.5 Total Organic Carbon

The TOC concentration in the purified water may not exceed 0.5 mg/L, based on the 20-week running average of all TOC results, and the average of the last four TOC results. Furthermore, the RO permeate may not exceed 0.25 mg/L more than 5 percent of the time during the first twenty weeks of operation. As summarized in **Table 6-5**, TOC in the secondary effluent averaged 14 mg/L with a range of 8 to 33 mg/L.

The advanced treatment processes at the Chanticleer AWPF, including RO, are expected to bring the TOC levels down below 0.25 mg/L.

8.2.6 Total Nitrogen

TN concentrations in the product water may not exceed 10 mg/L. TN is the sum of NO_3-N, NO_2-N, and TKN, which is the sum of NH_3-N and organically bonded nitrogen. The historical concentrations of NO_3-N, NO_2-N, TKN, and TN in the secondary effluent are summarized in **Table 6-6**. A maximum total nitrogen concentration of 55.8 mg/L may be present in the AWPF feed water. However, the treatment facilities at the AWPF are specifically designed to achieve the total nitrogen requirement, with expected total nitrogen in the RO permeate of less than 10 mg/L as N.

8.2.7 Other Priority Pollutants and CECs

As described in **Section 6**, there are 126 constituents included in the EPA's priority pollutants list. **Tables 6-1**, **6-2**, and **6-4** summarize the historical water quality data for all of the inorganic and organic priority pollutants that are regulated for groundwater replenishment projects. The remaining constituents on the priority pollutants list, summarized in **Table 6-7**, are not regulated in product water for groundwater replenishment projects, so there are no relevant benchmarks or compliance requirements with which to compare the product water quality. However, given the water quality data and typical removal of these compounds through advanced treatment, the priority pollutants summarized in **Table 6-7** are expected to be well controlled.

As shown in **Table 6-8**, 102 of 489 CECs were detected in the secondary effluent at the SC WWTF. Based on water quality data and typical removal through advanced treatment, all detected CECs are expected to comply with the recommended monitoring trigger levels (MTLs) in the product water with the possible exception of quinoline. Not enough data are available to estimate quinoline concentrations in the purified product water.

8.3 Compliance with Basin Plan Requirements

The Basin Plan designates beneficial uses and water quality objectives for surface water and groundwater in the region. Permit limits for groundwater recharge projects are set to protect the groundwater quality from degradation, including concentrations of chemicals that adversely impact beneficial uses. The PWS Project will inject the purified water into the Basin (Basin No. 3-001). The Basin was identified by a basin modification that consolidated the following into one groundwater basin:

- Soquel Valley sub-basin
- Parts of the Pajaro Valley sub-basin
- Parts of the West Santa Cruz Terrace sub-basin
- Parts of the Purisima Highlands sub-basin

Of these formerly defined basins, the reference to the Soquel Valley Groundwater Basin is of particular interest for the PWS Project because that area uses the Purisima Formation aquifer as a major part of its water supply. The PWS Project will inject purified water into the Purisima aquifer, and thus the Soquel Valley Groundwater Basin beneficial uses and water quality objectives are most applicable for establishing regulatory requirements. As described in **Section 3.2**, the designated uses for the PWS Project's groundwater basins are: (1) MUN, (2) IND, and (3) AGR. Water quality objectives are associated with the designated uses of the basin.

8.3.1 General Narrative Objectives

The Basin Plan includes general narrative objectives for taste and odor and radioactivity that apply to all groundwater.

- Taste and odor-producing substances shall not be present in concentrations that adversely affect beneficial uses.
- Radionuclides shall not be present in concentrations that are harmful to or result in accumulation in the food chain so as to present a hazard for human, plant, animal, or aquatic life.

The PWS Project is expected to comply with these general narrative objectives through the application of RO followed by UV-AOP.

8.3.2 Drinking Water Standards

All of the groundwater basins in the PWS Project area are designated as MUN and must comply with Federal and State primary and secondary drinking water standards and coliform criteria.

- Inorganic chemicals shall not be at concentrations greater than the primary drinking water MCLs.
- Organic chemicals shall not be at concentrations greater than the primary drinking water MCLs for regulated organic compounds.
- Radioactivity shall not be at concentrations greater than the primary drinking water MCLs for radionuclides.
- Median concentration of total coliform bacteria over any 7-day period shall be less than 2.2 MPN/100 mL.

As described above, the PWS Project is expected to comply with the Federal and State drinking water standards as well as the coliform criteria. The concentrations of most of these constituents are below the regulatory limits in the secondary effluent. For any constituents that are present at concentrations above the regulatory limits in the secondary effluent, treatment through the PWS treatment train including ozone, RO, and UV-AOP is expected to reduce concentrations to below the regulatory limits.

8.3.3 Water Quality Objectives for Agricultural Water Supplies

Water quality objectives are set for AGR to protect the soil productivity and livestock. These guidelines are shown in **Table 8-6**. The Basin Plan describes these as flexible guidelines that are modified when warranted based on local experience or special conditions of crop, soil, and method of irrigation. As shown in **Table 8-6**, the anticipated AWPF product water quality for the majority of the guidelines falls into the "no problem" category. Two guidelines in the Basin Plan refer to permeability risks associated with agricultural irrigation use of water having a high SAR and low EC. The expected SAR for the stabilized purified water is 0.5, which is far below where research shows significant permeability effects, even with water low in EC.

Table 8-6. Guidelines for Interpretation of Quality of Water for Irrigation					
		Water Quality Guidelines			Anticipated AWPF Product Water Concentration
Problem	Related Constituent(s)	No Problem	Increasing Problems	Severe	
Salinity	EC (µS/cm)	< 750	750 – 3,000	> 3,000	200
Permeability	EC (µS/cm)	> 500	200 - 500	< 200	200
	SAR, adjusted	< 6.0	6.0 – 9.0	> 9.0	0.5
Specific Ion Toxicity from root absorption	Sodium (evaluate by adjusted SAR)	< 3	3.0 - 9.0	> 9.0	0.5
	Chloride (mg/L)	< 142	142 – 355	> 355	10.1
	Boron (mg/L)	< 0.5	0.5 - 2.0	2.0 - 10.0	0.4
Specific Ion Toxicity from foliar absorption	Sodium (mg/L)	< 69	> 69	--	20
	Chloride (mg/L)	< 106	> 106	--	10.1
Miscellaneous	Ammonia-N (mg/L)	< 5	5 - 30	> 30	2.85
	Nitrate-N (mg/L)	< 5	5 - 30	> 30	1.67
	Bicarbonate (mg/L)	< 90	90 - 520	> 520	49
	pH	Normal range is 6.5 - 8.4	--	--	7.5

In addition to the guidelines, there are also numerical water quality objectives for agricultural water use. **Table 8-7** shows these objectives for irrigation supply and livestock watering. Many of these parameters also have drinking water standards that are more stringent. It is expected the PWS Project will meet these objectives through the selected treatment train including RO and UV-AOP.

Table 8-7. Water Quality Objectives for Agricultural Water Use		
	Maximum Concentration (mg/L)	
Element	Irrigation Supply	Livestock Watering
Aluminum	5.0	5.0
Arsenic	0.1	0.2
Beryllium	0.1	--
Boron	0.75	5.0
Cadmium	0.01	0.05
Chromium	0.10	1.0
Cobalt	0.05	1.0
Copper	0.2	0.5
Fluoride	1.0	2.0
Iron	5.0	--
Lead	5.0	0.1
Lithium	2.5 (0.075 for citrus)	--
Manganese	0.2	--

Table 8-7. Water Quality Objectives for Agricultural Water Use

Element	Maximum Concentration (mg/L)	
	Irrigation Supply	Livestock Watering
Mercury	--	0.01
Molybdenum	0.01	0.5
Nickel	0.2	--
Nitrate + Nitrite	--	100
Nitrite	--	10
Selenium	0.02	0.05
Vanadium	0.1	0.10
Zinc	2.0	25

8.3.4 Numerical Water Objectives

In addition to the general narrative objectives, the Basin Plan also specifies several numerical water quality objectives that serve as a baseline to evaluate water quality management for some groundwater basins. The Basin Plan does not establish specific numeric water quality objectives for the previously defined Soquel Valley Groundwater Basin.

8.4 Compliance with SWRCB Recycled Water Policy

Originally adopted by the SWRCB in 2009, the "Water Quality Control Policy for Recycled Water" (aka Recycled Water Policy) has been amended twice, in 2013 and most recently in 2018 (SWRCB, 2018). The amended Recycled Water Policy establishes CEC monitoring requirements and MTLs for recycled water groundwater recharge projects.

For groundwater recharge projects with subsurface injection, there are four groups of constituents that must be monitored:

- Health-based CECs
- Performance-indicator CECs
- Surrogates
- Bioanalytical screening tools

Table 8-8 summarizes the parameters that must be monitored per the Recycled Water Policy and the corresponding MTLs. Given the water quality data and typical removal of these compounds through advanced treatment, all of these constituents are expected to remain below the MTLs in the product water.

Table 8-8. Recycled Water Policy Constituents								
Parameter	**Relevance/ Indicator Type/ Surrogate**	**Units**	**MTL Value/ Example Removal Percentage**	**Median SC WWTF Secondary Effluent Value**	**Maximum SC WWTF Secondary Effluent Value**	**No. of Samples (# of ND)**	**Minimum Removal Needed to Meet MTL**	**Estimated to Meet MTL? (Median/Max)[a]**
1,4-Dioxane	Health	µg/L	1	< 5 (0.88 for quantifiable results)	1.9[b]	13 (7)	0.3-logs	Y/Y[c]
NDMA	Health and Performance	µg/L	0.010	0.029	0.058	4 (0)	0.8-logs	Y/Y[c]
NMOR	Health	µg/L	0.012	0.039	0.093	15 (2)	0.9-logs	Y/Y[d]
PFOS	Health	µg/L	0.013	0.0036	0.0044	3 (0)	--	Y/Y
PFOA	Health	µg/L	0.014	0.0057	0.0065	3 (0)	--	Y/Y
Sucralose	Performance	µg/L	>90%[e]	37,000	68,000	12 (0)	--	--
Sulfameth-oxazole	Performance	µg/L	>90%[e]	1.3	2.7	12 (0)	--	--
EC	Surrogate	µS/cm	>90%[e]	1,380	2,650	67 (0)	--	--
DOC	Surrogate	µg/L	>90%[e]	14.7	16.7	13 (0)	--	--
UV Absorbance at 254 nm	Surrogate	cm^{-1}	>50%[e]	0.23	0.27	13 (0)	--	--

a. Based on observed removal rates during pilot testing for Pure Water Monterey Groundwater Replenishment Project AWPF, unless otherwise noted (Nellor Environmental Associates, Inc. et al., 2019).

b. The seven non-detect results had a detection limit of 5 µg/L

c. UV-AOP system designed to achieve 0.6-log removal of 1,4-Dioxane and 2-log removal of NDMA.

d. Similar UV-AOP removal rates have been observed for NMOR and NDMA (Sakai et al., 2017).

e. Project-specific removal percentages will be developed for each project during the initial and baseline monitoring phases.

In addition, bioanalytical screening tools must be used to evaluate the purified water prior to injection. **Table 8-9** summarizes the bioanalytical screening tools and their equivalency agonist as well as the MTLs.

Table 8-9. Bioanalytical Screening Tool Equivalency Agonists and MTLs		
Parameter	**Equivalency Agonist**	**MTL Value (ng/L)**
Estrogen receptor-α (ER-α)	17-beta-estradiol	3.5
Aryl hydrocarbon receptor (AhR)	TCDD	0.5

The PWS Project will adhere to monitoring requirements in the Recycled Water Policy and will follow the guidelines to determine appropriate responses based on the measured environmental concentrations to MTL ratios.

Section 9: Pathogenic Microorganism Control

The PWS Project facilities are designed to meet the necessary pathogen LRVs defined in Section 60320.208 of Division 4, Chapter 3, Article 5.2 of the Title 22 CCR for GRRPs using subsurface application via injection. GRRPs are required to achieve LRVs of at least 12, 10, and 10 (12/10/10) for enteric viruses, *Giardia* cysts, and *Cryptosporidium* oocysts, respectively. The 12/10/10 requirement must be met using a multiple-barrier approach including the following conditions:

- A minimum of three separate treatment processes must provide at least 1-log reduction for each pathogen
- Each treatment process may be credited with no more than 6-log reduction for each pathogen
- Up to 1-log reduction of virus will be credited for each month of retention time in the aquifer, but not more than 6-log reduction of virus

The proposed pathogen LRVs for each treatment process, the surrogates used to credit and verify pathogen log-reduction performance, and the LRVs associated with underground retention time are discussed in this section.

Pathogen LRV credits are not being developed for the following processes at this time:

- Primary and secondary treatment at the SC WWTF
- Ozone pretreatment at the AWPF
- Chlorine disinfection through the Source Water Pipeline between the SC WWTF and the AWPF
- Chlorine disinfection in the Purified Water Pipeline after the AWPF

9.1 Advanced Water Purification Facility

Pathogen log reduction credits are proposed for the AWPF for the following treatment processes:

- MF
- RO
- UV-AOP

9.1.1 Membrane Filtration

MF serves as the first of three credited treatment process barriers for removal of pathogens. MF is being designed to achieve a minimum LRV of 4.0 for both *Giardia* cysts and *Cryptosporidium* oocysts. Performance surrogates include direct membrane integrity testing (MIT) and indirect filtrate turbidity monitoring. The daily MIT is being designed to provide a direct measurement of system integrity with sufficient sensitivity to detect 3-µm defects in the membrane hollow fibers. Effluent turbidity monitoring provides a continuous, indirect indicator of system integrity.

Drinking water regulations and guidance provide a framework for crediting MF with *Giardia* cyst and *Cryptosporidium* oocyst LRVs. The California Surface Water Treatment Rule (SWTR) allows the use of MF as an alternative filtration technology, provided the technology demonstrates at least 1-log reduction of virus, 2-log reduction of *Giardia* cysts, 2-log reduction of *Cryptosporidium* oocysts, and meets certain turbidity performance standards per Section 64653(e-i) in Division 4, Chapter 17, Article 2 of the CCR. California and

the federal LT2ESWTR provide further regulations and guidance on crediting LRVs for *Cryptosporidium* oocysts. Pathogen removal for MF is based on product-specific performance challenge tests conducted by the membrane manufacturer. The USEPA *Membrane Filtration Guidance Manual* (USEPA, 2005) provides detailed guidelines for performing pathogen removal challenge tests on MF to determine LRVs.

In addition to membrane manufacturer product-specific challenge tests, the state and federal LT2ESWTR require that the MF system regularly pass both direct and indirect integrity testing to verify and receive pathogen log-reduction credits.

Indirect Integrity Testing - Continuous Filtrate Turbidity Monitoring

Indirect integrity testing will be achieved through continuous MF filtrate turbidity monitoring. Online turbidimeters will provide measurements of the filtrate turbidity for each MF unit based on a 15-minute running average to determine if the following turbidity requirements are met:

- Does not exceed 0.2 NTU more than 5 percent of the time within a 24-hour period
- Does not exceed 0.5 NTU at any time

If either turbidity limit is exceeded for a reasonable period (i.e., exceeding a 15-minute alarm delay timer), the unit will be taken offline and then a MIT will be triggered (in accordance with USEPA, 2005) and the unit will remain offline until it is repaired and/or passes the MIT.

Direct Integrity Testing – Membrane Integrity Test

Direct integrity testing will be conducted through a PDT (a type of MIT). PDTs are performed on one MF unit at a time. The test is conducted as follows:

- Isolate the unit and portion of the system that is to be tested
- Pressurize the system with air
- Measure the pressure decay rate over a period of time

This method directly measures the extent of breaches 3-µm in size or larger in the membrane fibers. The 3 µm resolution allows for detection of breaches that could allow *Cryptosporidium* oocysts to pass through (3 µm to 7 µm) as well as *Giardia* cysts (5µm to 15 µm). PDTs will be conducted daily to quantify the LRV for each train. If the PDT fails, the train will be taken out of service for maintenance and/or repair.

The pressure decay rate and other parameters are used to calculate the LRV per the methodology of the *Membrane Filtration Guidance Manual* (USEPA, 2005). The PDT and LRV calculations described in the Guidance Manual will be followed for the Project. The following equations will be used, and the specific parameters relevant for the selected MF membranes (DuPont SFD-2880 XP) will be provided in the OOP. This resource defines the minimum applied test pressure necessary to detect a 3 µm breach as follows:

$$P_{test} = (0.193 \times \kappa \times \sigma \times \cos\theta) + BP_{max} \qquad \text{Eqn. 4.1 of EPA 2005}$$

Where,

P_{test} = minimum test pressure (psi)

κ = pore shape correction factor

σ = surface tension at air-liquid interface (dynes/cm)

θ = liquid-membrane contact angle (degrees)

BP_{max} = maximum backpressure on system during test (psi)

0.193 = constant that includes defect diameter (i.e., 3 µm resolution requirement) and unit conversion factors

The sensitivity of the PDT is system-specific and is calculated using the following equations. The PDT sensitivity is an important component of the test because it determines the maximum log reduction credit that can be awarded to the MF system—the PDT sensitivity must be greater than the log reduction credits sought.

$$LRV_{DIT} = \log\left(\frac{Q_p \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right) \quad \text{Eqn. 4.9 of EPA 2005}$$

$$ALCR = 170 \times Y \times \sqrt{\frac{(P_{test} - BP) \times (P_{test} + P_{atm})}{(460 + T) \times TMP}} \quad \text{Eqn. C.4 of EPA 2005}$$

$$Y \propto \left[\frac{1}{\left(\frac{P_{test} - BP}{P_{test} + P_{atm}}\right)}, K\right] \quad \text{Eqn. C.5 of EPA 2005}$$

$$K = f \times \frac{L}{d_{fiber}} \quad \text{Eqn. C.6 of EPA 2005}$$

where,

LRV_{DIT} = direct integrity test sensitivity in terms of LRV

Q_P = membrane unit design capacity filtrate flow (gpm)

ALCR = air liquid conversion ratio

P_{atm} = atmospheric pressure (psia)

ΔP_{test} = smallest rate of pressure decay that can be reliably measured and associated with a known integrity breach during an integrity test (psi/min)

V_{sys} = volume of pressurized air in the system during the test (gal)

VCF = volumetric concentration factor (dimensionless)

Y = net expansion factor for compressible flow through a pipe to a larger area (dimensionless)

P_{test} = direct integrity test pressure (psi)

BP = minimum backpressure (psi)

T = maximum anticipated temperature (°F)

TMP = maximum allowable transmembrane pressure (psi)

K = flow resistance coefficient

f = friction factor

L = length of defect (mm)

d_{fiber} = fiber diameter (mm)

The LT2ESWTR mandated control limit, or the upper control limit (UCL), is used as an indicator of a potential problem with the MF system and is calculated as part of the PDT. If the pressure decay observed during the PDT is below the UCL, the membrane is capable of achieving the LRV credit assigned to the process. If the pressure decay is above the UCL, the membrane must be taken offline for testing and repair (EPA 2005). The UCL is calculated as follows:

$$UCL = \frac{Q_p \times ALCR \times P_{atm}}{10^{LRV} \times V_{sys} \times VCF} \quad \text{Eqn. 4.17 of EPA 2005}$$

where,

UCL = upper control limit in terms of pressure decay rate (psi/minute)

LRV = log reduction credit

Q_P = membrane unit design capacity filtrate flow (gpm)

ALCR = air liquid conversion ratio

P_{atm} = atmospheric pressure (psia)

V_{sys} = volume of pressurized air in the system during the test (gal)

VCF = volumetric concentration factor (dimensionless)

The LRV for the MF system will be calculated based on Eqn. 4.9 of EPA 2005 (below), where the pressure decay rate and water temperature are determined at each PDT:

$$LRV = \log\left(\frac{Q_p \times ALCR \times P_{atm}}{\Delta P_{test} \times V_{sys} \times VCF}\right) \qquad \text{Eqn. 4.9 of EPA 2005}$$

where,

LRV = log reduction value

Q_P = membrane unit design capacity filtrate flow (gpm)

ALCR = air liquid conversion ratio

P_{atm} = atmospheric pressure (psia)

ΔP_{test} = measured test decay rate (psi/min)

V_{sys} = volume of pressurized air in the system during the test (gal)

VCF = volumetric concentration factor (dimensionless)

9.1.2 Reverse Osmosis

RO serves as the second of three credited treatment process barriers for the removal of pathogens. RO is typically credited with 1.0 to 1.5 LRV each for viruses, *Giardia* cysts and *Cryptosporidium* oocysts depending on the surrogate used. RO process performance for pathogen removal will be confirmed through measurement of a conservative surrogate parameter that demonstrates the integrity of the RO membranes. Potable reuse treatment facilities in California have traditionally used EC and TOC. The PWS Project will use both TOC and EC as surrogates, and both surrogates will be continuously monitored in case analyzers fail or need to be taken offline. In operation, the surrogate that provides the larger LRV will be used for determining the actual LRV for RO, which is expected to be TOC. If both surrogates show a failure to achieve a minimum LRV of 1.0 for a reasonable period (i.e., exceeding a 15-minute alarm delay timer), the RO train will be taken offline for further evaluation and repair, as needed. The RO LRV determinations are summarized in **Table 9-1** for TOC (Tier 1) and EC (Tier 2).

Table 9-1. RO LRV Determination

	Tier 1	Tier 2
Surrogate	TOC	EC
Frequency	Continuous (every ~8 minutes per TOC analyzer cycle)	Continuous (15-minute running average)
Monitoring Location	Combined RO feed and combined RO permeate	Combined RO feed and RO permeate for each train
Instantaneous LRV Calculation	=log(TOCROP/TOCROF) for combined ROF and ROP	= lowest of log(ECROP/ECROF) for each RO train
Expected LRV for V/G/C	≥1.5 (below this triggers an alarm)	≥1.0 (below this triggers an alarm)
LRV Awarded to RO		• The greater of the calculated LRV from TOC and EC will be used • In the event the TOC analyzer fails, only EC will be used • If LRV is <1.0, then AWPF will go to off-spec • Daily pathogen LRV reported to DDW will be based on daily average TOC log reduction and lowest EC log reduction for the day

First Surrogate - TOC

Based on the SC WWTF secondary effluent TOC values, TOC LRVs by the RO process in excess of 2.0 may be typical; however, for conservative planning purposes, a minimum LRV of 1.5 is assumed. TOC will be monitored using online analyzers at the combined RO feed and combined RO permeate.

Second Surrogate – EC

Based on the SC WWTF secondary effluent ionic composition, EC LRVs by the RO process may exceed 1.5; however, for conservative planning purposes, a minimum LRV of 1.0 is assumed. The credited EC LRV for the RO system will be that of the lowest RO train EC LRV, monitored using online analyzers at the RO feed and RO permeate of individual trains.

Additional information about the EC and TOC analyzer operations and maintenance (including calibration frequency and approach) will be provided in the OOP. In addition, RO profiling will be conducted to establish the baseline permeate conductivity values for new, intact vessels. It is recommended that RO profiling also be conducted on a routine basis to track membrane aging. To verify the integrity of the membranes: on a quarterly basis, measure and record the conductivity of the RO permeate from each of the vessels using a calibrated handheld conductivity analyzer. During this testing, the conductivity of the RO feed should be measured periodically; one feed measurement per bank is sufficient. Quarterly grab samples of the RO feed, concentrate and permeate should be sent to the laboratory to be tested for a suite of inorganics. This information can be used to track rejection of minerals by the membrane over time to help understand when the membranes will need to be replaced. In addition, it can be used to calculate recovery, which provides an additional check to verify the flow meters. Lastly, the data can be used to continually optimize threshold inhibitor doses and the feed pH setpoint.

9.1.3 UV-AOP

UV-AOP serves as the third of three credited treatment barriers for the control of pathogens. UV-AOP is designed to achieve a 6.0 LRV credit each for virus, *Giardia* cysts and *Cryptosporidium* oocysts. The USEPA's *UV Disinfection Guidance Manual* (USEPA, 2006) previously specified the UV dose requirements for achieving up to 4.0 LRVs each for virus, *Giardia* cysts, and *Cryptosporidium* oocysts. The new USEPA report, *Innovative Approaches for Validation of UV Disinfection Reactors for Drinking Water Systems* (Wright et al., 2020) provides UV dose requirements for achieving up to 6.0 LRVs each for virus, *Giardia* cysts, and *Cryptosporidium* oocysts as shown in **Table 9-2**. Viruses require the highest UV dose among the three target pathogens at 276 mJ/cm^2 to achieve 6.0 LRV.

Table 9-2. UV Dose Requirements (mJ/cm^2) for Log Inactivation Credit

Target Pathogens	Log Inactivation[a]											
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
***Cryptosporidium* oocysts**	1.6	2.5	3.9	5.8	8.5	12	15	22	30	45	64	85
***Giardia* cysts**	1.5	2.1	3	5.2	7.7	11	15	22	28	42	60	84
Virus	39	58	79	100	121	143	163	186	208	231	253	276

a. From Table 2.4 of Wright et al., 2020. Data based on USEPA 2003 and Qian et al., 2004.

UV-AOP requires UV doses higher than 276 mJ/cm^2 to meet the 0.5-log removal requirement for 1,4-dioxane and the product water limit for NDMA. For this Project, the design UV dose will be over 1,000 mJ/cm^2 to achieve the removal of greater than 0.6 log 1,4-dioxane and greater than 2 log NDMA. The design UV dose will be confirmed during UV-AOP challenge testing conducted during facility startup. The high UV-

AOP UV dose required for advanced oxidation of 1,4-dioxane and photolysis of NDMA provides a UV dose in excess of that required for 6.0 LRV each for virus, *Giardia* cysts and *Cryptosporidium* oocysts.

The UV reactor selected for the PWS Project will be required to have been previously validated per the USEPA *UV Disinfection Guidance Manual* (USEPA, 2006) requirements. Real-time monitoring and control of UV dose (or other DDW-approved method) will be used to ensure the minimum UV dose requirements are met for both pathogen and AOP compliance. If the UV dose decreases below these requirements or the reactor operates outside of the validated envelope for a reasonable time period (i.e., exceeding a 15-minute alarm delay timer), then the UV reactor will be taken offline or the AWPF will divert the off-specification effluent and/or shutdown. The UV-AOP system also has minimum UVT and flow rate requirements that will be continuously monitored to confirm the system is within the validation envelope.

9.2 Underground Retention Time

Based on refined particle tracking, the shortest estimated retention time between a SWIP well and a drinking water well is 33 months, as described in **Section 11.3.1**. A credit of 0.25 virus LRV per month is used for analytical equations and is assigned to the retention time estimates for the PWS Project. This would result in a total virus LRV of 8; however, the LRV is capped at 6. Within three months after the PWS Project begins operation, a tracer study will be conducted to verify the underground retention time.

Modeled Underground Retention Time

The PWS Project includes three SWIP wells that recharge Purisima aquifer subunits A and BC. The estimated retention times are based on both numerical modeling results and analytical equations, which are described in **Section 11**. A refined numerical modelling approach was used to estimate the retention times for the PWS Project, as described in the PWS Phase 2 Modeling Report (M&A, 2020) (included in **Appendix E**). The shortest retention time from the Monterey SWIP wells to the nearest private well is 33 months. The refined particle tracking indicates that the shortest retention time to the nearest municipal pumping wells is greater than 36 months and based on analytical equations, the retention times to municipal wells are at least 52 months. The PWS Project is proposing 6.0 virus LRV in the aquifer based on the modeling results described in **Section 11.3.1** and a virus log reduction credit of 0.25 per month.

Tracer Study

To demonstrate the retention time in the aquifer per Section 60320.208(d) of the CCR, a tracer study using either an added tracer or a DDW-approved intrinsic tracer will be conducted. The virus log reduction per month of retention time is 0.67 and 1.0 for intrinsic and added tracers, respectively. The retention time from the tracer study is the time representing the difference between when the water containing the tracer is applied at the SWIP wells to when either:

- Two percent of the initially introduced tracer concentration has reached the downgradient monitoring point, or
- Ten percent of the peak tracer unit value arrives at the downgradient monitoring point

The PWS Project will submit a tracer study work plan for DDW for approval prior to initiating the work. The tracer study will be initiated prior to the end of the third month of operation.

9.3 Pathogen LRV Summary

The pathogen LRVs for the PWS Project are summarized in **Table 9-3**. Total pathogen LRVs for the PWS Project exceed the 12/10/10 requirements.

Table 9-3. Pathogen Log-Reduction Credit Summary

Treatment Process	Crediting Method	LRVs		
		Virus	*Giardia*	*Cryptosporidium*
Primary and Secondary Treatment	Credit currently not pursued	0.0	0.0	0.0
Ozone	Credit currently not pursued	0.0	0.0	0.0
Source Water Pipeline Chloramine Disinfection	Credit currently not pursued	0.0	0.0	0.0
MF	Direct Monitoring (Daily PDT) and Indirect Monitoring (Continuous Filtrate Turbidity Monitoring)	0.0	4.0	4.0
RO[a]	Online Monitoring (TOC and EC)	1.5	1.5	1.5
UV-AOP	UV Dose (through monitoring of UVT, UV intensity, and flow rate) or DDW-approved alternative	6.0	6.0	6.0
Purified Water Pipeline Chlorine Disinfection	Credit currently not pursued	0.0	0.0	0.0
Underground Retention Time	Refined particle tracking and Analytical equations	6.0	0.0	0.0
PWS Project LRVs		13.5	11.5	11.5
Required LRVs		12.0	10.0	10.0

a. Credits shown assuming TOC as surrogate parameter. If EC is surrogate parameter, credits would be 1.0/1.0/1.0 but would still meet required LRV of 12.0/10.0/10.0

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Section 10: Hydrogeologic Setting

The section below describes the Project area setting with respect to hydrogeology and groundwater use. This information informs analysis of the SWIP wells by describing geological structure and flow mechanisms affecting the Project including underlying aquifer units, surface hydrology, and water use. Information summarized here is used in planning groundwater monitoring facilities and in the evaluation of potential impacts to drinking water wells in nearby proximity to the SWIP wells.

10.1 Groundwater Basin and Regional Hydrogeology

The SWIP recharge wells are located in the Basin as identified by the California DWR in *Bulletin 118 Interim Update 2016*. The Basin is classified as a high priority basin and therefore subject to the requirements of the SGMA. The Santa Cruz MGA is the exclusive Groundwater Sustainability Agency to manage the Basin under SGMA. SqCWD is one of four member agencies of the MGA.

DWR has designated the Basin as critically overdrafted due to seawater intrusion. Therefore, the MGA adopted in November 2019 the GSP for submittal to DWR by the SGMA deadline of January 31, 2020 for critically overdrafted basins. The State announced approval of the GSP on June 3, 2021. SGMA requires that the Basin achieve sustainability by 2040 and the GSP includes the PWS Project as part of the plan to achieve sustainability by eliminating undesirable results for seawater intrusion. Much of the information below is adapted from the GSP.

10.1.1 Geologic Setting

The Basin's geologic setting is characterized by sedimentary formations consistent with the larger Coast Range geology. The primary Basin formation that PWS SWIP wells will recharge is the Purisima Formation. Various forms of quaternary alluvium overlie the Purisima, including the Aromas Red Sands which is considered a significant aquifer.

The Purisima Formation is a Pliocene to late Miocene age sequence of grey-blue, moderately consolidated, fine to medium grained sandstones containing siltstone and claystone interbeds. This Formation underlies the entire Project area and has a thickness of up to 2,000 ft, though it is blanketed by the Aromas Red Sands in the eastern Project area and by relatively shallow intermittent alluvial and terrace deposits elsewhere. Within the Basin, the Purisima Formation dips to the southeast at approximately 4 degrees. This dip results in remnants of the lower-most strata occurring only along ridge tops west of the study area.

The Aromas Red Sands are a Pleistocene age hydrogeologically significant quaternary formation that overlie the Purisima Formation in the hills and coastal terraces east of Valencia Creek (**Figure 10-1**). Aromas Red Sands comprises interbedded fluvial and aeolian sediments that are generally brown to red, poorly consolidated, fine- to coarse-grained sands containing lenses of silt and clay. The Aromas Red Sands are assumed to be flat lying with a thickness of approximately 400 ft.

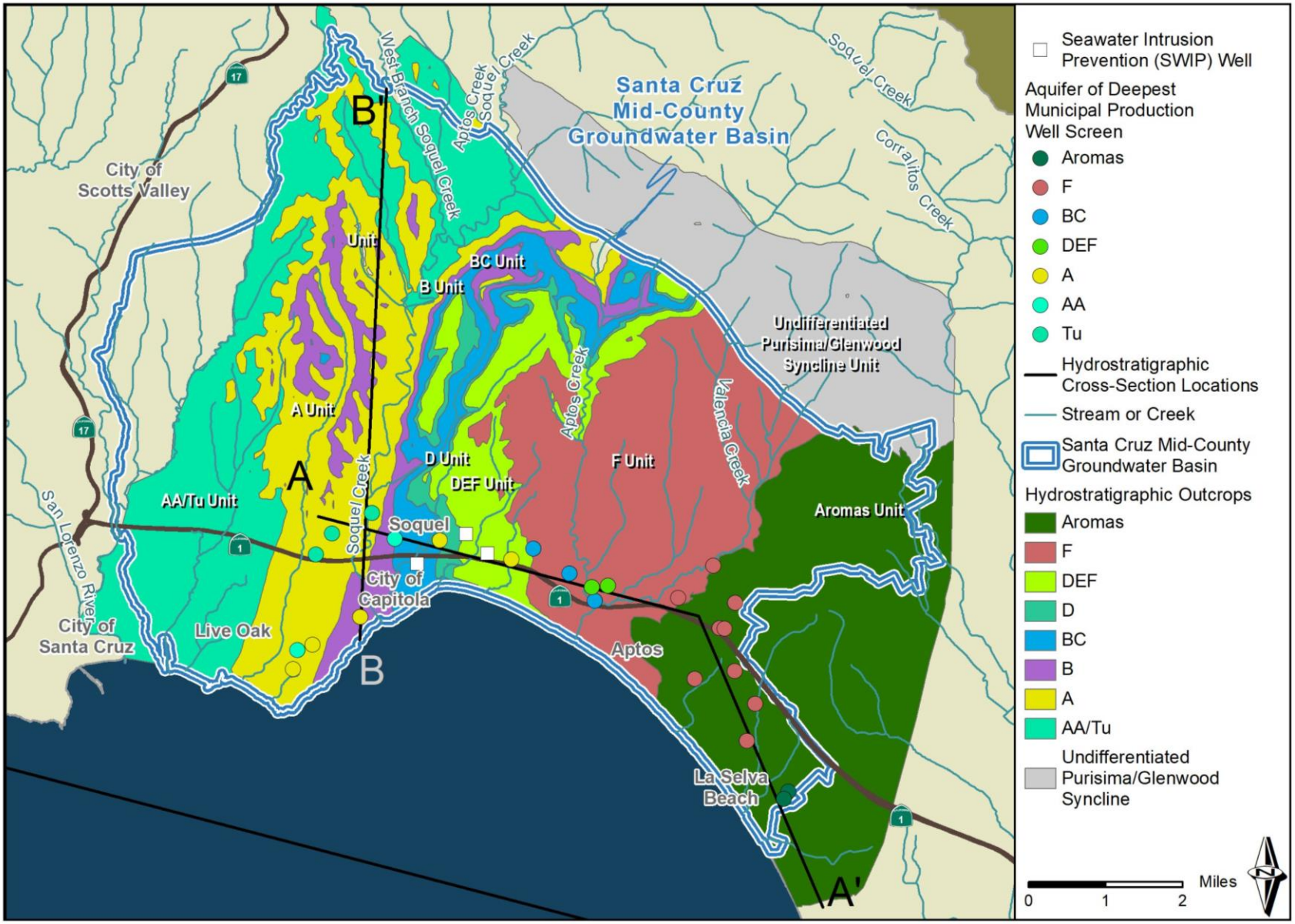

Figure 10-1. Aquifer and aquitard distribution in Santa Cruz Mid-County Basin and cross-section locations (adapted from MGA, 2019)

Apart from the Aromas Red Sands, quaternary surficial deposits overlying the Purisima Formation include colluvium, alluvium, flood plain deposits, beach sands, and terrace deposits.

10.1.2 Basin Hydrostratigraphy

Hydrostratigraphy for the Basin is dominated by the Purisima Formation, which contains a series of principal aquifers and aquitards as summarized in **Table 10-1**. Other principal aquifer units include the Aromas Red Sands overlying the Purisima Formation and Tu unit underlying the Purisima Formation.

Table 10-1. Aquifer and Aquitard Units of Santa Cruz Mid-County Basin

Hydrostratigraphic Unit	Aquifer or Aquitard	Approximate Thickness (ft)
Aromas red sands formation	Aquifer	400
Purisima-F unit	Aquifer	500+
Purisima-DEF unit	Aquifer	330
Purisima-D unit	Aquitard	80
Purisima-BC unit	Aquifer	200
Purisima-B unit	Aquitard	150
Purisima-A unit	Aquifer	250
Purisima-AA unit	Aquifer	150 - 300
Tu unit	Aquifer	10 - 3,000

Purisima Formation hydrostratigraphic units shown on **Figure 10-1** are based on Johnson et al. (Johnson et al., 2004). The hydrostratigraphic units are not always observed at the surface as they are often covered by alluvium or coastal terrace deposits. Hydrostratigraphic cross-sections on **Figure 10-2** and **Figure 10-3** illustrate the aquifer and aquitard units of the Basin. These figures are presented as an overview of the regional hydrostratigraphy.

10.1.3 Basin Hydrology

The Basin's climate is characterized by warm, mostly dry summers and mild, wet winters. Due to its proximity to Monterey Bay, fog and low overcast often occur during the night and morning hours, especially in the summer. The majority of seasonal rainfall occurs between November and March. Annual rainfall recorded at the Santa Cruz Co-op station within the Basin averages 29.3 inches. In the Santa Cruz Mountains, rainfall averages nearly 50 inches per year. However, rainfall varies greatly from year to year.

Figure 10-4 displays significant surface water bodies in the Basin and surrounding area. The major surface water features in the Basin are Soquel Creek, Aptos Creek, and Valencia Creek. The headwaters of these creeks originate far north of the Project area in the Santa Cruz Mountains. The SWIP wells are located within the Soquel Creek watershed, between Soquel Creek and Aptos Creek. Soquel Creek and Aptos Creek are respectively located roughly one mile west and east of the SWIP wells. Basin creeks are not used as municipal surface water supply.

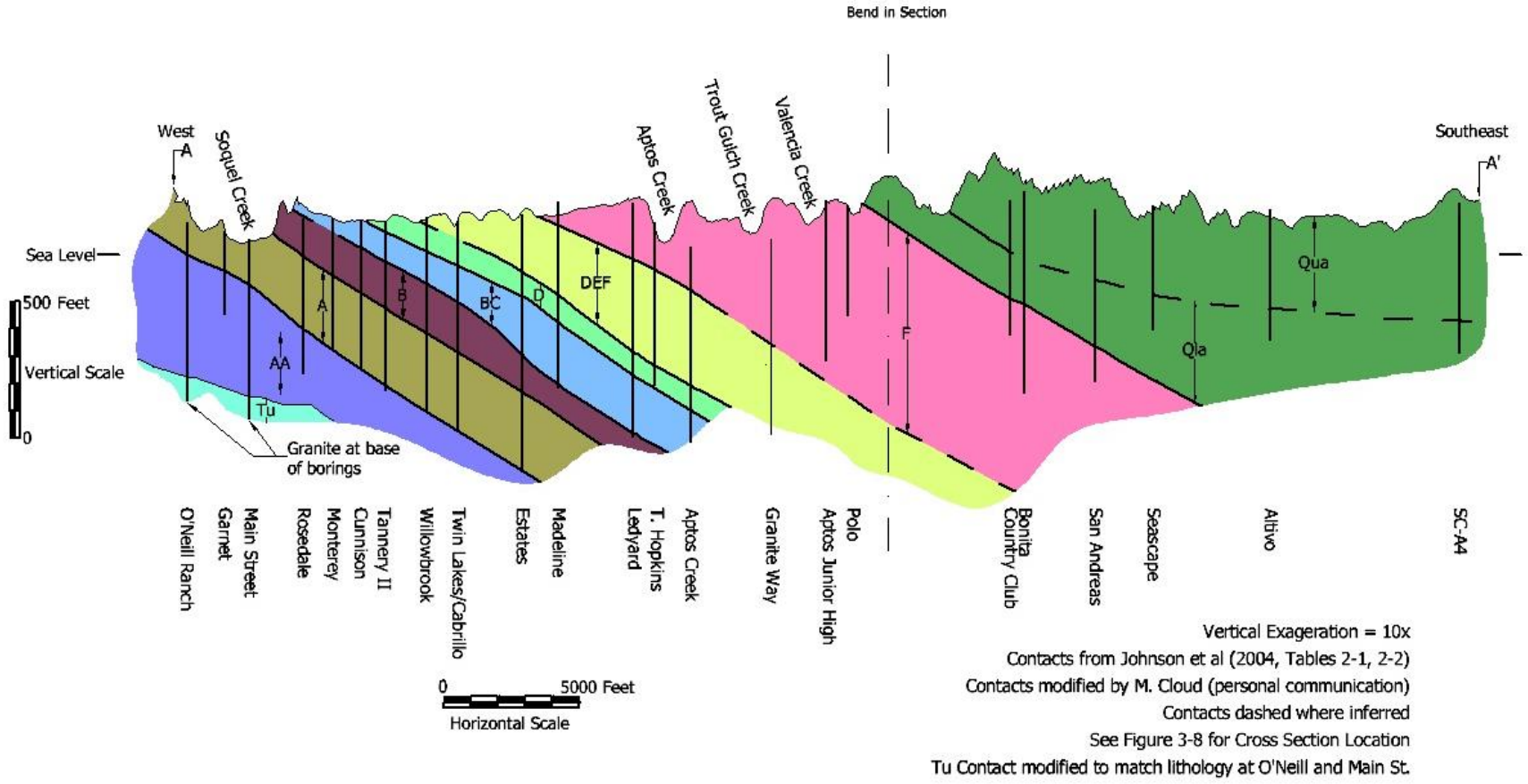

Figure 10-2. Santa Cruz Mid-County Basin Hydrostratigraphic cross-section, A-A' (MGA, 2019)

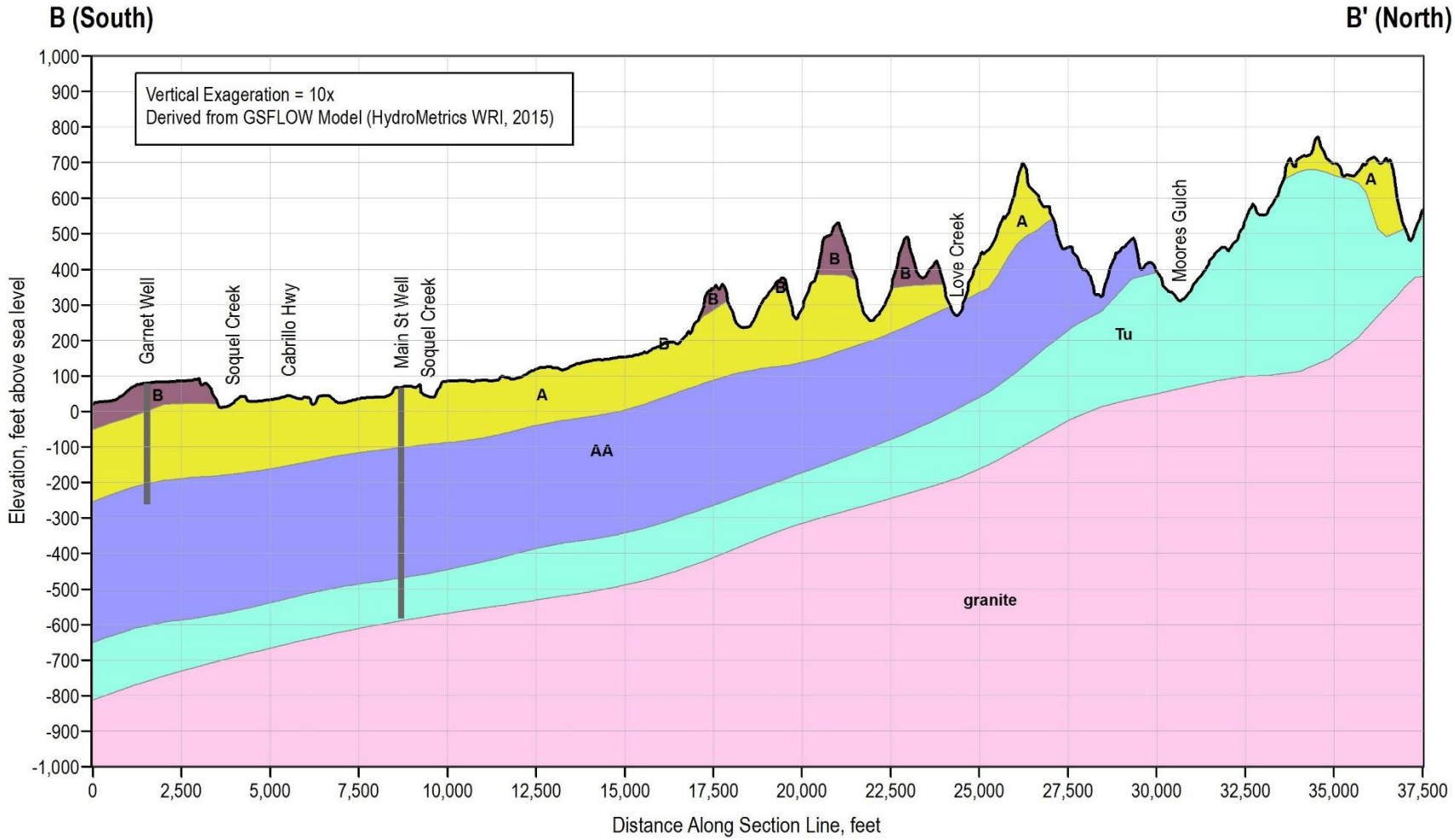

Figure 10-3. Santa Cruz Mid-County Basin Hydrostratigraphic cross-section, B-B' (MGA, 2019)

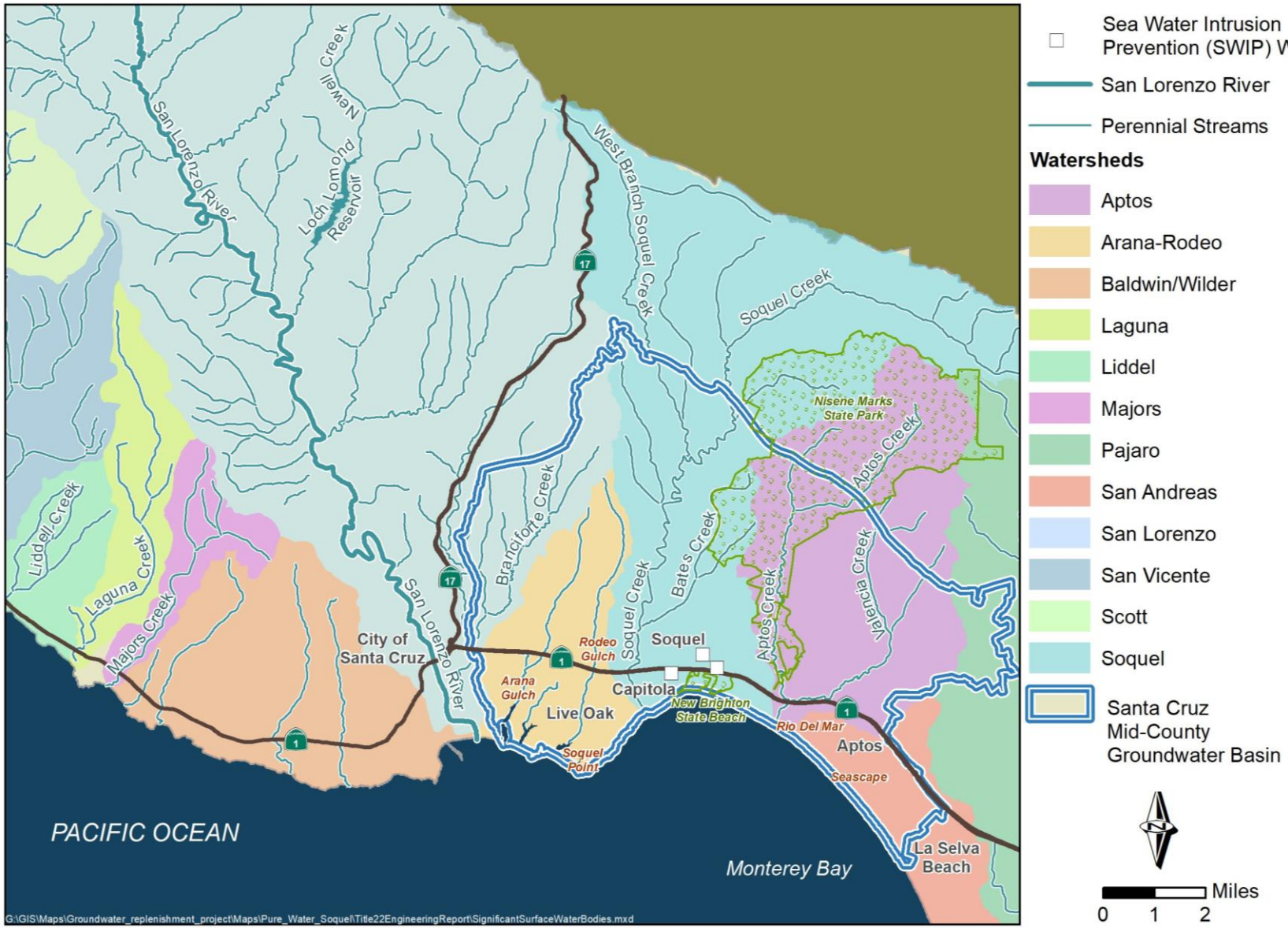

Figure 10-4. Surface water features in Santa Cruz Mid-County Basin (adapted from MGA, 2019)

10.1.4 Land Use and Water Use

The Basin includes a portion of the City, all of the City of Capitola, and unincorporated areas of Santa Cruz County. Land use is predominantly residential (50 percent) and open space/parks (34 percent), with limited commercial (8 percent) and agriculture (2 percent). Land use is further divided between urban and rural areas; development densities are greatest in the urban/suburban areas located on the coastal terraces, with much lower densities in the rural areas in the foothills and mountains.

All the major water supply purveyors in Santa Cruz County rely on local sources and import no water from outside the County. Estimated population within the Basin is 92,000 (Association of Monterey Bay Area Governments, 2018). Approximately 80,500 residents (88 percent) receive water from municipal suppliers and 11,600 residents are supplied by private wells or small water systems. Roughly 50,000 Basin residents (54 percent) rely solely upon groundwater. The remaining 42,000 residents are served by the City, with approximately 95 percent of its supply sourced from surface water from outside the Basin and 5 percent from groundwater within the Basin (Water Systems Consulting, 2016).

10.1.5 Seawater Intrusion

As introduced above, the Basin is classified as critically overdrafted by DWR due to seawater intrusion. Over-pumping of Basin aquifers dating back to the 1980s lowered groundwater elevations in the coastal portions of the Basin where the majority of municipal pumping takes place. Lowered groundwater levels allowed seawater intrusion into portions of the Basin and continues to pose a threat of more widespread seawater intrusion and contamination of the fresh groundwater supply.

Seawater intrusion is a concern for both the Purisima and Aromas formations, as the aquifers are hydrologically connected to the Pacific Ocean. Both the Purisima and Aromas Red Sands have been impacted by seawater intrusion. The Purisima A-unit aquifer has experienced seawater intrusion at Soquel Point and the Aromas Red Sands aquifer has ongoing seawater intrusion from SC-A8 to SC-A4.

The potential for seawater intrusion in coastal monitoring wells in the Project area is presented in **Figure 10-5**. This analysis indicates that seawater intrusion is an active threat along the Basin's entire coastal margin based on geophysical research (Ramboll, 2018), groundwater elevations, and groundwater modeling (Hydrometrics, 2018). Analysis indicates the highest risk of additional long-term seawater intrusion in SqCWD is near SC-5A, which is the closest coastal monitoring wells to the planned location of the SWIP wells.

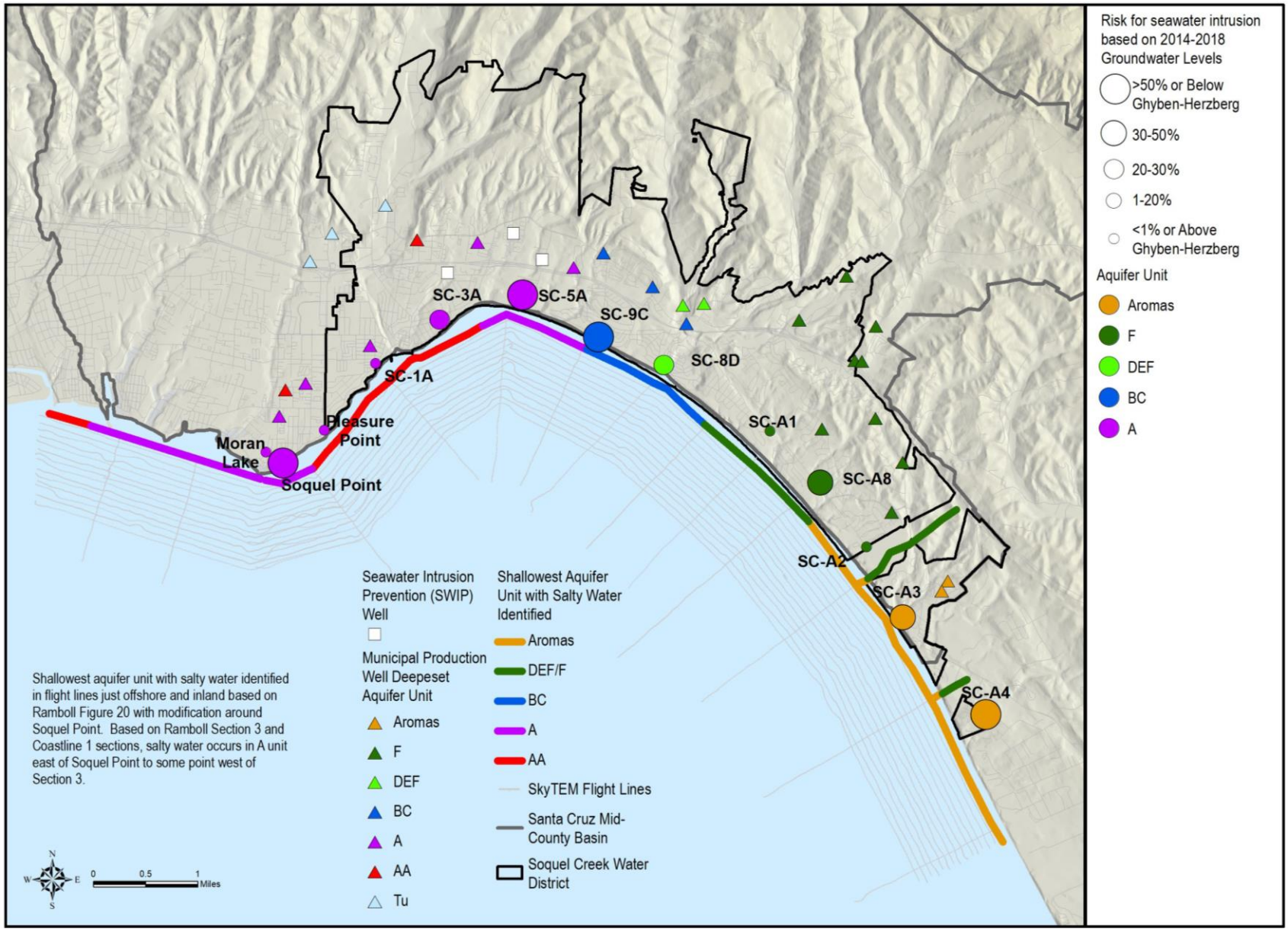

Figure 10-5. Seawater intrusion risk in the Santa Cruz Mid-County Basin

10.1.6 Groundwater Sustainability Plan

The MGA submitted the mandated Basin GSP to DWR in January 2020. The GSP establishes sustainable management criteria for sustainability indicators such as seawater intrusion and groundwater quality. The GSP also describes the extensive existing monitoring network used to monitor groundwater conditions in the Basin. The GSP includes projects and management actions to achieve sustainability by 2040.

As the Basin is in critical overdraft to seawater intrusion, the GSP indicates multiple metrics for this sustainability indicator. The GSP establishes minimum threshold (MT) isocontours of the secondary MCL for chloride of 250 mg/L that avoid significant and unreasonable conditions defined as seawater intrusion moving farther inland than observed from 2013-17. The GSP also identifies undesirable results based on MT for chloride concentrations at representative monitoring points and groundwater elevation proxies for preventing seawater intrusion. Groundwater elevation proxies for measurable objectives will provide operational flexibility to avoid undesirable results. The PWS Project aims to achieve these measurable objectives at representative monitoring points in SqCWD.

The GSP also defines significant and unreasonable conditions for groundwater quality as failing to meet state drinking water standards as a result of groundwater pumping or managed aquifer recharge. Sustainable management criteria are concentrations based on drinking water standards and historical concentrations for individual constituents.

Other relevant sustainability indicators include chronic depletion of groundwater levels, reduction of groundwater in storage, and depletion of interconnected surface water. As required by the GSP regulations, the sustainability management criteria for reduction of groundwater in storage is based on volume that can be extracted from the Basin (sustainable yield) without causing undesirable results. The GSP establishes groundwater elevation proxies at shallow groundwater wells as sustainable management criteria for avoiding depletion of surface water due to pumping greater than what occurred from 2001-15. Subsidence is not an applicable sustainability indicator in the Basin.

The existing monitoring network described by the GSP is laterally and vertically extensive across the Basin and meets most of the needs for representative monitoring points for the GSP. The GSP does identify two additional deep wells for monitoring seawater intrusion, and several shallow groundwater wells and stream gauges for monitoring streamflow depletion. The GSP also describes a new well metering program for private non-de minimis pumpers.

The GSP includes PWS as a planned project and management action for achieving sustainability. The GSP uses the groundwater model of the Basin to evaluate groundwater sustainability benefits from PWS under future conditions. The GSP concludes that PWS will reduce undesirable results for seawater intrusion by raising groundwater elevations above MT at coastal monitoring wells throughout SqCWD. The GSP also shows PWS benefits for streamflow depletion by raising shallow groundwater levels. Benefits for sustainability are achieved both by direct recharge of purified water and redistribution of pumping throughout SqCWD. As a result, PWS helps achieve sustainable yield and the reduction of groundwater in storage criteria in all three aquifer groups defined in the GSP.

The State announced approval of the GSP in June 2021; which was one of two GSPs receiving these first positive assessments. Further an excerpt from Santa Cruz Mid-County Groundwater Sustainability Plan DWR Determination Letter (dated June 3, 2021) acknowledged that the "*use of conservation efforts as well as projects such as Pure Water Soquel, at this time, appear feasible and reasonably likely to mitigate overdraft. The projects and management actions are expected to reduce net pumping by 1,740 acre-feet per year; thereby, likely bringing the Basin to operate within its sustainable yield*."

SGMA requires that an annual report on GSP status and implementation be submitted to DWR by April 1 each year. The MGA submitted the annual report for Water Year 2021 in March 2022. This annual report identifies continued undesirable results for seawater intrusion. A five-year update to the GSP is due in January 2025.

10.1.7 Basin Groundwater Model

The Basin Model is a numerical model using U.S. Geological Survey GSFLOW software (M&A, 2019). GSFLOW integrates simulations of surface water and groundwater processes by combining PRMS and MODFLOW code. The GSP used the Basin Model to understand Basin hydrogeology and water budget as well as evaluating project benefits for achieving sustainability under future conditions.

The Basin Model has been used to further evaluate PWS for this report and the draft anti-degradation study (BC, 2020c). Information from the TLC Pilot well testing has been incorporated in the Basin Model for these evaluations. Refined particle tracking to estimate retention time of purified water is based on the Basin Model. More information about the Basin Model is presented in **Section 11** and **Appendix E**.

10.2 SWIP Well Area Hydrogeology

The Purisima A and BC aquifer units are the main units where the TLC, Willowbrook, and Monterey SWIP wells are planned for completion. This section describes the hydrogeology encountered by SWIP wells and wells in surrounding area.

10.2.1 SWIP Well Area Hydrostratigraphy

The relevant Purisima Formation units within the SWIP well area are the AA, A, B, BC, and D units, from the deepest to shallowest units. The AA aquifer unit underlies the A aquifer unit where SWIP wells are screened, while the B and D aquitard units overlie the A and BC aquifer units, respectively.

The units are defined as follows:

- **Purisima-AA Aquifer Unit:** (150 to 300 ft thick). This unit comprises a sequence of interbedded, moderately coarse- and fine-grained zones underlying the well-defined A-unit. A fine-grained zone 20 to 70 ft thick divides the AA unit from the overlying A unit. Johnson et al. (2004) estimates that the hydraulic conductivity of this hydrostratigraphic unit ranges between 1 and 10 ft per day.
- **Purisima-A Aquifer Unit:** (~250 ft thick). This distinct aquifer is the most consistently coarse-grained aquifer within the Purisima Formation. It is sometimes divided into an upper and lower zone, with the lower zone being more coarse-grained. Johnson et al. (2004) estimates that the hydraulic conductivity of this hydrostratigraphic unit ranges between 7 and 65 ft per day.
- **Purisima-B Aquitard Unit:** (~150 ft thick). This aquitard is consistently fine-grained, with the lower 25 to 45 ft being the most highly correlated feature across the Basin. A coarse-grained bed is often encountered in the middle of this otherwise fine-grained unit. Johnson et al. (2004) estimates that the hydraulic conductivity of this hydrostratigraphic unit ranges between 0.005 and 1 ft per day.
- **Purisima-BC Aquifer Unit:** (~200 ft thick). This aquifer unit is a moderately coarse-grained unit with a distinct 15 to 20-ft thick coarse-grained unit at the top of the unit. Johnson et al. (2004) estimates that the hydraulic conductivity of this hydrostratigraphic unit ranges between 1 and 3 ft per day.
- **Purisima-D Aquitard Unit:** (~80 ft thick). This aquitard unit is predominantly fine-grained, with one or two minor coarse-grained intervals. Johnson et al. (2004) estimates that the hydraulic conductivity of this hydrostratigraphic unit ranges between 0.005 and 1 ft per day.

Figure 10-6 presents the locations of geologic cross-sections directly crossing the SWIP well area, presented in **Figure 10-7** and **Figure 10-8**. These cross-sections are based on unit elevations in the Basin Model (HydroMetrics WRI, 2015). Lithologic conditions encountered during the recent TLC Pilot well construction (BC, 2020a) were consistent with the hydrogeologic conceptual model (Johnson et al., 2004) used as a basis of the layering of the Basin Model. At the TLC Pilot well, the Purisima D aquitard unit was encountered at approximately 10 to -85 ft mean sea level (msl), the Purisima BC aquifer unit was encountered at approximately -85 to -330 ft msl, the Purisima B aquitard unit was encountered at approximately -330 to -425 ft msl, and the Purisima A aquifer unit was encountered at approximately -425 to -730 ft msl. These elevations are consistent with layer elevations in the Basin Model for the dipping Purisima Formation units recognizing that the coarse 800x800 ft grid of the Basin Model does not represent elevations at the specific TLC Pilot well location.

Cross-sections of the hydrostratigraphy through the TLC Pilot well show the structure of the dipping Purisima Formation units where the SWIP wells will be screened. **Figure 10-6** shows the locations of the west-east cross-section A-A' and the south-north cross-section B-B'. **Figure 10-7** and **Figure 10-8** show the cross-sections including screen intervals of SWIP wells, SqCWD production wells, and the coastal monitoring well SC-5A along the cross-sections. SC-5A along cross-section B-B' is the nearest coastal representative monitoring point identified in the GSP with established groundwater level proxies for sustainable management criteria to prevent seawater intrusion in the Purisima A unit. Cross-section B-B' extends offshore where aerial geophysics has identified salty water just offshore in the Purisima A aquifer unit (M&A, 2018 and Ramboll, 2018).

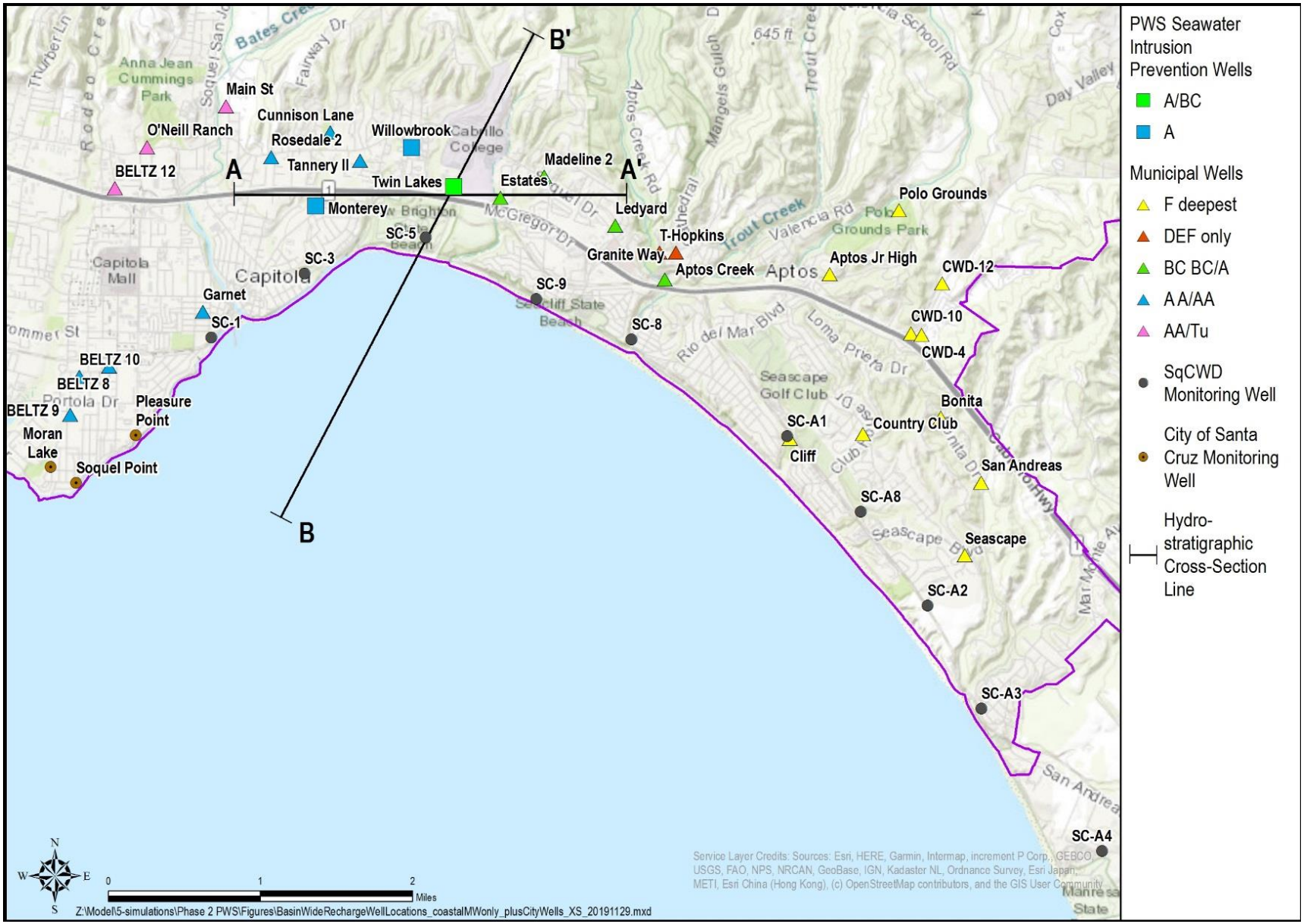

Figure 10-6. Location of cross-sections in Project area

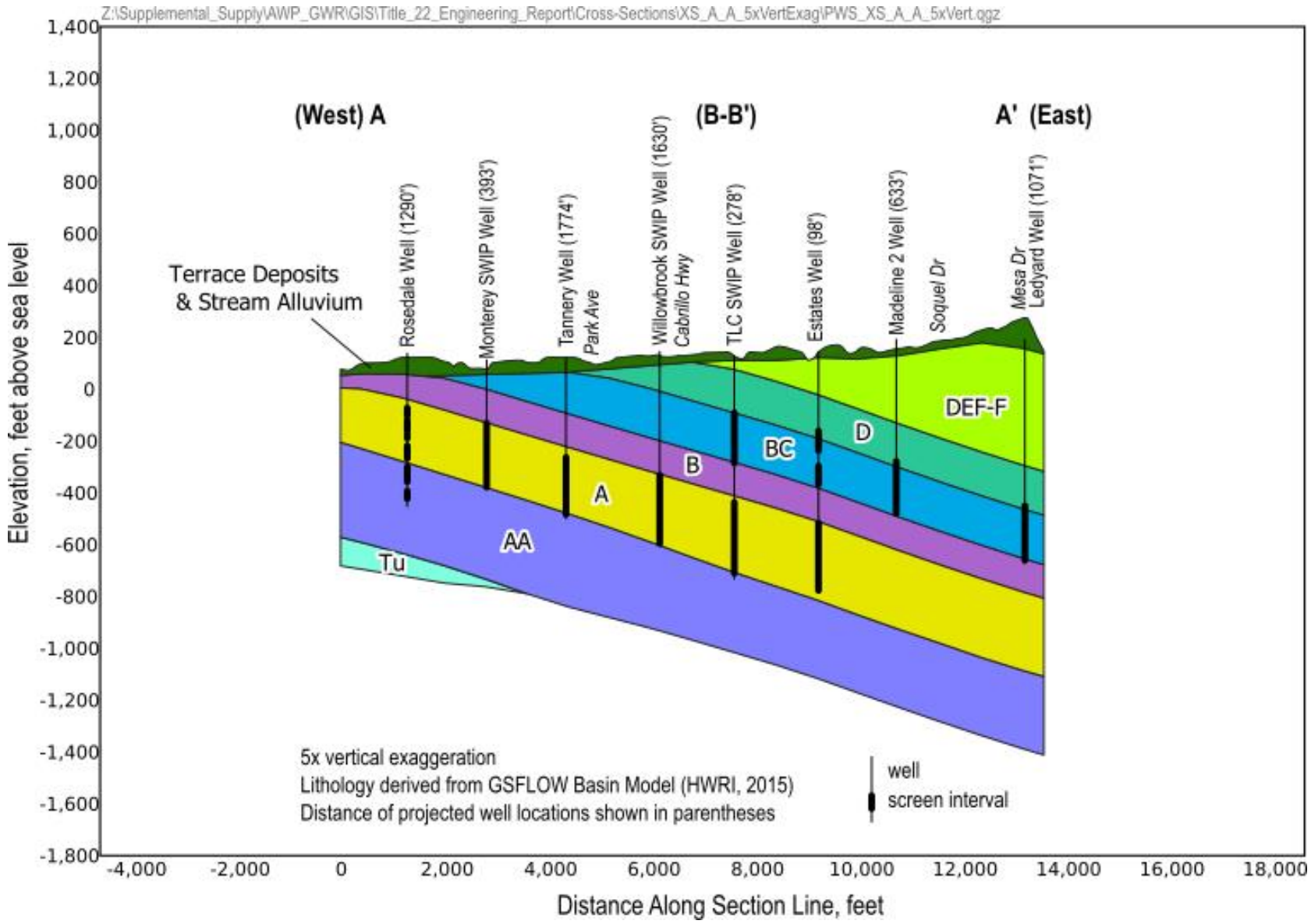

Figure 10-7. Cross-section A-A' based on Basin model layer elevations

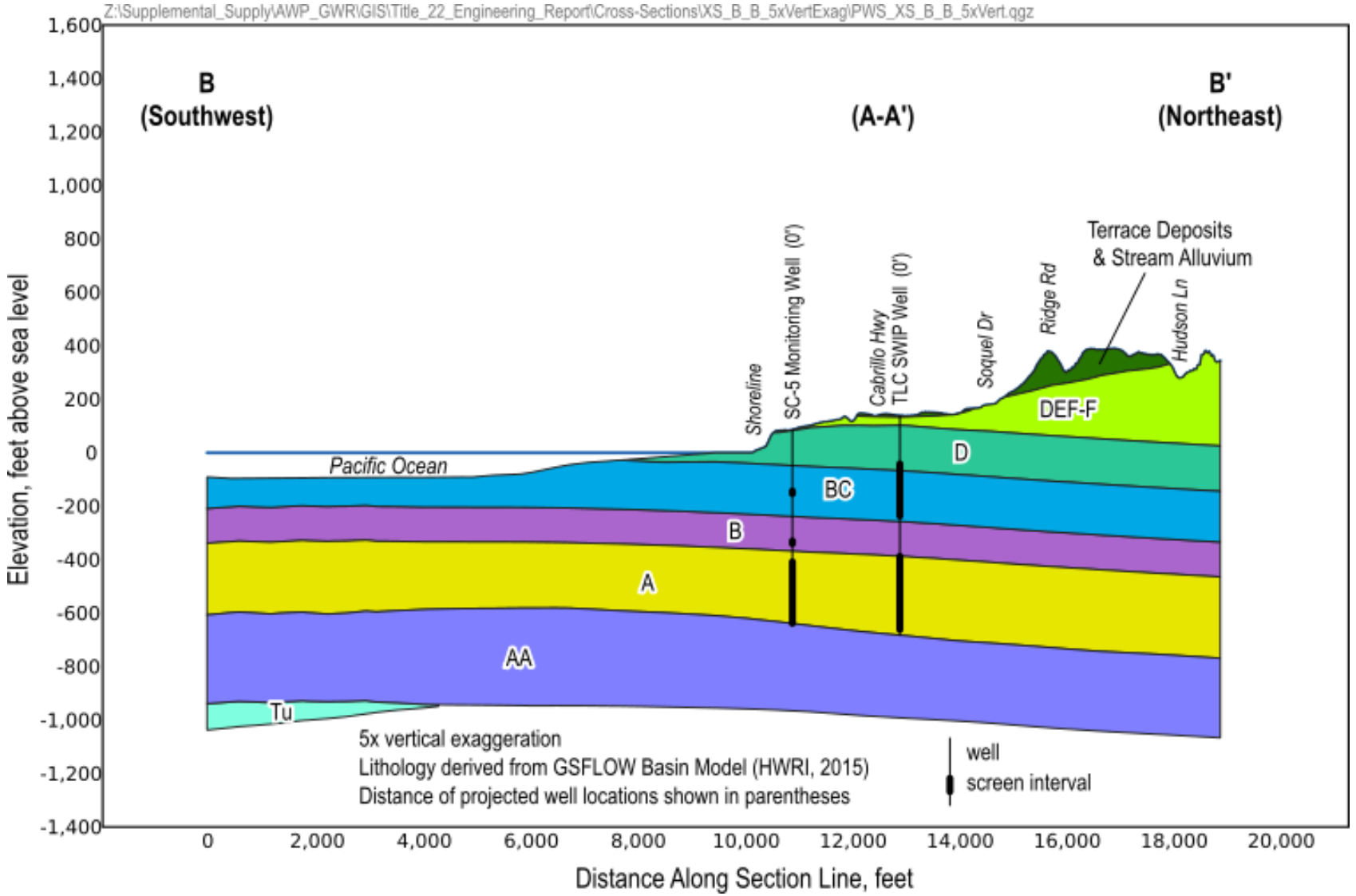

Figure 10-8. Cross-section B-B' based on Santa Cruz Mid-County Basin model layer elevations

10.2.2 Groundwater Elevations

Long-term overdraft in the Project area has led to the ongoing seawater intrusion as discussed above. The greatest groundwater level declines were measured in the Purisima BC unit in 1984 where declines on the order of 140 ft occurred. In 1988, the Purisima A unit reached its greatest groundwater level declines of 80 ft.

Since this time, groundwater levels in the Purisima aquifers have recovered due to reduced groundwater demand although not to groundwater elevations that are protective against seawater intrusion. The following paragraphs summarize groundwater elevations in Purisima aquifer units of the SWIP wells area in Water Year 2019. Groundwater elevations are presented in fall season, when levels are generally at their lowest and therefore most conducive to increasing risk of seawater intrusion.

10.2.2.1 Purisima A and AA Units

A contour map of groundwater elevations in fall 2019 for the Purisima A and AA units are shown in **Figure 10-9** (M&A, 2020). A cone of depression is well defined in the Purisima A unit at the Estates well east of the TLC SWIP well location and the effect of pumping around Tannery is also shown. Coastal groundwater elevations in fall 2019 were lower than seawater intrusion MT (green numbers) at SC-3A and SC-5A in the A unit of the SWIP well area.

As inferred from the contour map, the predominant hydraulic gradient directs flow towards SqCWD's production wells and to offshore. The contour map indicates significant flow from the northwest consistent with outcrop areas for the A and AA- units being towards the north and west (Johnson et al., 2004).

10.2.2.2 Purisima BC Unit

A contour map of groundwater elevations in fall 2019 for the Purisima BC unit are shown in **Figure 10-10** (M&A, 2020). The map shows cones of depression around SqCWD's Ledyard and Madeline production wells that extend to the coast. At the SC-9C representative monitoring point closest to the SWIP wells, groundwater elevations are below the seawater intrusion MT (green numbers) in the fall. The map shows groundwater flows from all directions including from the coastal area towards the pumping depression in the Purisima BC-unit.

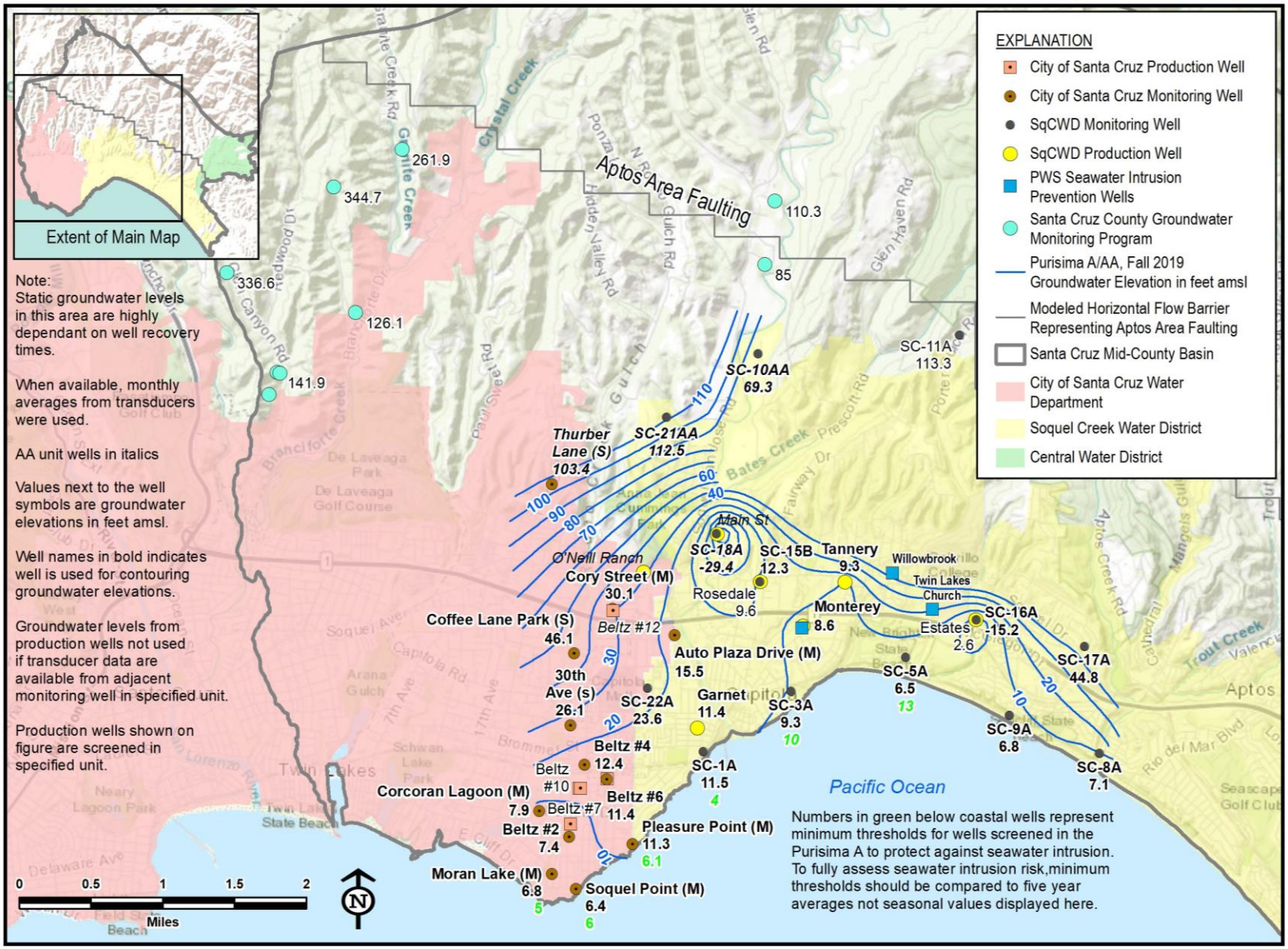

Figure 10-9. Groundwater elevation contours in Purisima A and AA-unit, fall 2019

(adapted from M&A, 2020)

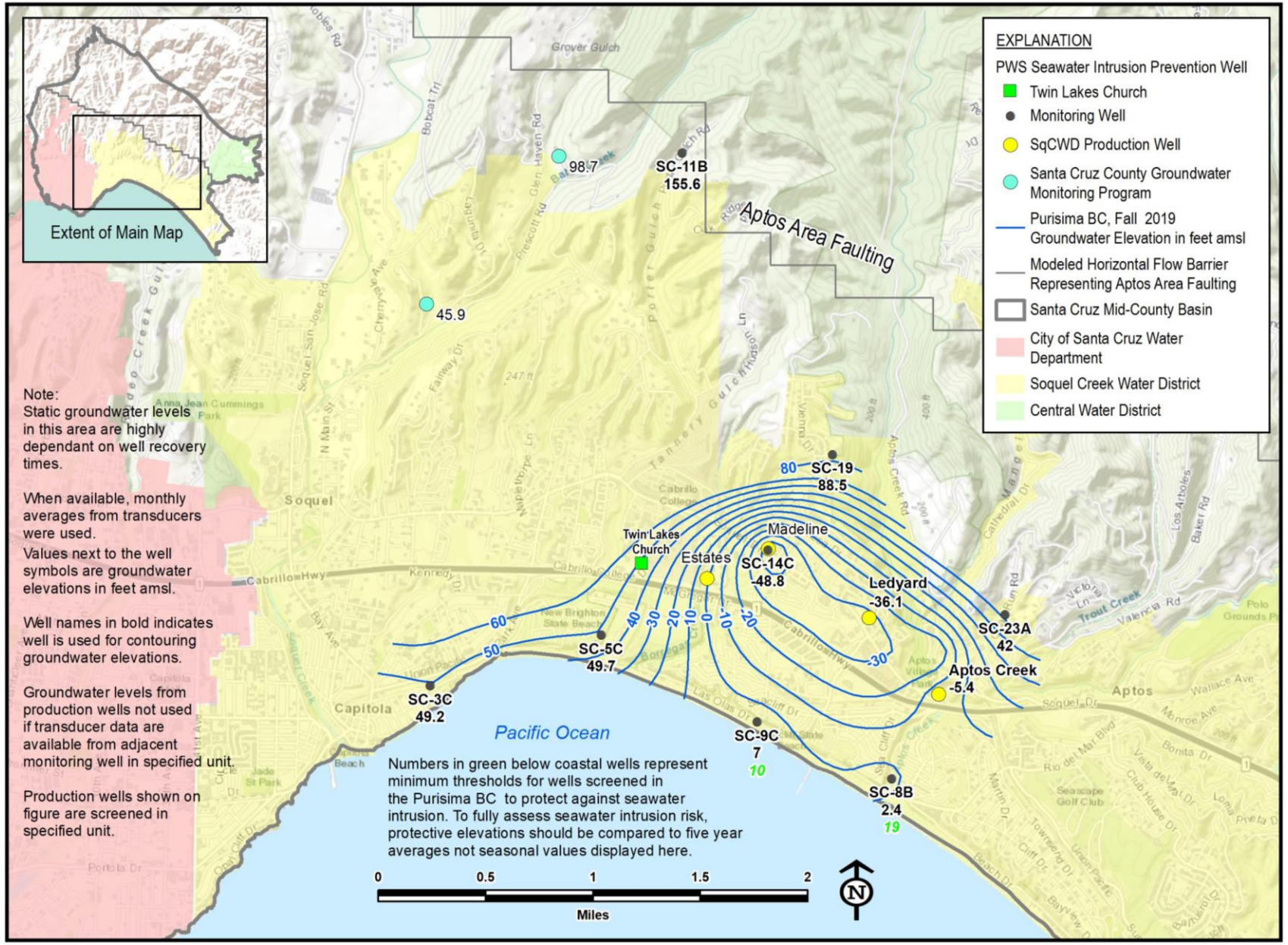

Figure 10-10. Groundwater elevation contours in Purisima BC-unit, fall 2019

(adapted from M&A, 2020)

10.3 Water Budget

This section summarizes the Basin groundwater budget in order to describe typical patterns of groundwater flow impacting the area of the SWIP wells. This groundwater budget accounts for the change in the total volume of water stored in the Basin and is derived from the Basin Model which simulates Basin-wide hydrogeologic and hydrologic conditions (M&A, 2019). The groundwater budget is presented for simulation water years 2010-15, which can be considered reflective of current conditions.

The groundwater budget accounts for all flows entering and leaving the groundwater system of the Basin. This includes subsurface inflows and outflows, pumping, and all forms of natural and managed aquifer recharge. Change of groundwater in storage is simply the difference between all inflows and outflows. Groundwater enters the Basin's aquifers by: subsurface inflow, direct percolation of precipitation, streambed recharge, irrigation return flows, septic system return flows, and managed aquifer recharge.

Substantial subsurface inflow enters the Basin from the Purisima Highlands Subbasin along the northern Basin boundary and from the Pajaro Valley Subbasin, south of the Aptos area faulting. There are lesser subsurface inflows across the Basin boundary from the Santa Margarita Basin, however, the net flow is an outflow to the Santa Margarita Basin. There are places along the coast where subsurface flows moving onshore from beneath the ocean occur as seawater intrusion; however, there is net outflow over the entire coastal boundary.

Aquifer recharge occurs from precipitation percolating directly into outcropping aquifers, streambed recharge, and recharge from precipitation percolating through stream alluvium and terrace deposits to underlying aquifers. Recharge also occurs due to percolation of irrigation and septic system return flows. In the model, areal recharge from direct percolation of precipitation is calculated using PRMS code for watershed processes while return flows from irrigation and septic systems are input using the MODFLOW Unsaturated Zone Flow (UZF) modeling package. The recharge from direct percolation of precipitation and return flows are then grouped together by MODFLOW using the UZF package. Therefore, the water budget groups these groundwater budget components together and refers to it as UZF recharge.

Groundwater leaves the Basin by subsurface outflows, groundwater pumping, and discharge to creeks. Relatively large subsurface outflows occur to the Pajaro Valley Subbasin north of the Aptos area faulting, while lesser outflows into the Santa Margarita Basin occur depending on hydrologic conditions. Net outflows offshore, the magnitude of which may not be sufficient to prevent seawater intrusion, occur along the coastal Basin boundary. Additional groundwater leaves the Basin when extracted by municipal, domestic, industrial, and agricultural users.

Basin-wide net groundwater inflows and outflows simulated by the Basin Model for water years 2010-15 are presented below. On average, combined surface recharge sources constitute approximately 55 percent of Basin inflows, with inflow from subsurface flow from the Purisima Highlands Subbasin comprising the remaining 45 percent. Surface recharge sources include UZF recharge, recharge from stream alluvium, and recharge from terrace deposits. The average loss of groundwater in storage for the Basin was 160 afy (**Table 10-2**). During the normal and wet years of 2010 and 2011, the Basin gained almost 2,000 AF of cumulative groundwater in storage. By 2015, four consecutive dry years contributed to a loss of all the groundwater gained in 2010 and 2011, plus additional losses for an overall cumulative groundwater in storage loss of approximately 1,000 AF over the six-year period.

Table 10-2. Santa Cruz Mid-County Basin Groundwater Budget Summary, 2010-15 (MGA, 2019)				
Groundwater Budget Component	**Annual Minimum**	**Annual Maximum**	**Annual Average**	**Average % (rounded)**
Inflows (afy)				
UZF recharge	1,640	5,770	3,600	31%
Net recharge from stream alluvium	780	1,260	970	8%
Recharge from terrace deposits	1,490	2,200	1,790	16%
Subsurface inflow from Purisima Highlands Basin	4,940	5,310	5,130	45%
		Total Inflow	**11,490**	**100%**
Outflows (afy)				
Pumping	5,260	6,650	6,220	53%
Subsurface outflow to Santa Margarita Basin	250	270	270	2%
Net subsurface outflow to Pajaro Valley Subbasin	4,050	4,300	4,170	36%
Net outflow offshore	920	1,060	990	9%
		Total Outflow	**11,650**	**100%**
Change of Groundwater in Storage (afy)	**Cumulative**		**Average**	
	-970 AF		-160	

10.4 Groundwater Quality

Groundwater produced in the Basin is generally of good quality and regularly meets primary drinking water standards. Groundwater produced from the Purisima Formation, which the SWIP wells will recharge, regularly exceed secondary drinking water standards for naturally occurring iron and manganese.

Treated groundwater delivered by SqCWD and other municipal water agencies in the Basin meets all state and federal drinking water parameters. The municipal water agencies routinely analyze untreated groundwater to determine the groundwater quality of the Basin and to comply with state water quality reporting requirements. Groundwater quality parameters analyzed include general minerals, general physical parameters, and organic/inorganic compounds. Analyses for these constituents are conducted in accordance with requirements of the CCR, Title 22. Groundwater quality results are compared to primary and secondary drinking water standards, established by the USEPA, and water quality standards established by the California State Water Resources Control Board's DDW.

Private domestic use wells are not subject to DDW drinking water regulations. However, the County of Santa Cruz requires one-time testing of nitrate, TDS, chloride, iron and manganese for any new non-municipal well. Small water systems that supply groundwater to 15 – 199 service connections also report water quality to the County and the Public Utilities Commission (PUC) for PUC-regulated systems. These water quality constituents include: inorganics, nitrates, arsenic, perchlorate, chromium, radiation, synthetic organic compounds, and volatile organic compounds (including MTBE). The frequency of reporting ranges between one year and nine years depending on the constituents. Smaller water systems with between 5 to 14 service connections have limited one-time testing requirements for inorganics.

10.4.1 Ambient Groundwater Quality

There are a number of groundwater constituents which occur naturally in the Purisima Formation as a result of the geologic setting. Historical concentrations and trends are described for these contaminants in the paragraphs below.

10.4.1.1 TDS and Chloride Concentrations

TDS concentrations measured in production wells in the Purisima aquifers have historically ranged between 270 and 740 mg/L and represent ambient groundwater quality. The TDS concentration at the TLC Pilot well was measured as 572 mg/L, exceeding the secondary drinking water standard of 500 mg/L. Concentrations measured during zone testing as part of TLC Pilot well construction were above the secondary drinking water standards in both Purisima A unit zones and the BC unit zone. Inland non-municipal wells typically have TDS concentrations between 210 and 480 mg/L. There is a small water system well near Pot Belly Beach Club just south of the SWIP wells that has had TDS concentrations close to 1,000 mg/L since at least 1994, but there is no increasing trend.

Chloride concentrations measured in production wells in the Purisima Formation have typically ranged between 10 and 100 mg/L, below the secondary drinking water standard of 250 mg/L. The chloride concentration measured at the TLC Pilot well was measured at 54 mg/L. Inland private wells generally do not have chloride concentrations greater than 20 mg/L. The private well at Pot Belly Beach Club has historically had chloride concentrations no higher than 140 mg/L. TDS and chloride concentrations in municipal production wells represent ambient groundwater quality and do not indicate any impacts from seawater intrusion. Seawater intrusion has been detected in coastal monitoring wells as described in **Section 10.1.5.**

10.4.1.2 Iron and Manganese

Groundwater in the Purisima Formation regularly has iron and manganese concentrations above secondary drinking water standards of 300 µg/L and 50 µg/L, respectively. Production wells with elevated iron concentrations can reach 3,000 µg/L, while production wells with elevated manganese can reach up to 600 µg/L. Both iron and manganese occur naturally in the Purisima Formation as a result of the dissolution of metals within the aquifer. Concentrations within a well can fluctuate greatly and may range by two orders of magnitude. SqCWD and other municipal water agencies treat groundwater to meet the secondary drinking water standards for iron and manganese. The total manganese concentration at the TLC Pilot well was measured as 172 µg/L, exceeding the secondary drinking water standard. Zone testing samples showed a manganese concentration higher than the secondary drinking water standard in the deepest Purisima A unit zone. Total iron concentration at the TLC Pilot well was measured as 129 µg/L, below the secondary drinking water standard. Zone testing samples showed an iron concentration higher than the secondary drinking water standard in the deepest Purisima BC unit zone.

10.4.1.3 Arsenic

Arsenic concentrations of up to 5.5 µg/L are regularly detected at two municipal water supply wells that produce groundwater from the Purisima Formation, near Aptos Village. Both of these wells are screened in the Purisima DEF unit, but the Aptos Creek well is also screened in the Purisima BC unit. All concentrations are below the state drinking water standard of 10 µg/L. Treatment of groundwater from these wells also reduces concentrations for drinking water distribution.

Arsenic was not detected in sampling of groundwater produced by the TLC Pilot well but was detected in samples of the three zones sampled during zone testing by depth in the borehole during well construction.

Concentrations in the three zones ranged from 0.6 to 1.3 μg/L. SqCWD conducted a geochemical source investigation for arsenic in 2003 and concluded that the arsenic detections are most likely associated with the depositional and geochemical conditions in the coastal environment. Dissolution of pyrite or desorption of arsenic oxyanions from iron oxide appear to be the most common causes of arsenic in groundwater.

There have been no increasing arsenic concentration trends in affected wells because the source of arsenic occurs naturally within the sediments and is not being added from a contamination point source. Potential geochemical effects of SWIP wells on concentrations of arsenic and other minerals are addressed in a separate report (BC, 2020b).

10.4.1.4 Chromium VI

Chromium is a naturally occurring metallic element that can be found in water, soil, and rocks, but it may also occur in groundwater due to industrial contamination. In water, chromium exists either in its more reduced form, trivalent chromium (chromium III), or its more oxidized form, hexavalent chromium (chromium VI). Chromium III is an essential nutrient; however, chromium VI may pose a potential public health risk, even when present at low levels. Studies indicate most of the total chromium in the Basin comprises chromium VI.

Chromium VI concentrations are detected in aquifer units that occur in areas east of the SWIP well area. The Aromas Red Sands aquifer has elevated chromium VI concentrations and the Purisima F unit underlying the Aromas Red Sands sometimes has very low detections of chromium VI. Groundwater in other Purisima Formation units, including the A and BC units planned for SWIP well recharge, does not have detectable chromium VI.

10.4.2 Anthropogenic Groundwater Contamination

The locations of known contaminant sites as of 2018 are identified on **Figure 10-11**, obtained from the SWRCB Geotracker database. Municipal groundwater is primarily pumped from confined aquifer units deeper than the contamination at these sites. Thus, the likelihood that groundwater pumping induces contaminant plume movement towards water supply wells is relatively small. Several constituents of concern are discussed further below.

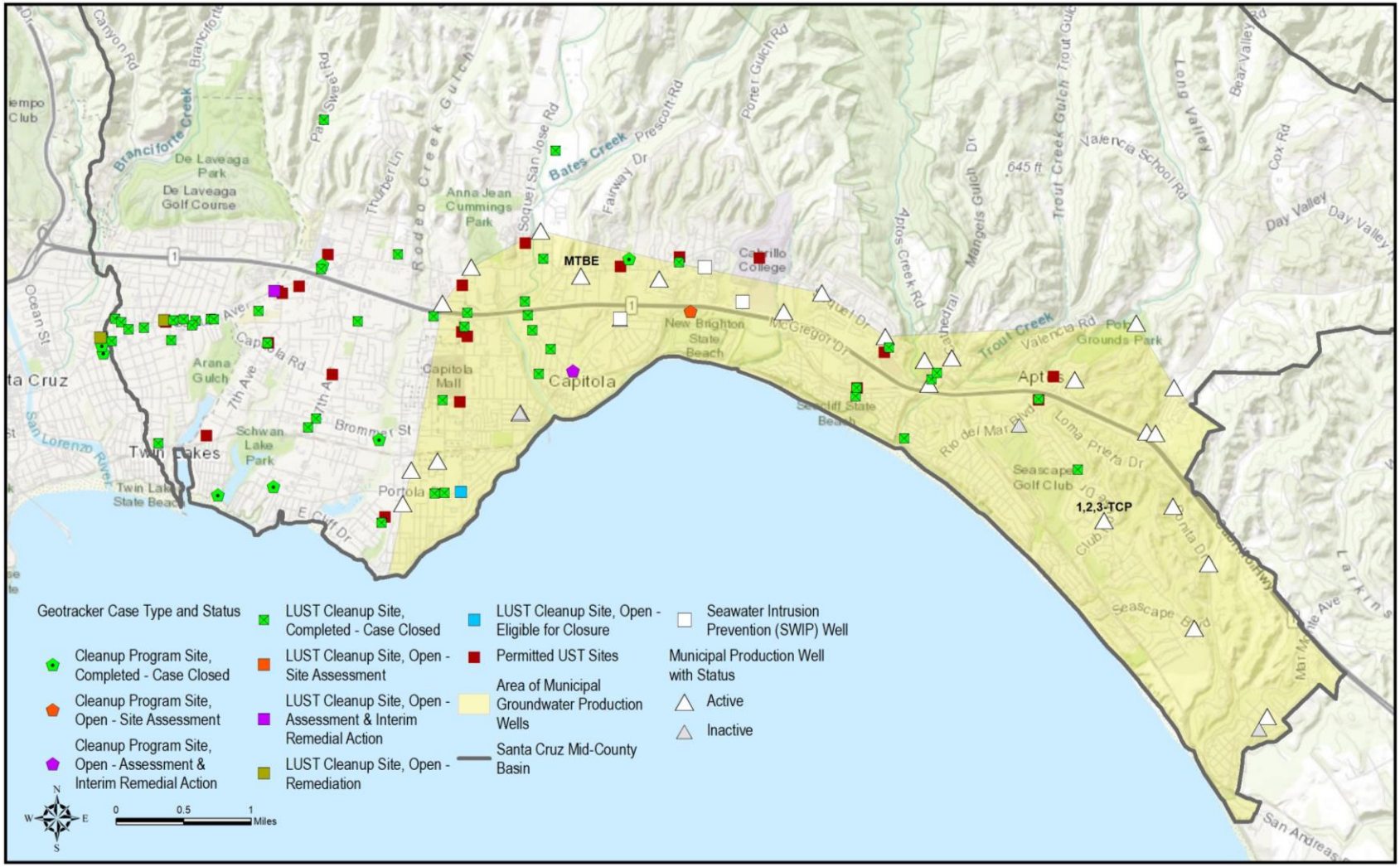

Figure 10-11. Geotracker sites near Project area, 2018

10.4.2.1 Nitrate

Nitrate is a compound formed in soil when nitrogen compounds are mineralized and subsequently oxidized. Elevated nitrate concentrations are most likely due to runoff and leaching from fertilizer use, leaching from septic tanks and leach fields, and erosion of natural deposits. Infiltration of nitrate through the unsaturated zone and into groundwater is a greater concern in areas with highly permeable sandy soils. A large area of the Basin is on septic systems because of the rural, low residential density, but only limited areas have highly permeable soils. State primary drinking water standards are 10 mg/L for nitrate as nitrogen (N); 10 mg/L for nitrate plus nitrite as N; and 1 mg/L for nitrite as N.

The Basin has historical nitrate as N concentrations in production wells that range from mostly non-detectable to a maximum of 11 mg/L. The highest nitrate as N concentrations are at shallowest depths. All recent nitrate as N concentrations are below the state drinking water standards and have not impacted the municipal water supplies that currently produce groundwater from depths greater than 200 ft. However, SqCWD had to inactivate the Sells production well in the Aromas Red Sands aquifer in 2009 because nitrate as N concentrations were above state drinking water standards.

In areas with sandy soils where septic systems are used, nitrate contamination can be an issue. However, groundwater quality data from private wells in the Basin, which generally produce groundwater from shallower depths than municipal production wells, suggests that septic systems have not adversely increased nitrate concentrations in private wells.

10.4.2.2 Organic Compounds

Organic compounds include VOCs and pesticides. VOCs are chemicals that are carbon-containing and evaporate or vaporize easily into air at normal air temperatures. VOCs are found in a variety of commercial, industrial, and residential products, including gasoline, solvents, cleaners and degreasers, paints, inks and dyes, and pesticides. VOCs in the environment are typically the result of human activity, such as a spill or inappropriate disposal where the chemical has been allowed to soak into the ground. Once released into the environment, VOCs may infiltrate into the ground and migrate into the underlying production aquifers.

The SWRCB's Geotracker database was used to provide the status and location of contamination sites within the Basin (**Figure 10-11**). Geotracker tracks regulatory data about leaking underground fuel tanks (LUFT), Department of Defense (DoD) cleanup sites, Spills-Leaks-Investigations-Cleanups (SLIC), and landfill sites. **Figure 10-11** shows that fewer than half of contaminant sites in the Basin are located within the area of municipal production, with none occurring in the inland portions of the Basin where non-municipal wells are used for water supply. The proximity of contaminated sites to municipal wells poses a greater risk to the municipal wells; however, most released contaminants remain shallow and rarely migrate down to the aquifers used by municipal production wells.

SqCWD has identified 1,2,3-trichloropropane (1,2,3-TCP) as exceeding the state drinking water standard at its Country Club production well, which is drilled within the Aromas Red Sands and Purisima F unit aquifers. The source of the 1,2,3-TCP in groundwater at this location is believed to be past use of fumigants that contained 1,2,3-TCP as an impurity, based on past agricultural land uses near the well. SqCWD is currently not pumping from this well but has plans to use a replacement for the Country Club well once a treatment plant for 1,2,3-TCP has been constructed and water from the well meets or exceeds state drinking water quality standards.

10.4.2.3 Contaminants of Emerging Concern

CECs, including pharmaceuticals and personal care products (PPCPs), are increasingly being detected at low levels in surface water and water infiltrating to groundwater from septic systems. Groundwater may be impacted by recharge of treated wastewater, surface water, and from septic systems. New and emerging contaminants are currently unregulated but may be subject to future regulation for surface water, septic systems, treated wastewater, or groundwater. Examples of new and emerging contaminants are NDMA, 1,4-dioxane, and per- and polyfluoroalkyl substances (PFAS).

The Unregulated Contaminant Monitoring Rule (UCMR) was part of the federal Safe Drinking Water Act Amendments of 1996 and is administered by the USEPA. The UCMR has required additional water quality testing within the Basin every five years since 2001. SqCWD conducts the UCMR testing within the Basin. Additionally, in 2007 and 2011 SqCWD participated in two phases of a joint USGS – USEPA study on CECs in drinking water. This joint USGS-USEPA study tested for additional CECs that are not included in standard UCMR tests (Nguyen, et al., 2018).

The production wells that have had detections of CECs are Sells, Altivo, and Bonita in the Aromas Red Sands aquifer. Sells is the La Selva area well with elevated nitrates as N that is currently inactive in the Aromas Red Sands aquifer. The CEC detected in Sells and Altivo is PPCPs, a pharmaceutical found during the USGS-USEPA joint test. SqCWD also identified 1,4-dioxane and 1,1-dichloroethane in its Bonita well during standard five yearly UCMR testing.

10.5 Water Rights

There are no areas with adjudicated rights to use groundwater in the Basin. Non-municipal pumpers that use groundwater on properties overlying the pumped aquifers have overlying rights. These overlying uses take precedence over non-overlying uses. Municipal water agencies have appropriative rights. Appropriative users are entitled to surplus water available after overlying uses are met. There are no established prescriptive rights in the Basin.

Surface water rights were adjudicated in Soquel Creek Watershed by the Santa Cruz County Superior Court in 1977. At that time, just over 300 users were granted rights to draw from Soquel Creek, its tributaries and stream-feeding springs. First, second, and third priority rights were granted for a variety of uses including domestic, irrigation, recreational, stock watering, agriculture, and fire protection. Limited consideration was given to flows for fish or other environmental users of water, and the adjudication predates the standards expected under the Public Trust Doctrine. During the summer and fall, Soquel Creek regularly has insufficient flow to meet the allocations of all but the first priority right-holders. Most water right holders do not presently exercise their rights.

10.6 Drinking Water Wells in PWS Project Area

The location and aquifer screening of the three SWIP wells and nearby municipal wells in the Project area is presented on **Figure 10-12**. The Monterey and Willowbrook SWIP wells are both screened in the Purisima A unit, while the TLC SWIP well is screened in both the Purisima A and BC units. Municipal drinking water wells screened in the SWIP well area are owned and operated by SqCWD in the Purisima AA, A, and BC units. Nearby non-municipal pumping wells are domestic wells owned privately or wells owned by small water systems. Locations of private domestic wells shown on **Figure 10-12** were identified for a monitoring well network analysis (BC, 2019a) primarily based on evaluation of parcels without a SqCWD service connection. Drinking water use has not been confirmed for most of the possible private well locations shown on **Figure 10-12**, but drinking water use is conservatively assumed unless specific information is available. Well completion information is also not available at most of the private well locations. Non-municipal domestic users of groundwater generally complete their wells in the shallowest productive aquifers, which are often not as deep as the aquifers where municipal pumping occurs. However, unless there is specific information, private domestic wells are conservatively assumed to produce from the same aquifer units as the nearby PWS SWIP wells.

The nearest downgradient drinking water wells from the planned SWIP recharge wells have been identified using hydrogeological analysis of groundwater elevations and spatial examination. **Figure 10-12** displays the location of the planned SWIP wells, nearby municipal wells, and identified private domestic wells. Due to expected mounding caused by recharge at the SWIP wells, there will be a radial downgradient emanating from each SWIP well. Therefore, the nearest downgradient drinking water well is likely the nearest drinking water well in any direction.

The nearest drinking water well to the planned Monterey SWIP well in the Purisima A unit has been identified as a private domestic well at 2603 Monterey Ave. (APN 37-191-12) at a distance of approximately 900 ft. The well completion report for this well shows multiple screen intervals spanning from 100 feet bgs to 360 feet bgs. The shallower screens are in the Purisima BC unit and the Purisima B aquitard unit and the deeper screens are in the Purisima A unit. There is also a drinking water well identified at a distance of approximately 1,050 ft at 2510 Orchard St. (APN 37-171-09). There is no publicly available well completion information for this well so it is conservatively assumed to extract from the Purisima A unit. Well completion reports have not been identified for most wells on **Figure 10-12** The next closest private well location with a well completion report available on the Santa Cruz County Environmental Health online database or the California DWR Well Completion Report Map Application is located at 2615 Monterey Ave. (APN: 037-191-17). The well's screen interval of 160-300 feet bgs indicates the well is screened in both the A unit and the overlying B aquitard unit. A local pump installer has reported that the well at at 310 Kennedy Dr. (APN 036-031-16) has a completed depth of 240 feet bgs (verbal communication Capitola Pump 2019), which extends into the identified depth of the A unit. The pump installer also reported that the well at 300 Kennedy Dr. (APN 036-031-18) has a completed depth of 180 feet bgs, which extends to the top of the identified depth of the A unit. The nearest municipal production wells are SqCWD's Rosedale well screened in the Purisima AA and A units and SqCWD's Tannery 2 well screened in the Purisima A unit. Both municipal wells are approximately 2,200 ft away from the Monterey SWIP well location.

The nearest well to the planned Willowbrook SWIP well at 6120 Abbey Road (APN 037-221-54) is only used for irrigation, and the measured depth of this well was 130 ft, which indicates that it is shallower than the Purisima A unit that will be recharged by the Willowbrook SWIP well. The 6120 Abbey Road well is separated from the Purisima A unit by the Purisima B aquitard and much of the thickness of the Purisima BC aquifer, which will limit vertical flow of purified water to this well from the Willowbrook SWIP well. As detailed in Section 11.2.2, monitoring of the 6120 Abbey Road well showed no groundwater level response to pump testing at the Willowbrook SWIP well indicating purified water will likely not be observed at the

6120 Abbey Road well (M&A, 2021). Also, Section 11.2.3 describes how the calibrated three-dimensional groundwater model of the Basin shows flow as two-dimensional within aquifers such that purified water is unlikely to travel to the 6120 Abbey Road well. The nearest drinking water well in the Purisima A unit is SqCWD's Tannery 2 well approximately 1,800 ft to the west of the Willowbrook SWIP well site.

The nearest drinking water wells to the TLC SWIP well are on the 800 block of Pine Tree Lane approximately 1,000 ft away. The log of the Pine Tree Lane MWC well shows that it is primarily screened in the Purisima BC unit and has a total depth shallower than the Purisima A unit. The 830 Pine Tree Lane (APN 038-221-31) well is assumed also to be screened in the Purisima BC unit which the TLC SWIP well will recharge. The nearest drinking water well in the Purisima A unit is the SqCWD Estates well screened approximately 1,600 ft to the east of the TLC well. Like the TLC well, the Estates well is screened in both the Purisima BC and A units.

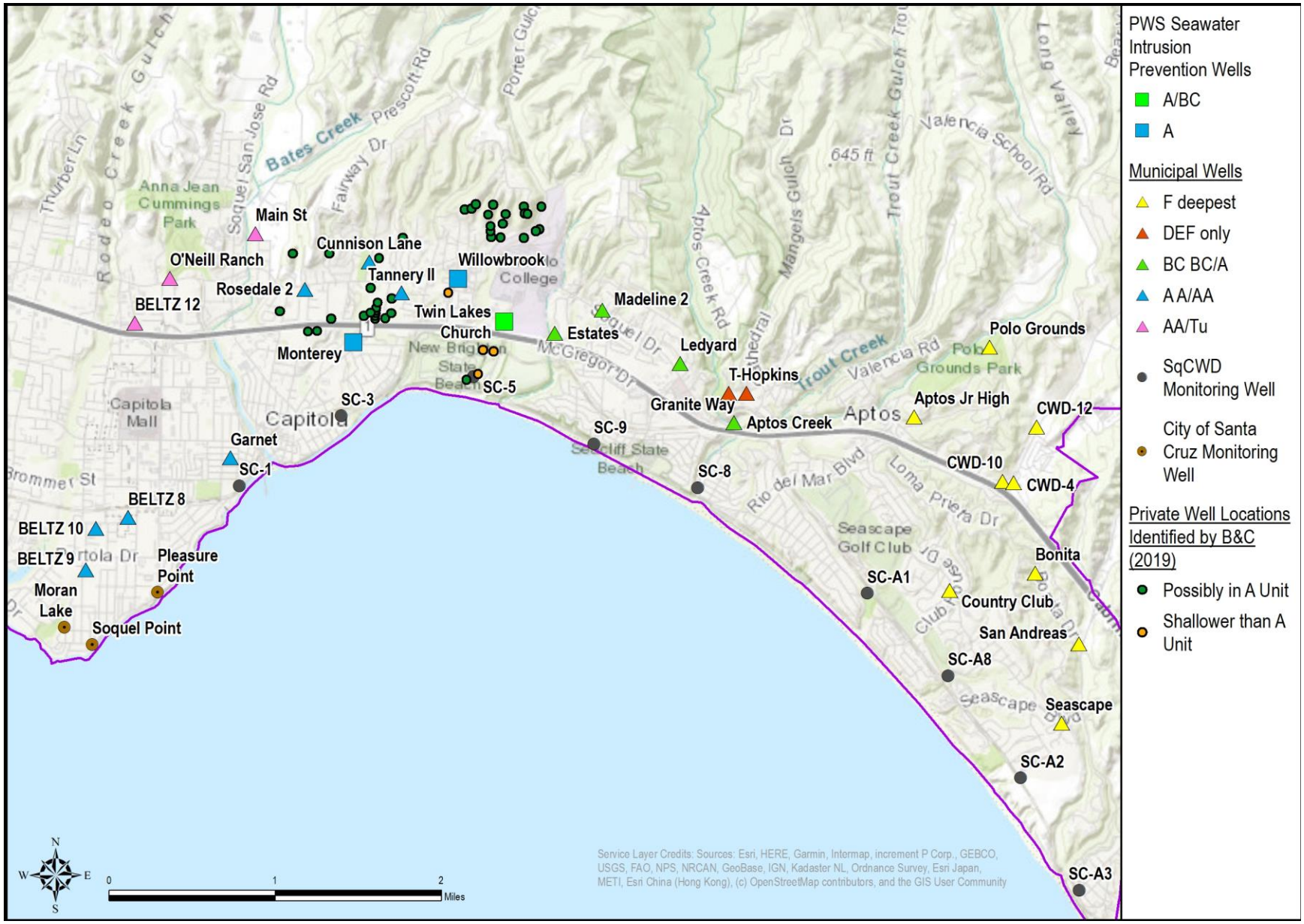

Figure 10-12. Location of SWIP wells, Municipal production wells, and identified private wells

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Section 11: Groundwater Recharge Impacts

Numerical models have been used to evaluate impacts of recharging purified water into the Purisima A and BC units at the TLC, Willowbrook, and Monterey SWIP wells. These evaluations have been performed for the PWS EIR (ESA, 2018), the Basin GSP (MGA, 2019b), and the PWS Phase 2 Modeling Report (**Appendix E**, M&A, 2020a).

Based on modeling, the EIR concluded that there are no significant adverse groundwater hydrology impacts from the PWS Project. Subsequent modeling for PWS has not changed the EIR's significance determinations.

Modeling for the GSP shows that recharge at SWIP wells and pumping redistribution at SqCWD municipal wells for PWS provides the expected benefits of preventing seawater intrusion into the SqCWD area to help meet the sustainability goal for the Basin within 20 years as mandated by the SGMA.

The PWS Phase 2 Modeling Report incorporates new information from the TLC Pilot Well testing. The report confirms expected benefits of PWS for preventing seawater intrusion and indicates that recharge quantities planned for the SWIP wells are within well capacities. The PWS Phase 2 Modeling Report also describes particle tracking to evaluate retention times and fate of purified water to meet California Title 22 regulations for Groundwater Replenishment with Recycled Water (CCR, 2018) and support the anti-degradation study discussed herein. For more information regarding post treatment stabilization at the AWPF, refer to Section 5.3.7.

11.1 Hydrogeological Analyses

The numerical model used to evaluate groundwater recharge impacts, herein referred to as the Basin Model, is based on a groundwater flow model of the Basin developed using the U.S. Geological Survey GSFLOW (Markstrom *et al.*, 2008) integrated groundwater and surface-water model (M&A, 2019a). GSFLOW integrates the PRMS watershed model code with the MODFLOW groundwater code (Harbaugh, 2005; Niswonger *et al*., 2008). The Basin Model is a transient, three-dimensional, 9-layer model, which has been calibrated with groundwater level data from a 30-year period of Water Years 1985-2015.

The Basin Model covers the entire watershed that contributes flow to the stacked aquifer units of the Basin. **Table 11-1** shows the relationship between model layers and hydrostratigraphic units, which are described in **Section 10**. The southern coastal boundary of the model extends approximately one mile offshore, parallel to the coastline, allowing for contact of outcropping Purisima and Aromas Formation units with the seafloor that serves as a potential source of seawater intrusion into the Basin. Climate inputs for simulated future water years are generated from a catalog of historical climate data from warm years in the Basin's past to simulate warmer temperatures predicted by global climate change (HydroMetrics WRI, 2017b).

Table 11-1. Model Layers and Hydrostratigraphic Units		
Model Layers	**Hydrostratigraphic Unit**	**Aquifer/Aquitard**
1-8	Stream Alluvium	N/A
1-8	Terrace Deposits	N/A
2	Aromas Red Sands	Aquifer
3	Purisima F and DEF	Aquifer
4	Purisima D	Aquitard
5	Purisima BC	Aquifer
6	Purisima B	Aquitard
7	Purisima A	Aquifer
8	Purisima AA	Aquifer
9	Tu	Aquifer

The Basin Model has been used to evaluate projects such as PWS to achieve sustainability for the Basin's GSP (GSP, MGA, 2019). The Basin Model was recently updated (M&A, 2020a) to incorporate new site-specific aquifer parameters and hydrogeologic characterization of flow distribution in the target aquifers obtained during the installation and development of the TLC Pilot well (BC, 2020a).

The modeling is used to evaluate the expected benefits of the PWS Project for SWIP and to estimate retention times and long-term fate of purified water recharged at PWS SWIP wells.

11.1.1 Groundwater Modeling Scenarios

PWS SWIP wells are planned to recharge purified water into the Basin's Purisima A and BC units, but PWS also supports in-lieu recharge in aquifer units and areas where purified water is not directly recharged. In-lieu recharge is facilitated by increasing SqCWD pumping in areas where PWS recharge takes place, which allows for reductions of SqCWD pumping from the Tu aquifer unit in the western portion of the Basin and from the Purisima F unit and Aromas Red Sands in the eastern portion of the Basin[1], as illustrated conceptually in **Figure 11-1**. The effects of both direct PWS recharge and in-lieu recharge and pumping redistribution are evaluated by comparing a PWS project scenario to a baseline model scenario with no direct PWS or in-lieu project recharge. This no-project baseline model scenario is consistent with the baseline scenario without projects used for the GSP (M&A, 2019b). The baseline scenario assumes ongoing water conservation and demand management actions are continued in the Basin, and also accounts for installation and redistribution of municipal groundwater pumping by SqCWD and the City Water Department (SCWD). Non-SqCWD pumping, including SCWD, and non-municipal pumping such as from private domestic, institutional, and agricultural wells is assumed to be the same for both the PWS scenario and baseline scenario.

[1] The Aromas Red Sands overlies the Purisima Formation but only occurs in the eastern portion of the Basin.

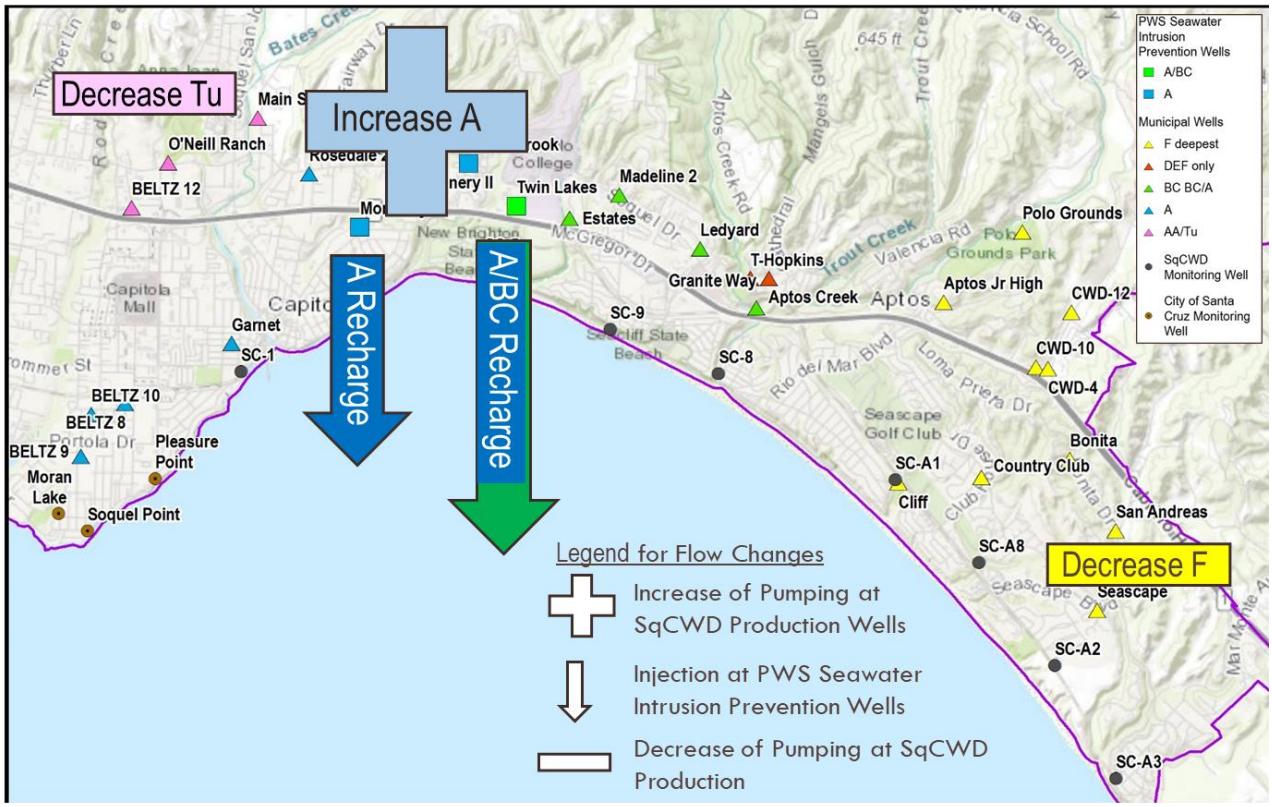

Figure 11-1. Schematic PWS pumping and recharge distribution

Table 11-2 shows the simulated recharge and production rates for the PWS scenario and how it is different from the baseline scenario. The average change from the baseline scenario (last column of **Table** 11-2) is positive for the Cunnison Lane, Tannery II, and Estates wells that extract from the Purisima A unit near the SWIP wells. The increase in pumping at these wells is supported by recharge at the PWS SWIP values and in turn supports reduced pumping from the Purisima AA/Tu unit aquifers (O'Neill Ranch and Main Street wells) and Aromas/Purisima F unit aquifers (Bonita and San Andreas wells). Recharge at SWIP wells and decreases in pumping are represented by negative values for average change from the baseline scenario.

Table 11-2. PWS Scenario Pumping and Recharge Redistribution by Well					
Well	Aquifer	Non- Critically Dry	Non-Critically Dry	Critically Dry	Average Change From Baseline without PWS (M&A, 2019b)
		afy[a]			
		2023-25	2026-69		
O'Neill Ranch	Purisima AA/Tu	264	190	195	-38
Main Street	Purisima AA/Tu	348	348	352	-180
Rosedale 2	Purisima A/AA	544	544	553	0
Garnet	Purisima A	320	278	139	0
Monterey SWIP	Purisima A	-500	-500	-500	-500
Cunnison Lane	Purisima A	0	439	437	209
Tannery II	Purisima A	689	580	577	369
Willowbrook SWIP	Purisima A	-233	-233	-233	-233
TLC SWIP	Purisima BC/A	-742	-742	-742	-742
Estates	Purisima BC/A	466	404	403	88
Madeline 2	Purisima BC	98	98	98	0
Ledyard	Purisima BC	108	108	108	0
Aptos Creek	Purisima DEF/BC	0	0	0	0
T-Hopkins	Purisima DEF	156	137	137	0
Granite Way	Purisima DEF	145	135	135	0
Polo Grounds	Purisima F	100	100	100	0
Aptos Jr High	Purisima F	250	250	250	0
Country Club	Aromas/Purisima F	70	70	70	0
Bonita	Aromas/Purisima F	137	86	144	-173
San Andreas	Aromas/Purisima F	159	85	148	-275
Seascape	Aromas/Purisima F	46	46	46	0

a. Negative flow values for SWIP wells are recharge flows.

Table 11-2 shows a change of pumping distribution after 2025 as the Cunnison Lane well comes online, which allows existing wells to pump less. There is a slight variation in the pumping distribution between critically dry and non-critically dry years.

PWS may operate wells differently than the PWS scenario shown in **Table 11-2** based on operational needs, but the PWS scenario is a reasonable representation of pumping and recharge distribution with PWS implementation. For example. the recharge rates at SWIP wells represent endpoints of the range of recharge rates over which the SWIP wells could be operated. The recharge rate of 500 afy at the Monterey SWIP well is a maximum recharge rate for the well, while the recharge rates of 233 afy at the Willowbrook SWIP well and 742 afy at the TLC SWIP wells should be considered minimum recharge rates for the wells. A combination of minimum and maximum rates is used so that the total simulated recharge is approximately 1,500 afy, which allows model results to be used to evaluate project benefits for basin sustainability. The potential effects over the range of potential recharge rates at the SWIP wells for regulatory purposes is evaluated in **Section 11.3.2**.

11.1.2 Groundwater Elevation Contours and Flow Directions in Baseline and PWS Scenarios

Simulated groundwater elevations in the Purisima A and BC units are presented for the simulations of baseline (no project) and PWS scenarios below. Results are presented for September 30, 2025 and 2047, dates which reflect 3 years and 25 years of ongoing recharge, respectively. In addition to recharge, the pumping redistribution changes between 2025-47, as summarized in **Table 11-2**. These changes include pumping coming online at the Cunnison Lane well and decreases in pumping at the Garnet, Tannery II, and Estates Wells. **Table 11-2** also displays pumping redistribution from baseline for both time periods.

The expected SWIP benefits of PWS are evaluated based on simulated groundwater elevations at the representative monitoring points designated in the Basin GSP (MGA, 2019) with groundwater elevation proxies to protect the Basin from seawater intrusion[2]. Groundwater elevation proxies for MT are posted at coastal monitoring wells used as representative monitoring points specific to each aquifer unit on the following maps of simulated groundwater elevations. The maps demonstrate expected Basin sustainability benefits of PWS including raising groundwater levels at coastal monitoring wells throughout SqCWD's service area to reduce the risk of further seawater intrusion.[3]

11.1.3 Simulated Groundwater Flow for Baseline Scenario

For both the Purisima BC and Purisima A units, baseline groundwater elevations in 2025 reflect conditions conducive to seawater intrusion. In the Purisima BC unit, elevations are below sea level in a large area along the coast within drawdown cones from the Estates, Madeline 2, and Ledyard wells (**Figure 11-2**). Elevations are more than 10 ft below MT at the SC-9C and SC-8B coastal monitoring wells in the Purisima BC unit. In the Purisima A unit, the baseline scenario predicts elevations below sea level along the coast within the drawdown cone from the Rosedale and Tannery II wells (**Figure 11-3**). Drawdown from the Garnet and Estates wells also contribute to groundwater elevations being approximately 5-15 ft below MT at the SC-3A and SC-5A coastal monitoring wells in the Purisima A unit, and just above MT at the SC-1A coastal monitoring well in the Purisima A unit. Elevations in 2047 are largely similar for both units (**Figure 11-4** and **Figure 11-5**), though adding Purisima A unit pumping at the Cunnison Lane well widens and reduces the depth of the depression in this area.

[2] As indicated in the SGMA Regulations Section §354.36(b) "groundwater elevations may be used as a proxy for monitoring other sustainability indicators." The Basin GSP uses groundwater elevation proxies for seawater intrusion in addition to monitoring chloride concentrations. The groundwater elevation proxies are based on cross-sectional SEAWAT models of density-dependent flow and transport to estimate heads at coastal monitoring wells needed to prevent seawater intrusion into productive aquifer units. Using Monte Carlo uncertainty analysis based on uncertainty of aquifer characteristics, a range of protective groundwater levels were developed for each coastal monitoring well cluster (HydroMetrics LLC, 2009). The MT at a coastal monitoring well is the groundwater elevation that represents at least 70 percent of cross-sectional model simulations being protective, while the measurable objective at the well is the groundwater elevation that represents greater than 99 percent of cross-sectional model simulations being protective.

[3] Complete evaluation of the expected Basin sustainability benefits is provided in M&A (2020a) and includes calculating five-year average of groundwater levels at representative monitoring points and comparing to groundwater elevation proxies plus simulated sea level rise of 2.3 ft. From the GSP: "The model incorporates projected sea level rise in the offshore boundary condition for simulations of future conditions. The boundary condition head for sea level is increased over time to 2.3 ft in 2070 over current sea level rise based on state of California projections for Monterey representing 5 percent probability under a High Emissions scenario (California Natural Resources Agency, 2018). Since the datum in the model is set at current sea level, simulated future groundwater levels were compared to the groundwater level proxies plus the total sea level rise of 2.3 ft. This allows evaluation of whether projects and management actions will raise and maintain groundwater elevations to meet groundwater level proxies relative to projections of higher sea levels."

11.1.4 Simulated Groundwater Flow for PWS Scenario

PWS simulated groundwater elevations in 2025 are significantly higher than the baseline scenario in both the Purisima BC and Purisima A units. In the Purisima BC unit, elevations are uniformly above sea level across the area of interest (**Figure 11-6**). While only 5 percent of recharge at the TLC well enters the Purisima BC unit, this recharge translates to an increase of 10-30 ft in elevations across the area of interest even with increased pumping at the Estates well from baseline as part of the pumping redistribution. In the Purisima BC unit, groundwater elevations are above MT at the SC-9C coastal monitoring well, and roughly 4 ft below MT at the SC-8B coastal monitoring well though the MT for SC-8B was established to protect production at the Aptos Creek well, which is no longer assumed. PWS benefits are similarly present in the Purisima A unit, raising groundwater elevations by around 15-45 ft in the area of interest even with increased pumping from baseline in the A unit as part of the pumping redistribution (**Figure 11-7**). Elevations are more than 10 ft and 20 ft above MT at the Purisima A unit coastal monitoring wells SC-3A and SC-5A, respectively. Elevations are about 2 ft above MT at the SC-1A coastal monitoring well in the Purisima A unit. Even with a small depression from pumping at Garnet, elevations are uniformly above sea level along the coast.

Between 2025 and 2047, recharge and pumping redistribution continue to raise simulated groundwater elevations in the Purisima A and Purisima BC units. In the Purisima BC unit, elevations are raised by roughly an additional 5 ft in the area between SC-8B and SC-5C, a product of recharge at TLC even with increases in pumping from baseline at the Estates well (**Figure 11-8**). Groundwater elevations are about 5 ft above MT at the SC-9C coastal monitoring well in the Purisima BC unit. Groundwater elevations do not rise high enough above MT at the SC-8B coastal monitoring well to counteract simulated sea level rise though the MT for SC-8B was established to protect production in the Purisima BC unit at the Aptos Creek well, which is no longer planned for pumping. In the Purisima A unit, elevations are similarly raised an additional 5-10 ft across much of the area of interest: specifically, near the TLC and Estates wells, in the eastern areas near SC-19, and near the Garnet well (**Figure 11-9**). Elevations near the Rosedale and Cunnison Lane wells are slightly lower than in 2025, a result of pumping at the Cunnison Lane well. Elevations are above MT by around 10-15 ft and 20-25 ft at the Purisima A unit coastal monitoring wells SC-3A and SC-5A, respectively, and roughly 6 ft above MT at the SC-1A coastal monitoring well in the Purisima A unit. By 2047, groundwater elevations are uniformly above sea level across the area of interest, including the depression at Garnet.

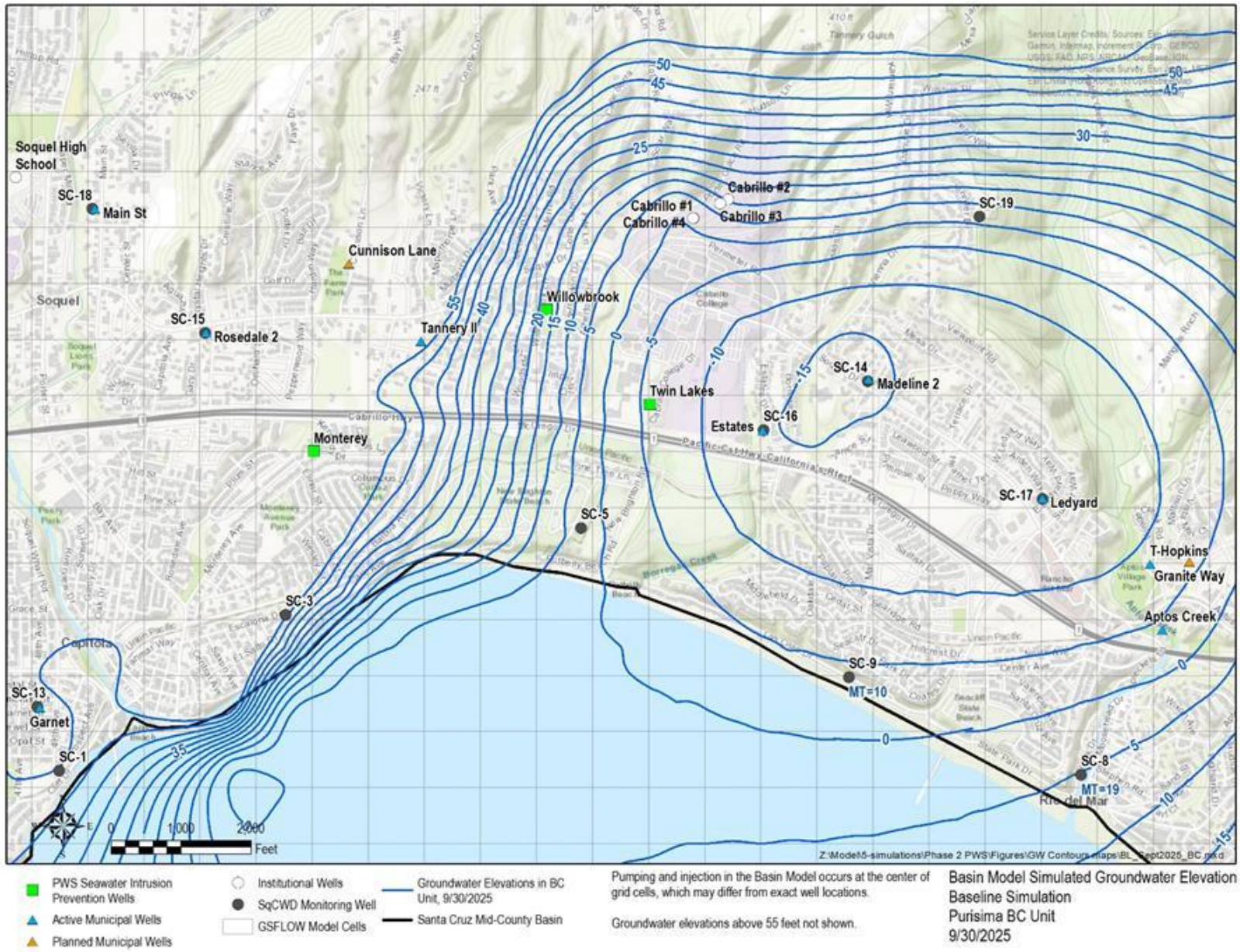

Figure 11-2. Simulated baseline (no recharge at SWIP Wells) groundwater elevations (ft msl) in Purisima BC unit, September 30, 2025

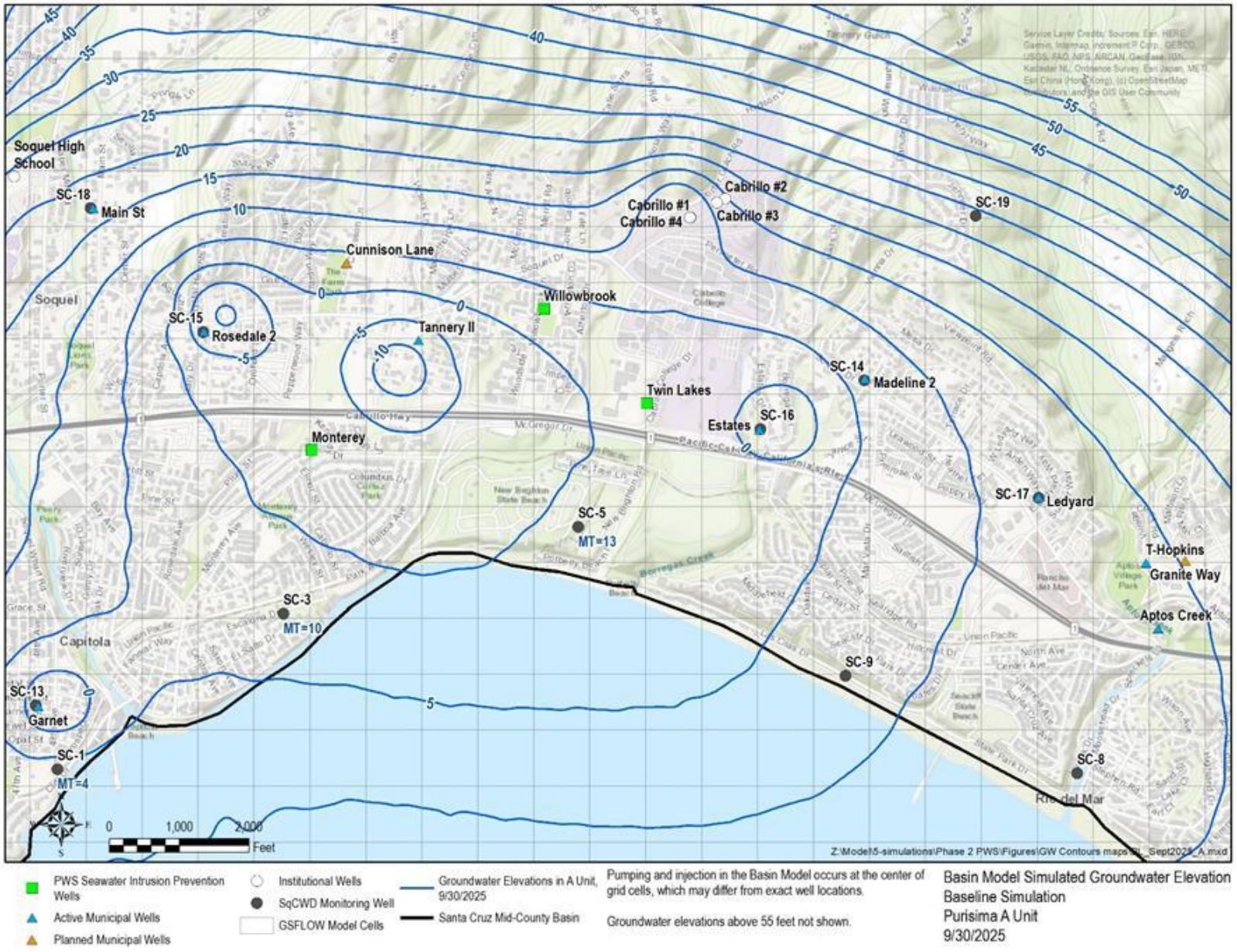

Figure 11-3. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima A unit, September 30, 2025

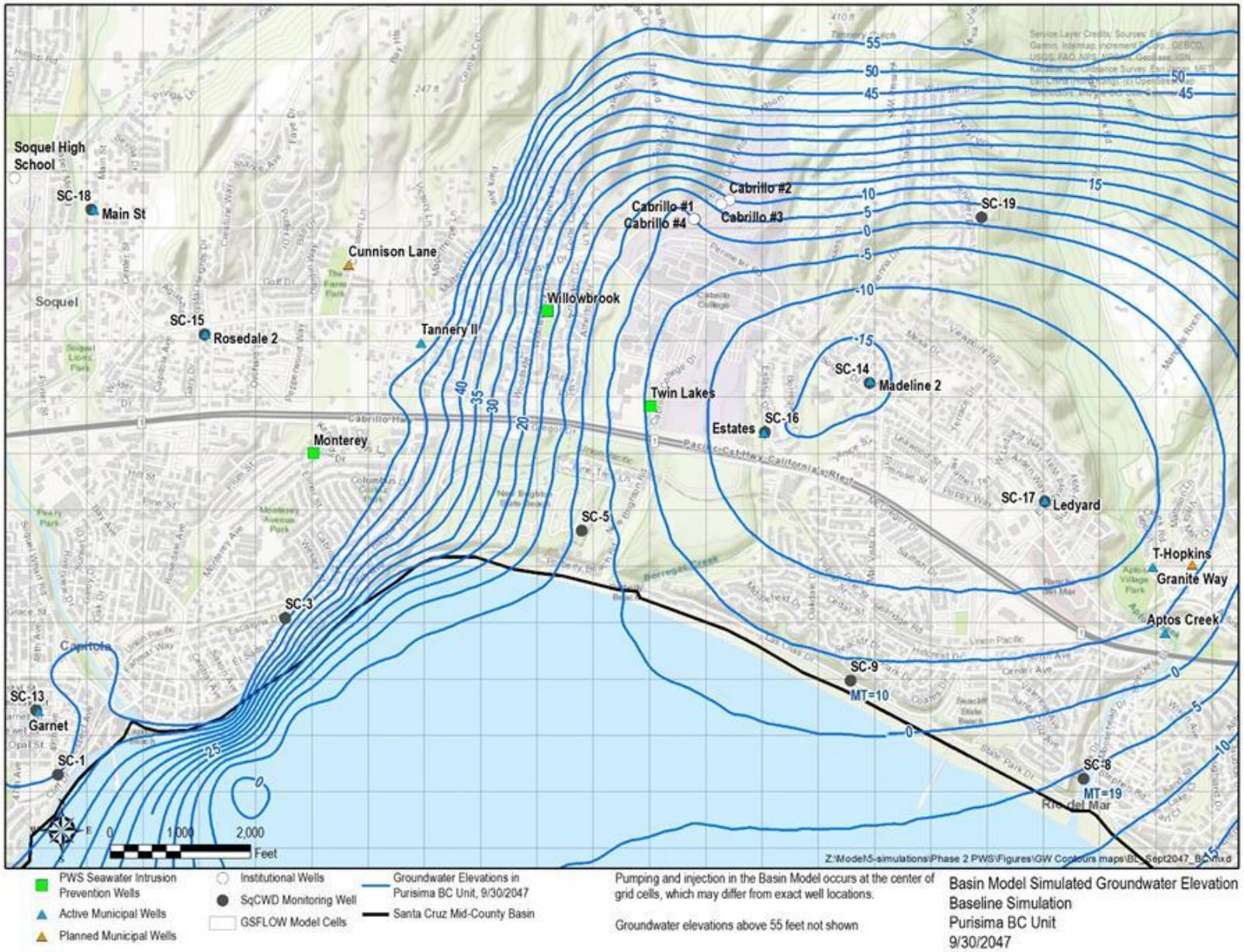

Figure 11-4. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima BC unit, September 30, 2047

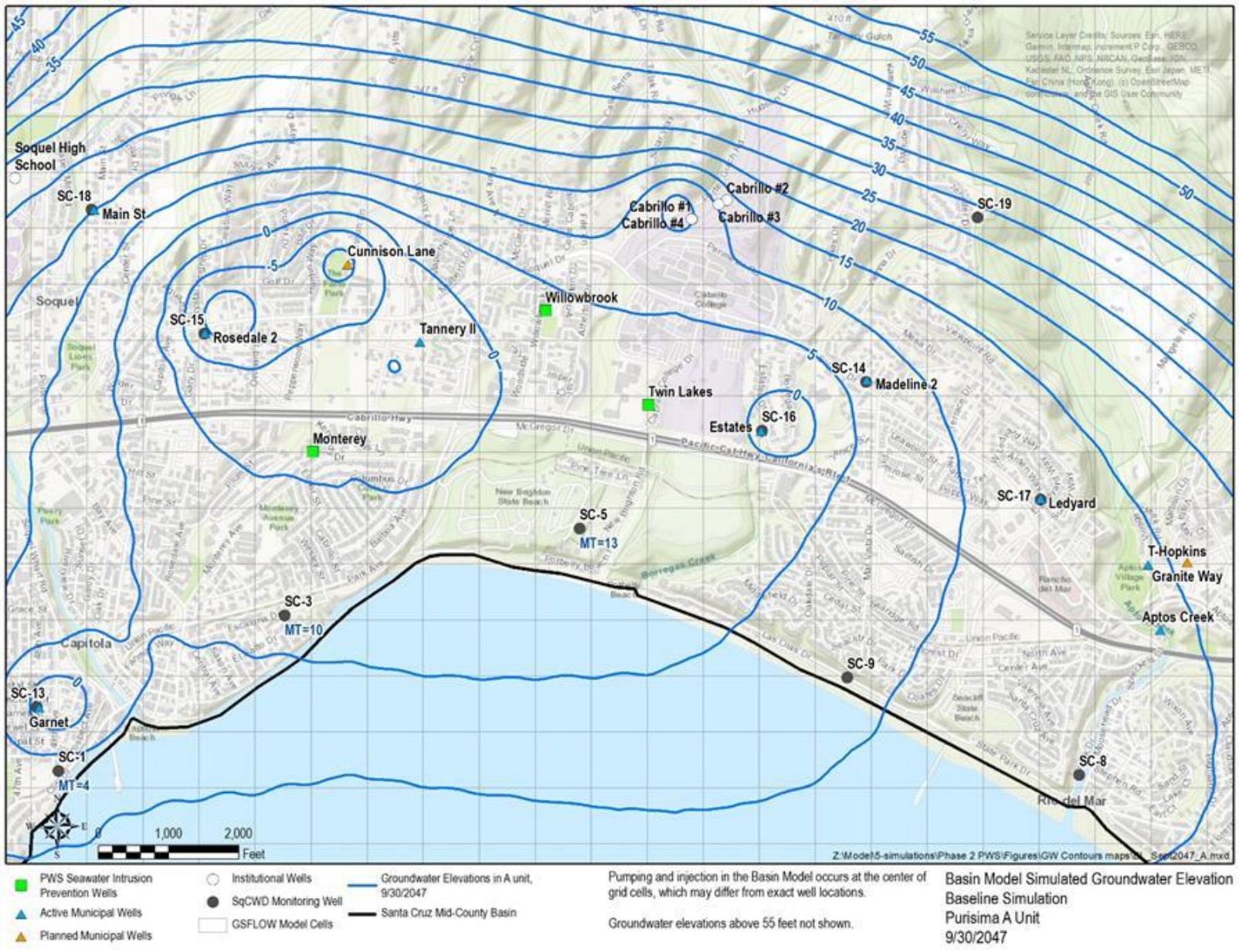

Figure 11-5. Simulated baseline (no recharge at SWIP wells) groundwater elevations (ft msl) in Purisima A unit, September 30, 2047

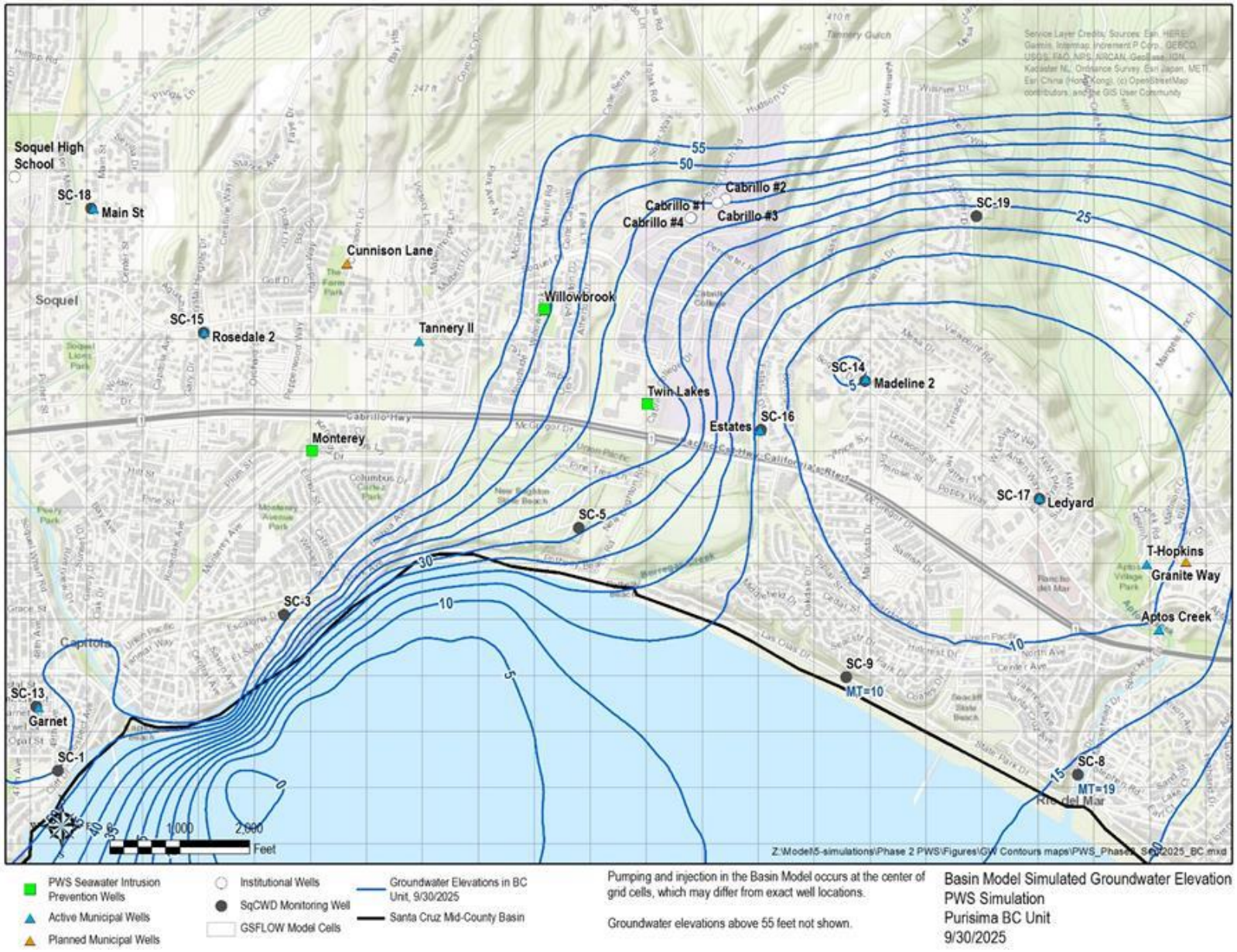

Figure 11-6. Simulated PWS groundwater elevations (ft msl) in Purisima BC unit, September 30, 2025

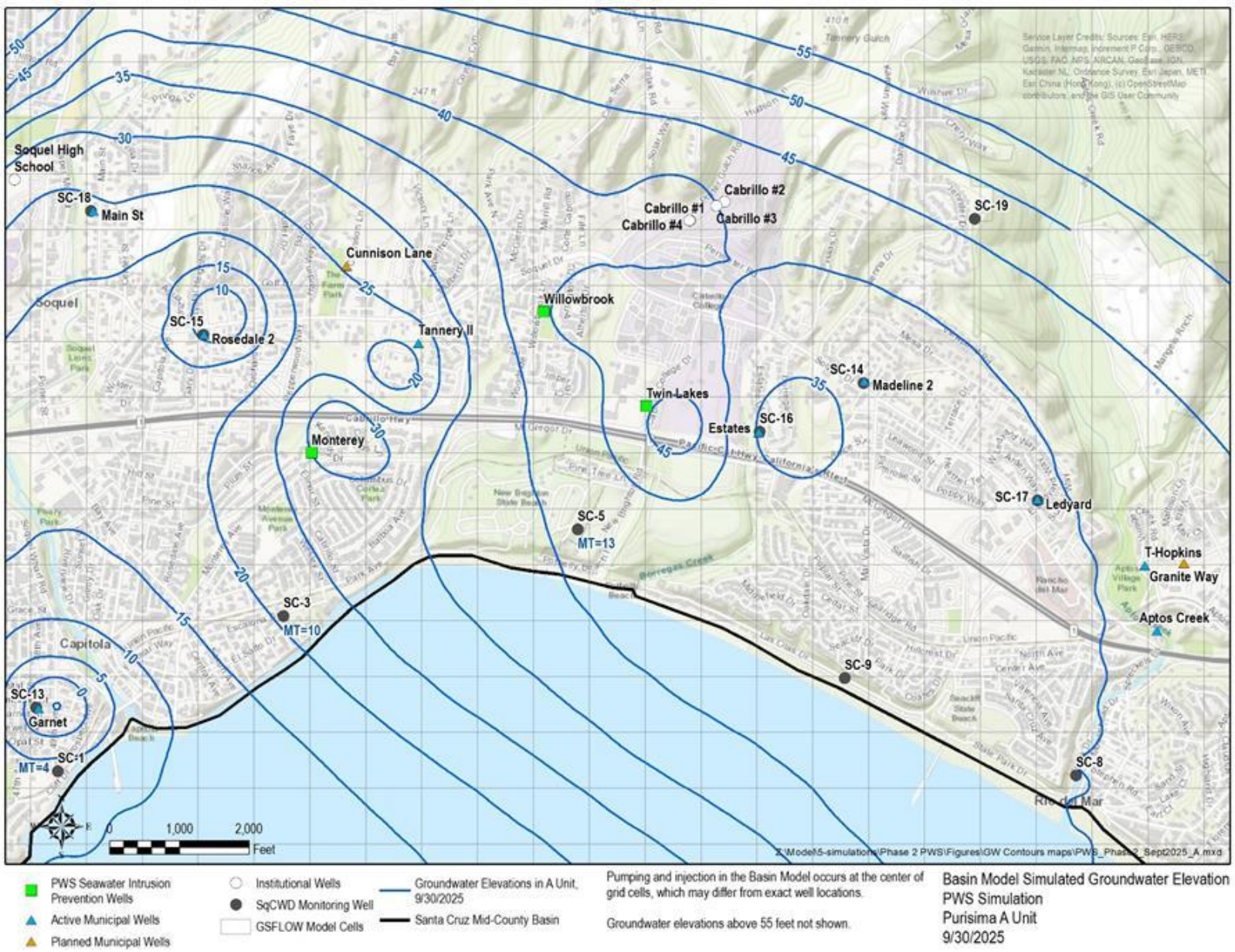

Figure 11-7. Simulated PWS groundwater elevations (ft msl) in Purisima A unit, September 30, 2025

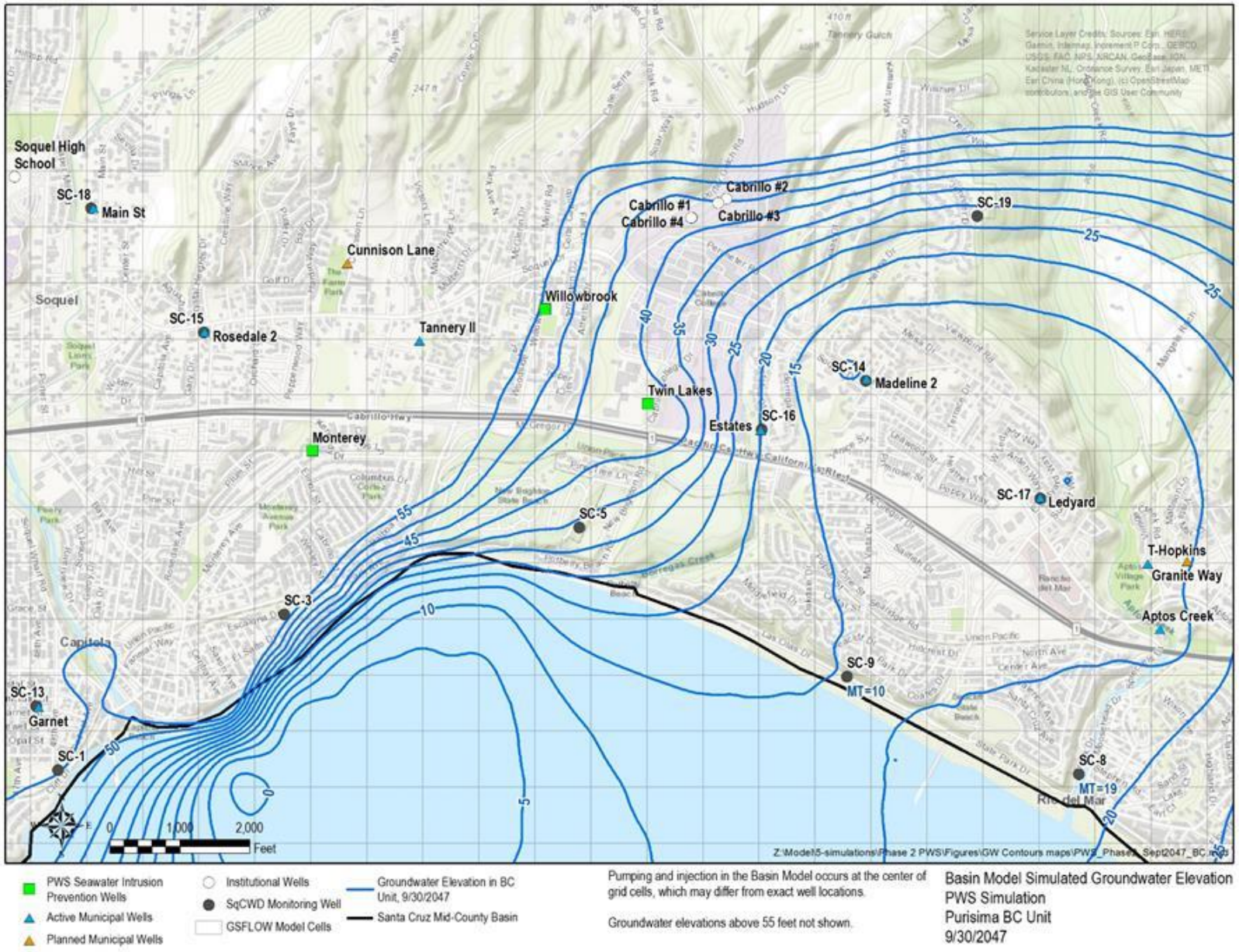

Figure 11-8. Simulated PWS groundwater elevations (ft msl) in Purisima BC unit, September 30, 2047

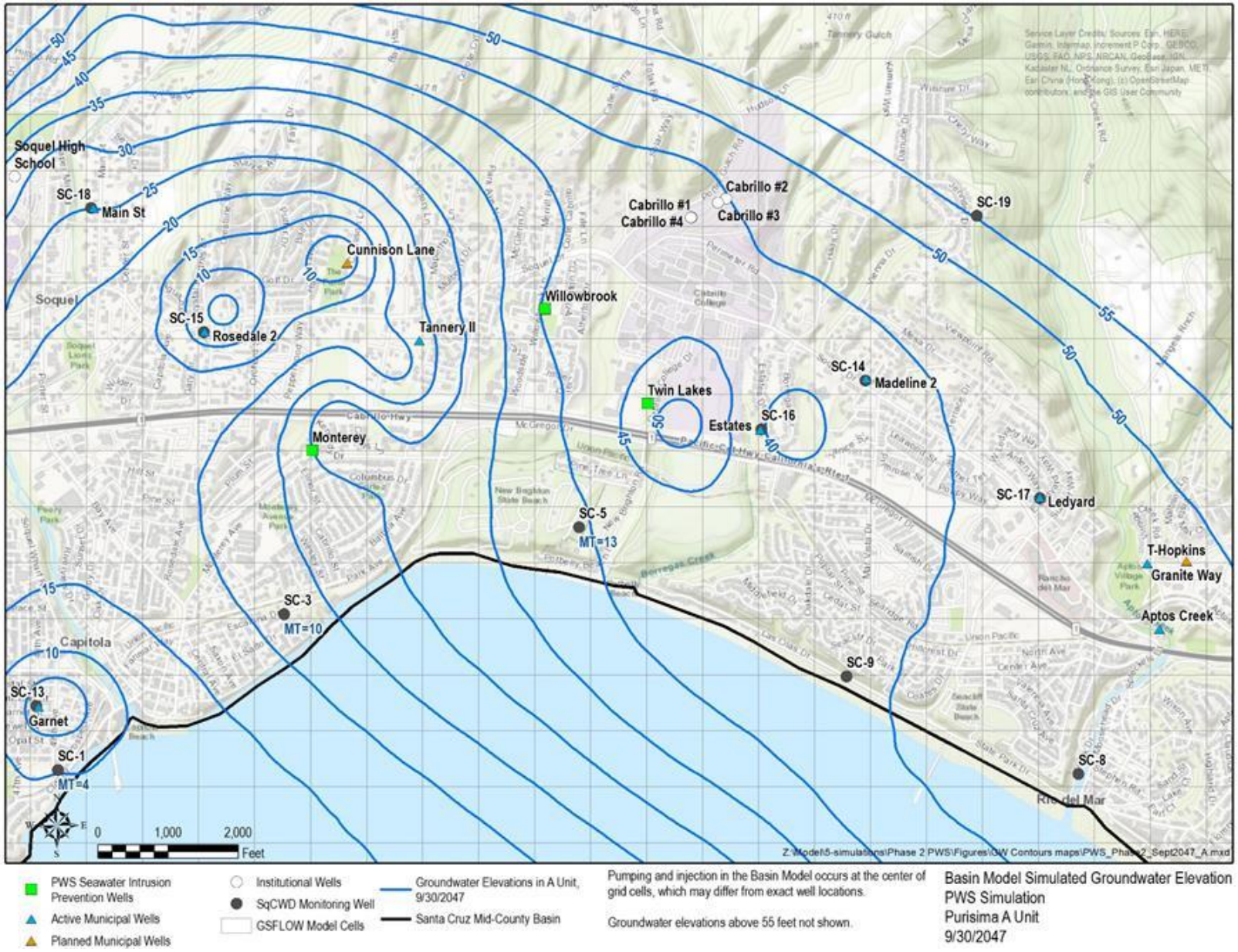

Figure 11-9. Simulated PWS groundwater elevations (ft msl) in Purisima A unit, September 30, 2047

The simulated potentiometric surfaces show the mounding that forms around the recharge wells, with flow directions being dominantly radially outward from the recharge wells within the first thousand ft or so around each recharge well before being drawn by the drawdown cones of closest large municipal production wells and also the regional flow gradients towards the coast.

11.2 Recycled Water Contribution to Aquifer Zones and Water Supply Wells

SqCWD is proposing to conservatively apply a 100 percent Recycled Water Contribution (RWC) for regulatory compliance in conformance with Title 22 Section 60320.216 with no diluent water required. The purified water to be used for recharge will receive FAT as described in **Section 5**. Any dilution in the subsurface due to groundwater underflow will not be counted.

This subsection describes the modeled long-term contribution of recharged purified water to the Basin aquifers and individual extraction wells. This long-term spatial extent of recharged purified water is evaluated using United States Geological States (USGS) MODPATH particle tracking based on results of the Basin Model simulation of the PWS scenario described in **Section 11.1.1.** The evaluation of the long-term fate of recharged purified water includes modeled results for where the purified water travels in the Basin, which wells eventually extract purified water, and estimates of the percentage of purified water in extracted water. These results are also incorporated into an anti-degradation analysis (BC, 2020c).

As described in **Section 11.3**, MODPATH results are not used to estimate underground retention time to meet Title 22 requirements for response retention times and virus log reduction credits.

11.2.1 MODPATH Setup for Particle Tracking based on Basin Model

MODPATH is set up so that particles are released from the Basin Model cells that contain simulated TLC, Willowbrook, and Monterey SWIP recharge wells monthly during the time period that the SWIP wells are in operation under the PWS scenario. The number of particles released from each SWIP well is proportional to the recharge flow rate at each well, so that the number of particles approximately equates to the amount of recharged water mass. For example, doubling the flow rate at a constant concentration effectively doubles the amount of mass being recharged to the aquifers, therefore twice the number of particles is released if the flow rate is doubled.

The starting points for the particles are evenly distributed in both the horizontal and vertical directions along the sides of each of the 800x800 ft Basin Model cells containing the three SWIP wells. It is not possible in MODPATH to start particles in the cell interior, such as at actual well locations. The amount of flow and corresponding number of particles released by each well is summarized in **Table 11-3** below.

Table 11-3. Volumes of Purified Water Recharged and Particle Distribution Used in MODPATH

SWIP Well Screening	Recharged Volume (afy)	Number of Particles Released Monthly
Willowbrook (A)	233	164
TLC (A)	690	484
TLC (BC)	52	37
Monterey (A)	500	350
Total	1,475	1,035

Effective porosities used for the MODPATH particle tracking are 9 percent for the Purisima BC unit and 13 percent for the Purisima A unit based on adding an estimated specific retention of 5 percent to specific yield values in the Basin Model (M&A, 2019a). Porosities exceed specific yield by specific retention (Robson, 1993) and a relatively low specific retention was used for the semi-consolidated Purisima Formation. The effective porosities used are also in the range of porosities presented for the Purisima Formation (8 to 15 percent) in the primary basis for the hydrogeological conceptual model for the GSP (Johnson et al., 2004).

11.2.2 MODPATH Results for Spatial Extent of Recharged Purified Water

Long-term spatial extent of recharged water in Purisima A and BC units are based on particle locations at the end of Water Year 2047. **Figure 11-10** and **Figure 11-11** show the spatial extent of 25 years of recharged purified water based on MODPATH particle locations at the end of Water Year 2047 for the Purisima BC and A units, respectively. The 25-year time span encompasses the long-term pumping distributions assumed for the PWS scenario that includes Cunnison well pumping coming online in Water Year 2026 (**Table 11-2**).

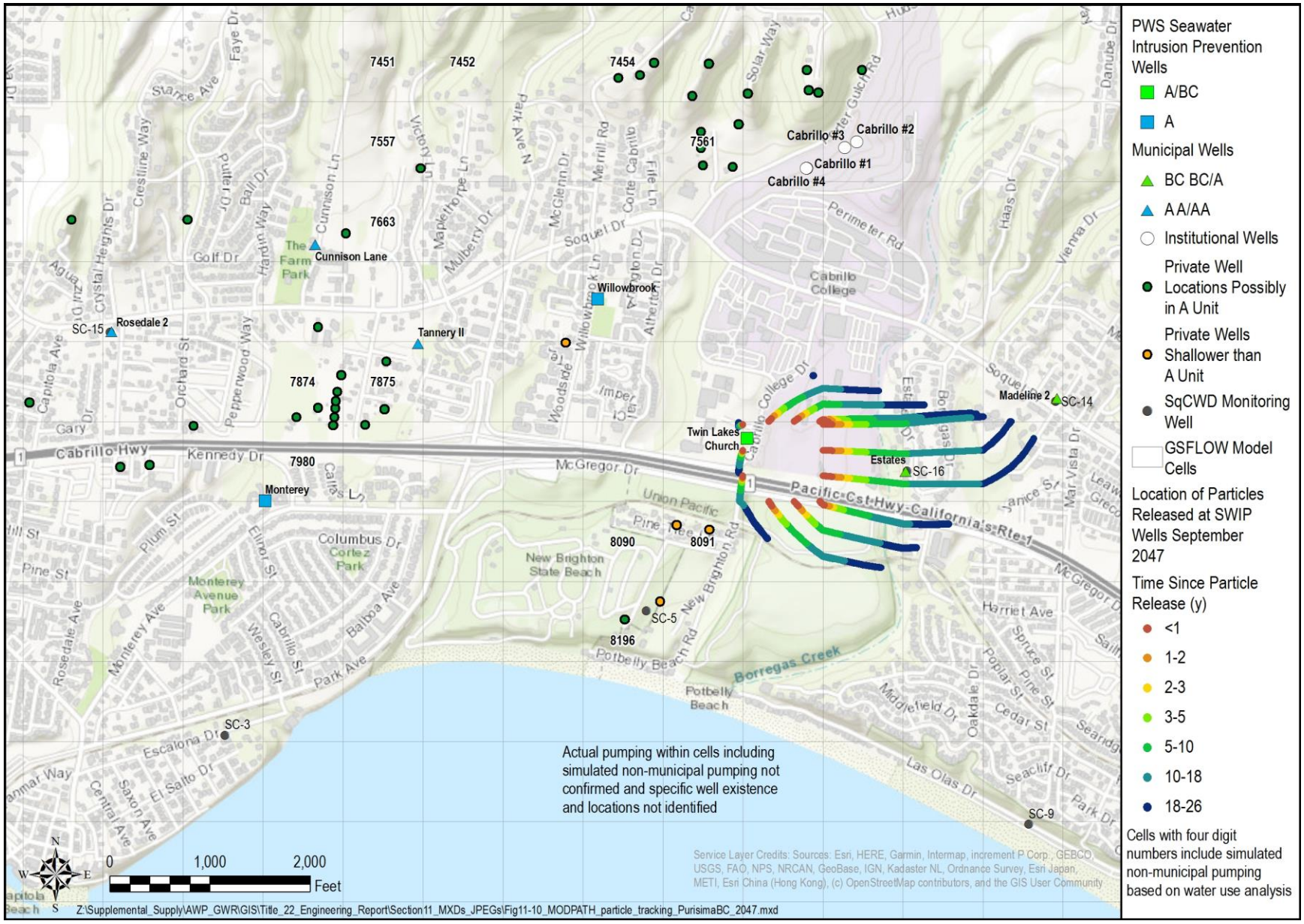

Figure 11-10. MODPATH particle tracking in Purisima BC unit, end of water year 2047

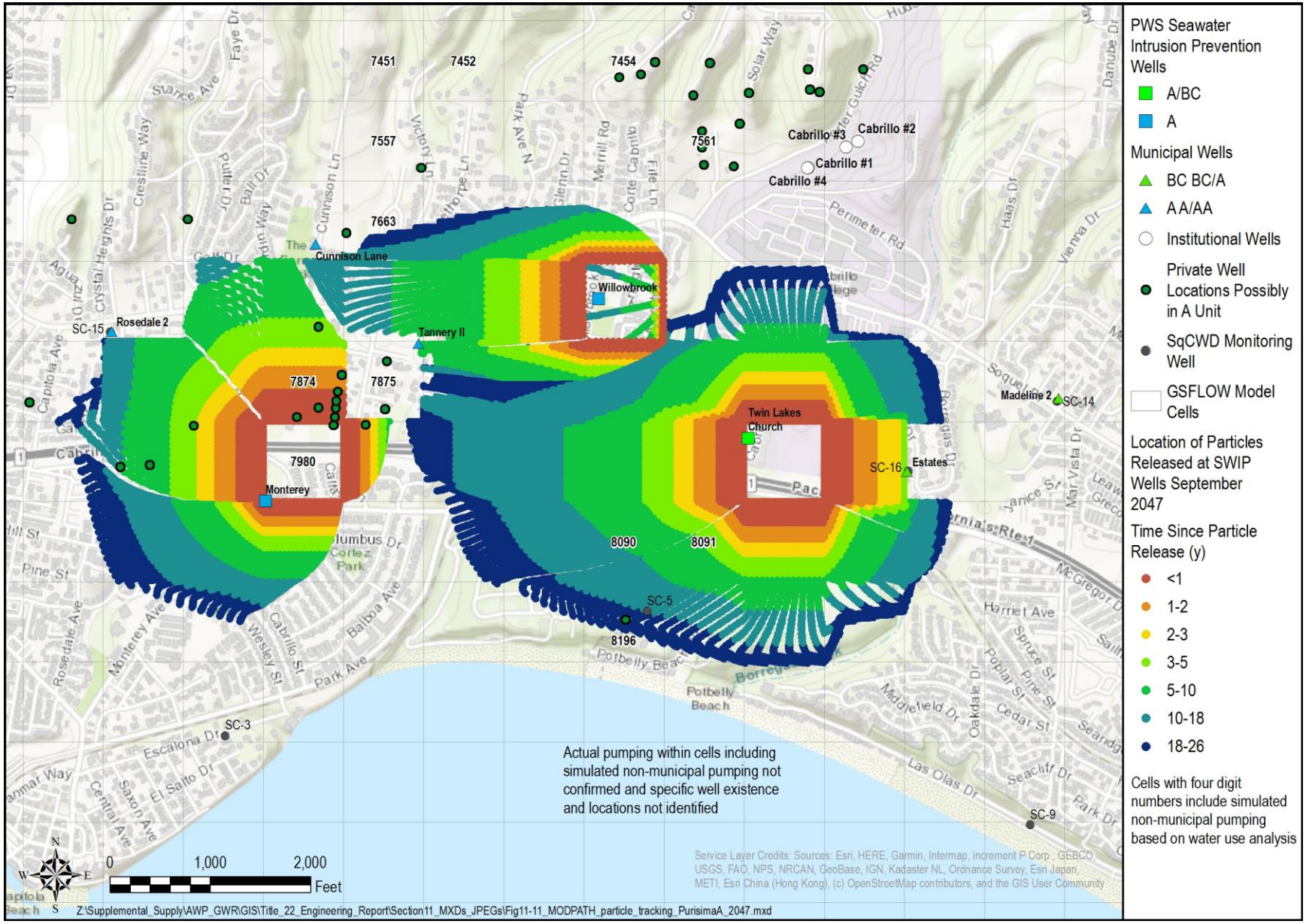

Figure 11-11. MODPATH particle tracking in Purisima A unit, end of water year 2047

The spatial extent of recharged purified water even over this long period is much smaller than the area where recharge by PWS increases groundwater elevations as shown when comparing **Figure 11-6** through **Figure 11-9** for the PWS simulation to **Figure 11-2** through **Figure 11-5** for the baseline simulation. For example, recharge at the SWIP wells increases groundwater levels at SC-3A in the Purisima A unit (**Figure 11-9**) and SC-9C in the Purisima BC unit (**Figure 11-8**) very soon after recharge commences in simulated Water Year 2023, but recharged purified water does not reach these locations within 25 years.

Figure 11-10 shows that recharged purified water from the Monterey and Willowbrook SWIP wells screened only in the A unit are not simulated to travel to the shallower BC unit. Therefore, purified water is not expected to travel to the irrigation well at 6120 Abbey Road just southwest of the Willowbrook well because its depth of 130 ft measured by SqCWD in March 2020 is to the top of the BC unit. The lack of connection between this irrigation well and the Willowbrook SWIP well is reinforced by monitoring of the irrigation well during pump tests at the SWIP well in December 2020. Groundwater levels at the irrigation well showed no response to a 10 hour step test with pumping rates ranging from 491-1,509 gpm and a 24 hour constant rate test with a pumping rate of 1,012 gpm (M&A, 2021). This lack of hydraulic connection indicates that purified water will not travel from the Willowbrook SWIP well to the irrigation well at 6120 Abbey Road.

MODPATH assumes that once a particle reaches a model cell simulating a well with high enough extraction to create a "strong sink", the particle is removed from the system by the well. Extraction flow rate for a strong sink is high relative to total flow through the aquifer at that cell. Municipal wells in the Purisima A unit are simulated as strong sinks. Therefore, the particles are removed at the cell boundary at municipal wells, and **Figure 11-11** shows no particles within the cells where particles are removed in the A unit.

There are a couple of model cells where wells add water to aquifer units, but at rates low enough that particles can pass through the model cells. This occurs at the Estates well in the BC unit where higher recharge in the A unit at TLC SWIP well results in flow from the A unit to the BC unit at the Estates well. This flow does not change the overall west to east gradient simulated by the Basin model (**Figure 11-8**) and particles pass through this model cell in the BC unit (**Figure 11-10**). The particles passing through the Willowbrook model cell in the A unit **(Figure 11-11**) indicate that particles released on the eastern edge of the cell move to the west due to the overall east to west gradient simulated at the 800x800 grid resolution (**Figure 11-9**).

As shown on **Figure 11-11**, some particles pass through cells where private wells are located because the wells are considered "weak sinks" by MODPATH. Extraction flow rate for a weak sink is low relative to total flow through the aquifer at that cell so weak sink pumping is not strong enough to capture particles in MODPATH. As MODPATH does not show capture of particles at these wells, MODPATH does not reflect the reality that the wells will intercept purified water as it travels to the well. **Figure 11-11** does show particles traveling to private well locations so those wells are expected to extract purified water. Therefore, the amount of purified water captured by private wells are estimated outside of MODPATH as described below. Private wells shown in **Figure 11-11** are assumed to provide potable domestic supply (BC, 2019a) although this has not been confirmed at all mapped wells.

11.2.3 Estimates of Purified Water Contribution to Wells and Aquifer

Estimates of the amount of recharged purified water extracted from wells versus remaining in Basin aquifers are primarily based on the number of particles simulated by MODPATH as extracted at municipal wells and remaining in the model over the 25-year period. As described in the previous section, treatment of private wells as "weak sinks" requires estimating the amount of purified water extracted by the private wells separately from MODPATH.

The estimate of the amount of purified water captured by private wells is based on the assumption that once purified water reaches the private well, all water extracted from the well is purified water. This first requires assessing which private wells are expected to extract purified water at all. **Figure 11-10** shows private well locations known to be screened in the Purisima BC unit and shows no purified water travelling to these locations in the BC unit. **Figure 11-11** shows private well locations assumed to be screened in Purisima A unit. The only non-municipal well locations where purified water travels are the locations near the Monterey SWIP well. As will be later described in **Section 11.3.2**, estimated retention time of purified water between Monterey SWIP well and the nearest private well is approximately 33-39 months for the range of recharge rates evaluated. Assuming that all of private extraction near the Monterey SWIP well after 33 months is purified water, up to 89 percent of the non-municipal extraction over the 25-year period is purified water. The estimated total non-municipal extraction simulated by the Basin Model near the Monterey SWIP well over the 25-year period is approximately 125 acre-ft (AF). Therefore, the amount of purified water estimated to be extracted by non-municipal wells near the Monterey SWIP well and overall is up to approximately 110 AF or 0.3 percent of the total amount of purified water recharge. This extraction of purified water by private wells would reduce extraction of purified water by municipal production wells Tannery II, Rosedale, and Cunnison slightly from estimates based on particle capture in MODPATH.

Based on the MODPATH results and the above estimate for private wells near the Monterey SWIP well, approximately 37 percent of recharged purified water is captured by SqCWD production wells and up to 0.3 percent of recharged purified water is captured by private wells. The remaining approximately 63 percent remains in the aquifer system after 25 years of simulated recharge operations.

Table 11-4 shows the estimated total amount of recharged purified water from the PWS Project extracted by each well and the fraction of the total water pumped by each well consisting of recharged water captured by SqCWD production wells and non-municipal wells simulated in the Basin Model through the end of Water Year 2047. Note that the percentages of pumped purified water in the middle column are shown as a fraction of total pumping at each individual well, rather than as total pumped purified water across all wells, and so do not add up 100 percent along all rows. The last column totals up to the 37 percent of all recharged water that is captured at the wells.

Table 11-4. Estimated Total Amount of Purified Water Captured at Wells through end of Water Year 2047

Supply Well	Total Pumped at Well through end of WY 2047 (AF)	Percent Purified Water of Total Water Pumped at Well	Percent of All Recharged Purified Water Captured at Well
Tannery	14,700	41%	16%
Estates	10,300	40%	11%
Rosedale	13,600	19%	7%
Cunnison Lane	9,600	10%	3%
Madeline	3,000	1%	0.1%
Private Wells around Monterey SWIP Well (APN 3719112)	125	<=89%	<=0.3%

Table 11-5 shows the fate of recharged purified water by aquifer unit. For water recharged into the Purisima A unit, 44.7 percent of the recharged water is captured by wells after 25 years of recharge. Almost none of the smaller amount of water recharged into the Purisima BC unit is captured by wells during the same period. Recharged water remains in the same aquifer unit that they are recharged indicating flow is two-dimensional for the spatial extent of the recharged purified water simulation. This is consistent with the calibrated three-dimensional Basin Model flow output showing that 99.9 percent of total particle velocity throughout the area of influence of the project is parallel to the modeled aquifer layering and that flow gradients orthogonal to the layering are negligible. This also means that no supply well is simulated to extract purified water recharged in a different unit than where the supply well is screened.

Table 11-5. Fate of Purified Water through End of Water Year 2047 by Aquifer Unit

Aquifer where Particles Released	Percent Purified Water Recharged into Each Unit	Percent Purified Water Remaining in A Unit	Percent Purified Water Remaining in BC Unit	Percent Purified Water Captured by Wells
A	~96%	59%	0%	37%
BC	4.1%	0%	4%	0.1%

11.3 Underground Retention Time

Modeled retention time estimates are necessary for the purpose of siting SWIP and monitoring wells during project planning to meet California regulations for Groundwater Replenishment with Recycled Water. The regulations provide different levels of virus log reduction and response time credit per month of modeled retention time depending on the method used for estimating the retention times. A virus log reduction and response time credit of 0.50 per month is assigned for retention times estimated using numerical modeling consisting of calibrated finite element or finite difference models using validated and verified computer codes used for simulating groundwater flow. A virus log reduction and response time credit of 0.25 per month is assigned for analytical calculations using existing academically accepted equations such as Darcy's Law to estimate groundwater flow conditions based on simplifying aquifer assumptions. Retention time estimates are presented in the following subsections using two methodologies: (1) refined particle tracking based on the numerical Basin Model and (2) analytical equations. Retention time estimates will be updated based on the tracer study to be started within the first 3 months of purified water recharge at the SWIP wells (see **Section 14.7**).

11.3.1 Retention Time Estimates Using Refined Particle Tracking

Retention times based on calibrated numerical modeling results are expected to be more accurate than analytical calculations. However, the grid cell size of the calibrated Basin Model is not fine enough to accurately represent short term travel times between recharge and extraction wells because: (1) simulated wells are represented as 800 ft by 800 ft grid cells rather than their actual positions, and (2) water levels are averaged over each grid cell and do not accurately capture the steeper hydraulic gradients closest to the wells. In addition, the Basin Model using GSFLOW requires setup of the integrated PRMS watershed component model on the same grid and resolution as used for the MODFLOW groundwater model, so grid refinement of the full Basin Model itself is not a simple or straightforward process. Therefore, a refined numerical model for the local subarea of the Basin Model was developed, which combines the regional hydraulic heads and aquifer parameters from the calibrated Basin Model with simulated SWIP recharge wells and municipal extraction wells placed at their actual locations. This refined local numerical model can more accurately represent the steeper near-well hydraulic gradients at a finer scale, using the Analytic

Element Method (AEM) numerical modeling approach (Strack & Haitjema, 1981a; 1981b; Haitjema, 1995; and Bakker & Strack, 2003).

The results of this local model were used as the basis for a refined particle tracking analysis to evaluate the retention times over the first three years (36 months) of purified water recharge under the PWS Scenario (**Table 11-2**). The details of the refined modeling approach are described fully in the PWS Phase 2 Modeling report (M&A, 2020), included in **Appendix E**. The PWS Phase 2 Modeling report also describes justification for applying a 0.50 per month credit to retention times estimated by the refined particle tracking, but retention time estimates meet Project requirements even with a 0.25 per month credit.

Figure 11-12 shows refined particle tracking results for recharge from the TLC SWIP well into the Purisima BC unit. **Figure 11-13** shows refined particle tracking results for recharge from the three SWIP wells into the Purisima A unit. The refined particle tracking analysis indicates that no particles released at any of the SWIP wells in either the Purisima A or BC units reach any municipal pumping wells within 3 years as modeled. In the Purisima A unit, particles released from the Monterey SWIP well reach the horizontal locations of two of the private wells identified in the Monitoring Network Analysis shown on **Figure 11-12** and **Figure 11-13** and assumed to provide domestic supply (BC, 2019) approximately 33 months into the three-year refined particle tracking period of the model. 33 months is the best estimate of shortest underground retention time to a drinking water well because the PWS scenario assumes 500 afy recharge at the Monterey SWIP well, which is the maximum rate at the well. The private domestic well with the shortest retention time from the Monterey SWIP well is at 2603 Monterey Avenue (APN 37-191-12). This well is screened to a depth of 360 ft and therefore extracts water from the Purisima A unit that the Monterey SWIP well would recharge. Applying a 0.25 credit, this would provide an 8.25-month credited retention time to provide planned log virus reduction credit of 6 months as described in **Section 9**.

Figure 11-13 shows a private well shallower than A unit overlying the three-year refined particle tracking period simulated for the A unit by the model around the Willowbrook SWIP well. This is the irrigation well near 6120 Abbey Road discussed in **Section 11.2.2**. As discussed, this well has a depth just to the top of the BC unit and monitoring of the well during pump testing of the Willowbrook SWIP well indicates a lack of hydraulic connection between the irrigation well and the Willowbrook SWIP well. **Section 11.2.3** also explains that the calibrated Basin Model does not simulate purified water being transported to aquifers other than the recharged aquifer. Purified water is unlikely to be observed at this irrigation well.

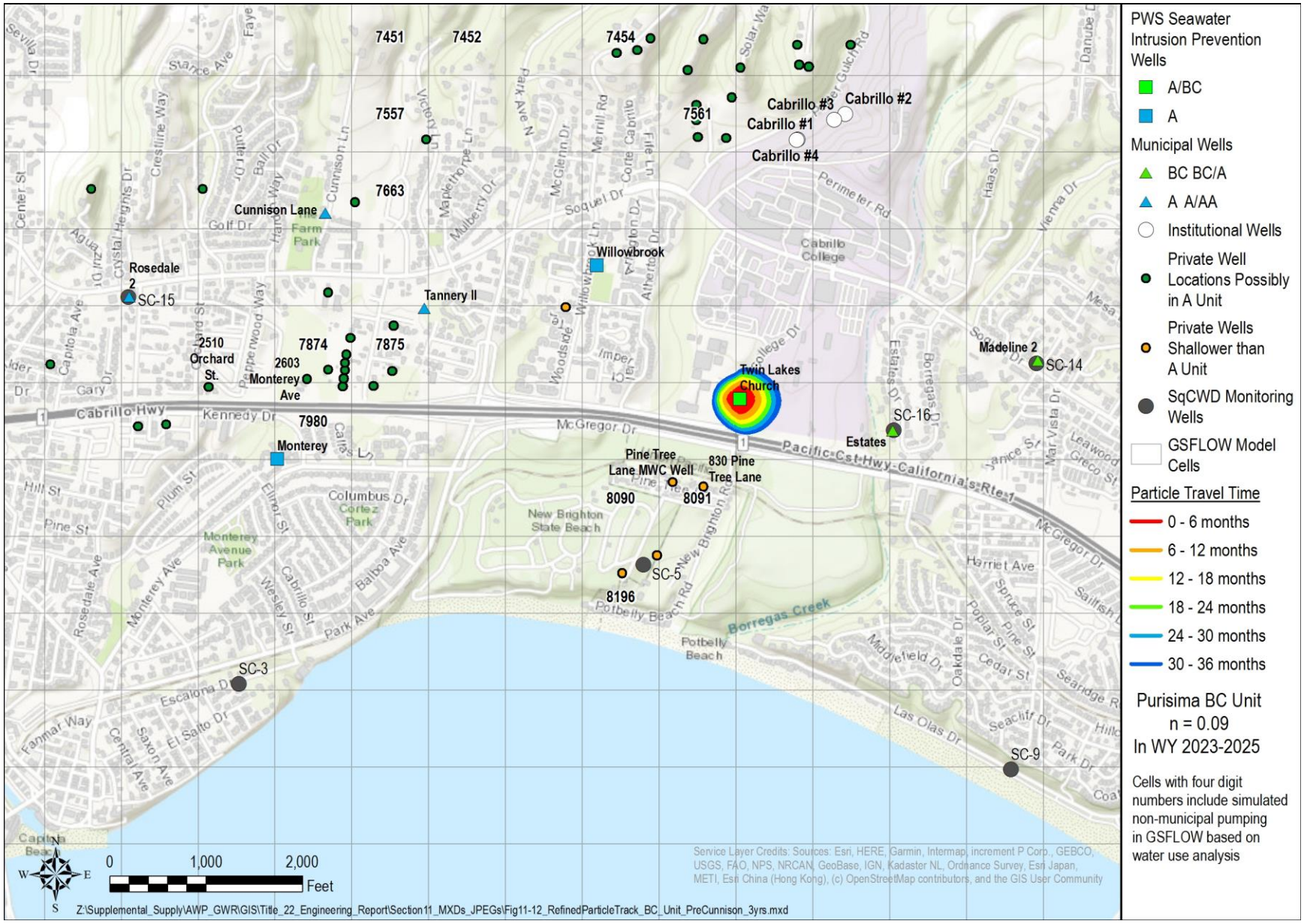

Figure 11-12. Refined particle tracking results in Purisima BC unit (Layer 5)

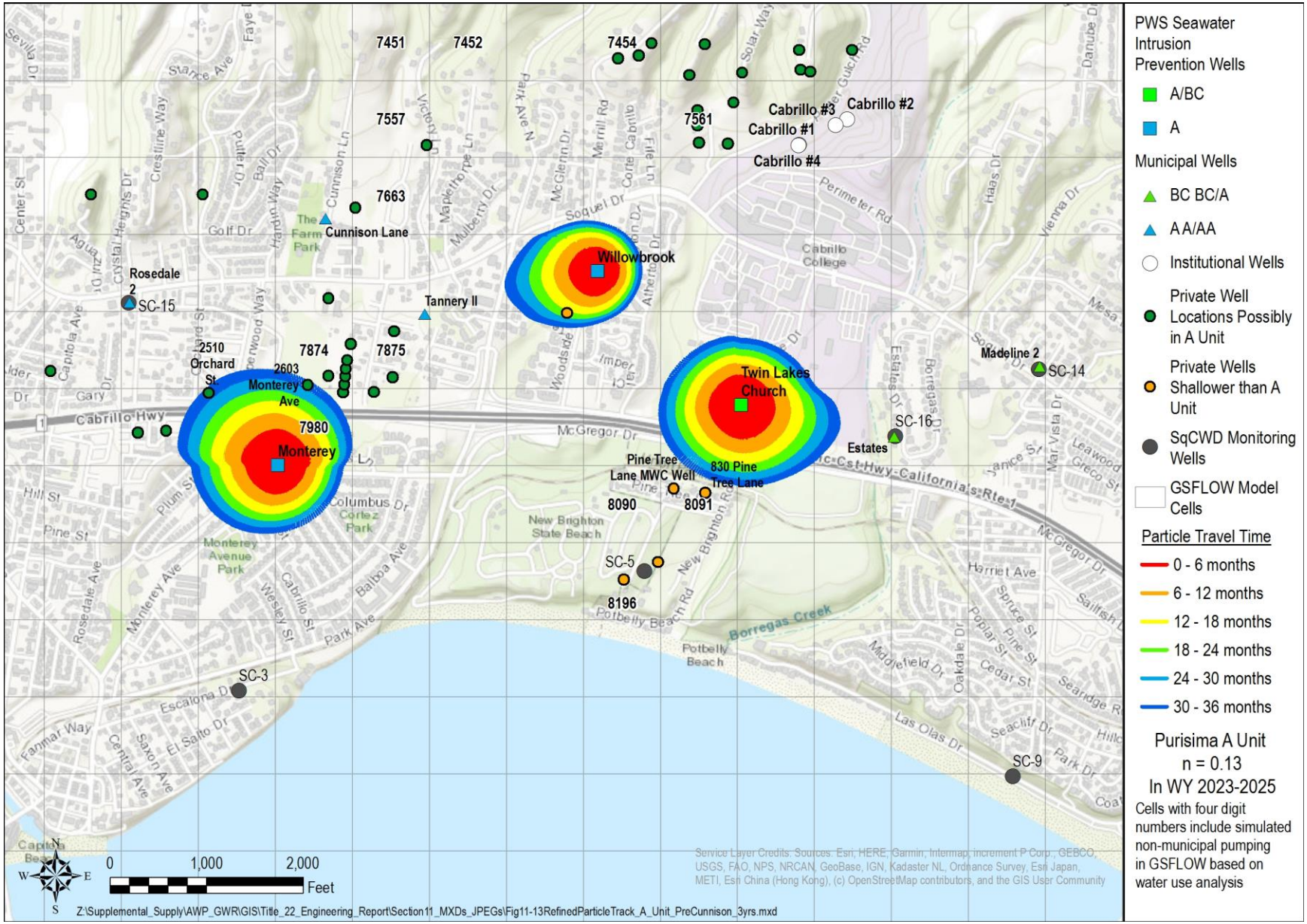

Figure 11-13. Refined particle tracking results in Purisima A unit (Layer 7)

11.3.2 Retention Time Estimates Using Analytical Equations

Analytical equations are used to estimate retention times not estimated by the refined particle tracking. These include:

- Retention times between SWIP wells and drinking water wells beyond the three years simulated by the refined particle tracking are calculated using analytical equations with results presented below.
- Retention times between the SWIP wells and proposed monitoring well locations beyond 3 years as discussed in **Section 14.5.2**.
- Retention times between proposed monitoring well locations and drinking water wells as discussed in **Section 14.5.2**.
- Retention times between wells to evaluate the range of recharge rates at the SWIP wells not simulated with refined particle tracking. The resulting estimates for ranges of retention times between SWIP wells and drinking water wells are presented below. Ranges of retention times to and from monitoring wells are presented in **Section 14.5.2.**

The analytical equations that can be used to estimate retention times between pumping and recharge wells are solutions of Darcy's law for simplified conditions. One such analytical solution is described by Luo & Kitanidis (2004) for the shortest travel time between a single recharge and extraction well pair operating in a uniform regional gradient. This analytical solution relies on a number of simplifying assumptions, including a homogenous aquifer of uniform conductivity and thickness between the two wells, and that both wells are pumping at equal and opposite pumping rates. The solution assumes that only those two wells are pumping and does not account for effects of additional pumping or recharge wells operating simultaneously that the MODPATH and refined particle tracking approaches do.

To estimate retention times in a direction with no extraction by a SqCWD production well or a location where extraction is much lower, an analytical equation (USEPA, 1987) is used that assumes only recharge at the SWIP well drives the gradient. This means that retention times are calculated to some wells even though recharge and pumping induced gradients may result in purified water never reaching those wells. Examples of these wells are the Pine Tree Lane wells southwest of the TLC SWIP well (in cell 8091) as shown in **Figure 11-10** of the MODPATH results from the Basin Model. Although not definitive based on retention times up to 36 months, refined particle tracking shown in **Figure 11-12** also indicate that purified water may not reach the Pine Tree Lane wells that extract from the BC unit.

Table 11-6 shows the estimated retention times using the analytical equations for retention times to drinking water wells beyond the 36 months estimated by refined particle tracking assuming recharge rates at the SWIP wells assumed for the Basin Model as shown in **Table 11-2** and **Table 11-3**. The estimated retention times using analytical equations to these wells are all over 36 months.

Table 11-6. Estimates of Retention Times Based on Analytical Equations for Retention Times Beyond 36 Months

SWIP Well	Purisima Aquifer Unit(s)	Closest Municipal Well in Direction of Flow	Approx. Distance of Municipal Well from SWIP Well (ft)	Drinking Water Well	Approximate Distance from SWIP Well (ft)	Estimated Retention Time from SWIP Well (months)
Monterey	A	Tannery II	2200	Tannery II	2200	80[a]
Willowbrook	A	Tannery II	1770	Tannery II	1770	72
TLC	A	Estates	1630	Estates	1630	52
TLC	BC	Estates	1630	Estates	1630	456
TLC	BC	None	N/A	Pine Tree Lane Wells	1,000	280[b]

*a. Corrected from **Appendix E**.*
b. Based on equation 4 (USEPA, 1987) for travel time from a single well using SWIP recharge rate only, which results in shorter retention time than equation 3 (Luo & Kitandis, 2004) for an injection-extraction well pair using average of recharge and municipal pumping rates.

As discussed in **Section 11.1.1**, the SWIP well recharge rates simulated as the PWS Scenario with the Basin Model and used for refined particle tracking estimates of underground retention time represent endpoints of potential ranges of recharge rates at the SWIP wells. Due to uncertainty of recharge rates that can be achieved at the SWIP wells during long-term operation, PWS may operate at lower recharge rates than the 500 afy at the Monterey SWIP well used for refined particle tracking and higher recharge rates than the 233 afy and 742 afy at the Willowbrook SWIP well and TLC SWIP well, respectively. In order to provide operational flexibility over the potential range of recharge rates, analytical equations are used to evaluate underground retention time associated with a minimum recharge rate at the Monterey SWIP well and the maximum recharge rates at the Willowbrook SWIP well and TLC SWIP well. **Table 11-7** shows the estimated retention times for these recharge rates using analytical equations to evaluate the range of potential recharge rates at the SWIP wells to allow for flexibility in operation of PWS. The minimum recharge rate results in the maximum estimated retention time and vice-versa. **Table 11-8** summarizes the range of potential retention times based on the range of potential recharge rates evaluated, combining results from refined particle tracking (**Section 11.3.1**) and analytical equations (**Table 11-6** and **Table 11-7**). Even compared to estimated retention times for maximum recharge rates at Willowbrook and TLC SWIP well, 33 months based on the maximum recharge rate at Monterey SWIP well is the shortest underground retention time to a drinking water well.

Table 11-7. Estimates of Retention Times Based on Analytical Equations to Evaluate Range of Recharge Rates at SWIP Wells

SWIP Well	Purisima Aquifer Unit(s)	Recharge Rate Evaluated with Analytical Equation (afy)	Minimum or Maximum Rate at SWIP Well	Drinking Water Well	Approximate Distance from SWIP Well (ft)	Estimated Retention Time from SWIP Well at Evaluated Rate (months)
Monterey	A	200	Minimum	2603 Monterey Ave.	900	39
Monterey	A	200	Minimum	Tannery II	2200	107
Willowbrook	A	500	Maximum	Tannery II	1770	56
TLC	A	1000	Maximum	Estates	1630	43
TLC	BC	1000	Maximum	Estates	1630	352
TLC	BC	1000	Maximum	Pine Tree Lane Wells	1,000	211[a]

a. Based on equation 4 (USEPA, 1987) for travel time from a single well using SWIP recharge rate only, which results in shorter retention time than equation 3 (Luo & Kitandis, 2004) for an injection-extraction well pair using average of recharge and municipal pumping rates.

Table 11-8. Estimates of Retention Times for Range of Recharge Rates at SWIP Wells

SWIP Well	Purisima Aquifer Unit(s)	Range of Recharge Rates Evaluated (afy)	Drinking Water Well	Approximate Distance from SWIP Well (ft)	Range of Estimated Retention Time from SWIP Well (months)
Monterey	A	200-500	2603 Monterey Avenue	900	33-39
Monterey	A	200-500	Tannery II	2200	80-107
Willowbrook	A	233-500	Tannery II	1770	56-72
TLC	A	742-1000	Estates	1630	43-52
TLC	BC	742-1000	Estates	1630	352-456
TLC	BC	742-1000	Pine Tree Lane Wells	1,000	211-280

Estimates using the analytical equations also demonstrate the robustness of proposed log reduction virus credits even when using a 0.25 credit, as discussed in **Appendix E**. Results using simplified analytical equation approaches, derived from Darcy's Law and based on simplifying aquifer assumptions, show credited retention time exceeding log reduction virus credits of six months across the range of recharge rates from all three SWIP wells with a 0.25 credit applied. The minimum retention time estimated with analytical equations is 29 months between Monterey SWIP well and the private well at 2603 Monterey Ave., which is equivalent to 7.2 months applying the 0.25 credit. As refined particle tracking incorporates Basin specific information from the Basin model and a more plausible representation of recharge and pumping distribution, the 33 months estimated by refined particle tracking between the Monterey SWIP well and the private well at 2603 Monterey Ave is considered the best estimate of the shortest potential underground retention time.

11.4 Drinking Water Well Control Zones

Title 22 Section 60320.200(e)(2) requires defining a three-dimensional zone called the primary control zone in which drinking water well construction around each SWIP recharge is restricted. This primary control zone is defined by the extent of the greatest horizontal and vertical distance travelled reflective of either the underground retention time needed for pathogenic microorganism control, or the RRT, whichever is greatest. As described in earlier sections, the pathogenic microorganism control retention time for the Project is 6 months. As calculated in **Section 12** using estimates of underground travel time to the nearest monitoring well (MM-1) to a SWIP well**,** the RRT is 7.5 months based on maximum recharge rate of 500 afy at the Monterey SWIP well and 9.2 months based on the minimum recharge rate of 200 afy at the Monterey SWIP well. Thus, the primary control zone is evaluated based on underground retention times of 7.5-9.2 months estimated for the range of recharge rates used for RRT.

The regulations also require a secondary boundary (secondary control zone) representing an extended zone of potential controlled drinking water well construction requiring further study and potential mitigating activities prior to drinking water well construction. It is proposed that this secondary control zone be defined based on retention times of 8.5-10.2 months estimated for the range of recharge rates used for RRT.

As described in **Section 11.3.2**, the range of SWIP well recharge rates are evaluated to provide operational flexibility given the uncertainty of the long-term operational recharge rates at the SWIP wells. As indicated by the range of estimates for underground retention times on **Table 11-8,** the range of recharge rates results also results in different control zones. Control zones around the Monterey SWIP well for minimum recharge rate of 200 afy use RRT of 9.2 months based on 200 afy while the control zones around the well for maximum recharge rate of 500 afy use RRT of 7.5 months based on 500 afy. However, because total recharge is planned to be approximately 1,500 afy, control zones around the Willowbrook and Twin Lakes Church SWIP wells for their minimum recharge rates use RRT of 7.5 months based on the maximum rate at the Monterey SWIP well, 500 afy. Conversely, control zones around the Willowbrook and Twin Lakes Church SWIP wells for their maximum recharge rates use RRT of 9.2 months based on the minimum rate at the Monterey SWIP well, 200 afy.

The extent of the zones will be conservatively based on applying a 0.25 credit to estimated underground retention times over the range of recharge rates evaluated for the SWIP wells. For primary and secondary control zones of 7.5-8.5 months based on maximum recharge rate at Monterey SWIP well, underground retention times are estimated based on refined particle tracking of the PWS scenario simulated with the Basin Model described in **Section 11.1.1** with maximum recharge of 500 afy at Monterey SWIP well and minimum recharge rates of 233 afy and 742 afy at the Willowbrook SWIP well and TLC SWIP well, respectively. Applying the 0.25 credit, control zones of 7.5-8.5 months are based on refined particle tracking estimates of underground retention times of 30-34 months.

If recharge at Monterey SWIP well is at its minimum rate of 200 afy resulting in control zones of 9.2-10.2 months, recharge at the Willowbrook SWIP well and TLC SWIP well will be higher than what was simulated with the PWS scenario simulated with the Basin Model. Therefore, the control zones of 9.2-10.2 months are estimated based on analytical equations of the minimum recharge rate at the Monterey SWIP well and the maximum recharge rates of 500 afy and 1,000 afy at the Willowbrook and TLC SWIP well, respectively. This results in circular control zones with radii based on the retention time calculated between the SWIP well and the nearest municipal production well. Applying the 0.25 credit, control zones of 9.2-10.2 months are based on the analytical equation estimates of underground retention times of 36.8-40.8 months.

The sets of proposed primary and secondary control zones for each SWIP well in the Purisima BC and Purisima A units are shown on **Figure 11-14** through **Figure 11-17**. The vertical extents of the control zones are defined by the aquifer units recharged by each SWIP well as the calibrated Basin Model indicates minimal vertical flow between aquifer units. In other words, **Figure 11-14** shows the extent of the control zones for the TLC SWIP well in the BC unit only. **Figure 11-15** through **Figure 11-17** shows the extent of control zones for the three SWIP wells in the A unit only.

No drinking water wells are presently located within the proposed primary control zones for the aquifer units recharged by the SWIP wells. At the TLC SWIP well that recharges both the Purisima A and BC units, no drinking water wells are located in the primary or secondary control zones. **Figure 11-15** shows that the Pine Tree Lane wells overlie the primary control zone for the A unit based on maximum recharge at the TLC SWIP well. These drinking water wells are not in the control zones as they are understood to be screened shallower than the A unit as shown on **Figure 11-18**. In addition to the calibrated model indicating lack of vertical flow between aquifer units, there are no known vertical conduits between the TLC SWIP well and the Pine Tree Lane wells that could transport water from the A unit to the Pine Tree Lane wells. SqCWD will seek access to sample the Pine Tree Lane wells as part of the tracer study to evaluate whether the three-dimensional control zones should include these wells.

No drinking water wells are located in the primary or secondary control zones of the Willowbrook SWIP well that will recharge the Purisima A unit. The irrigation well at 6120 Abbey Road overlies the primary control zone for the Willowbrook SWIP well, but is not screened in the same aquifer unit as the control zones of the Willowbrook SWIP well that are located only in the A unit. As described in **Section 11.2.2**, this irrigation well is completed to a depth that is near the top of the Purisima BC unit (**Figure 11-19**) and did not show water level response to pumping at the Willowbrook SWIP well. The Willowbrook SWIP well will recharge purified water in the Purisima A unit. As described in **Section 11.2.2**, purified water recharged from the Willowbrook SWIP well is not simulated to travel through the overlying B aquitard unit into the BC unit. There are no known vertical conduits between the TLC SWIP well and the Pine Tree Lane wells that could transport water from the A unit to the Abbey Road well. SqCWD will seek access to sample the Abbey Road well as part of the tracer study to evaluate whether the three-dimensional control zones should include this well.

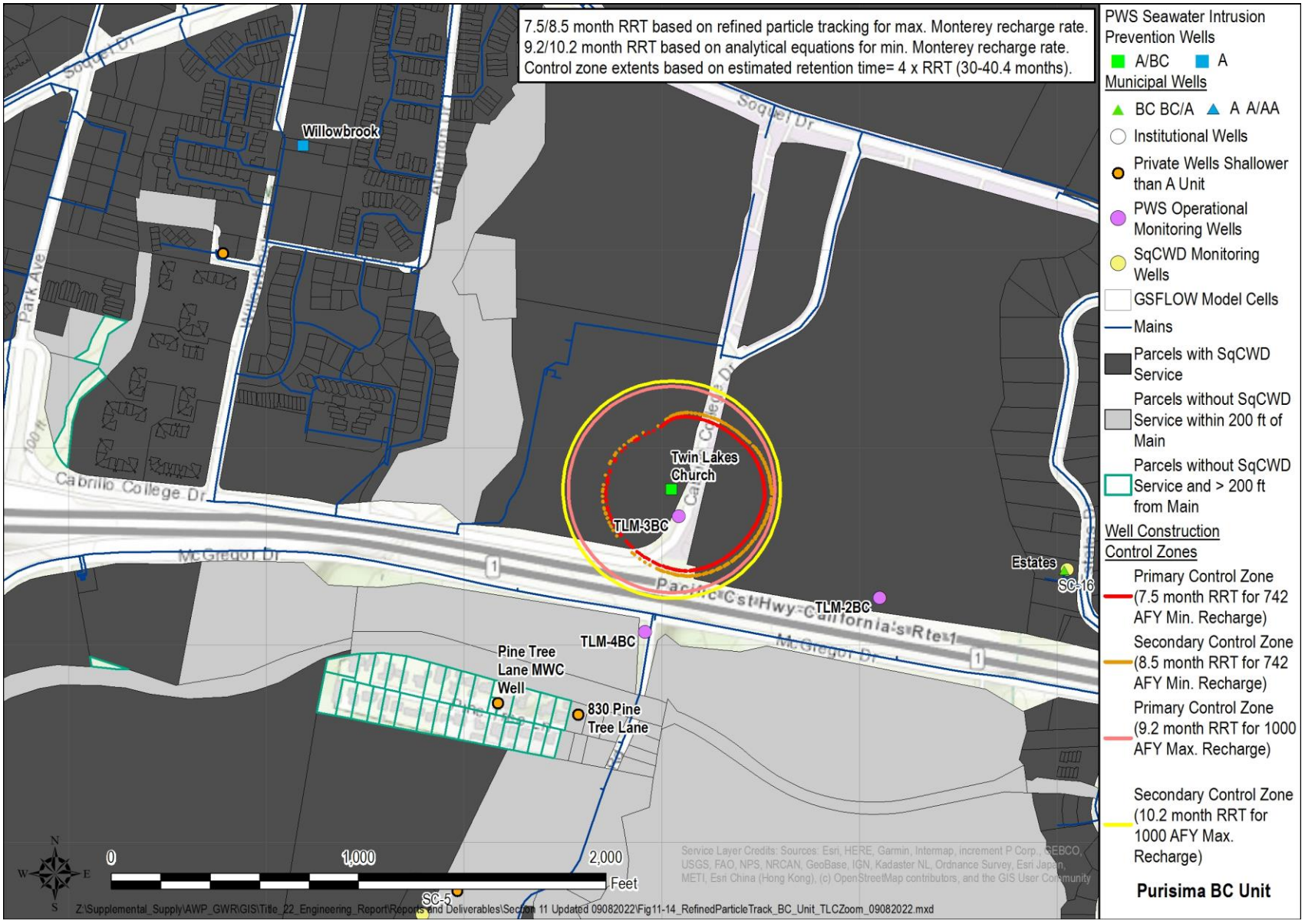

Figure 11-14. Primary and secondary well construction control zones for TLC SWIP well in Purisima BC unit

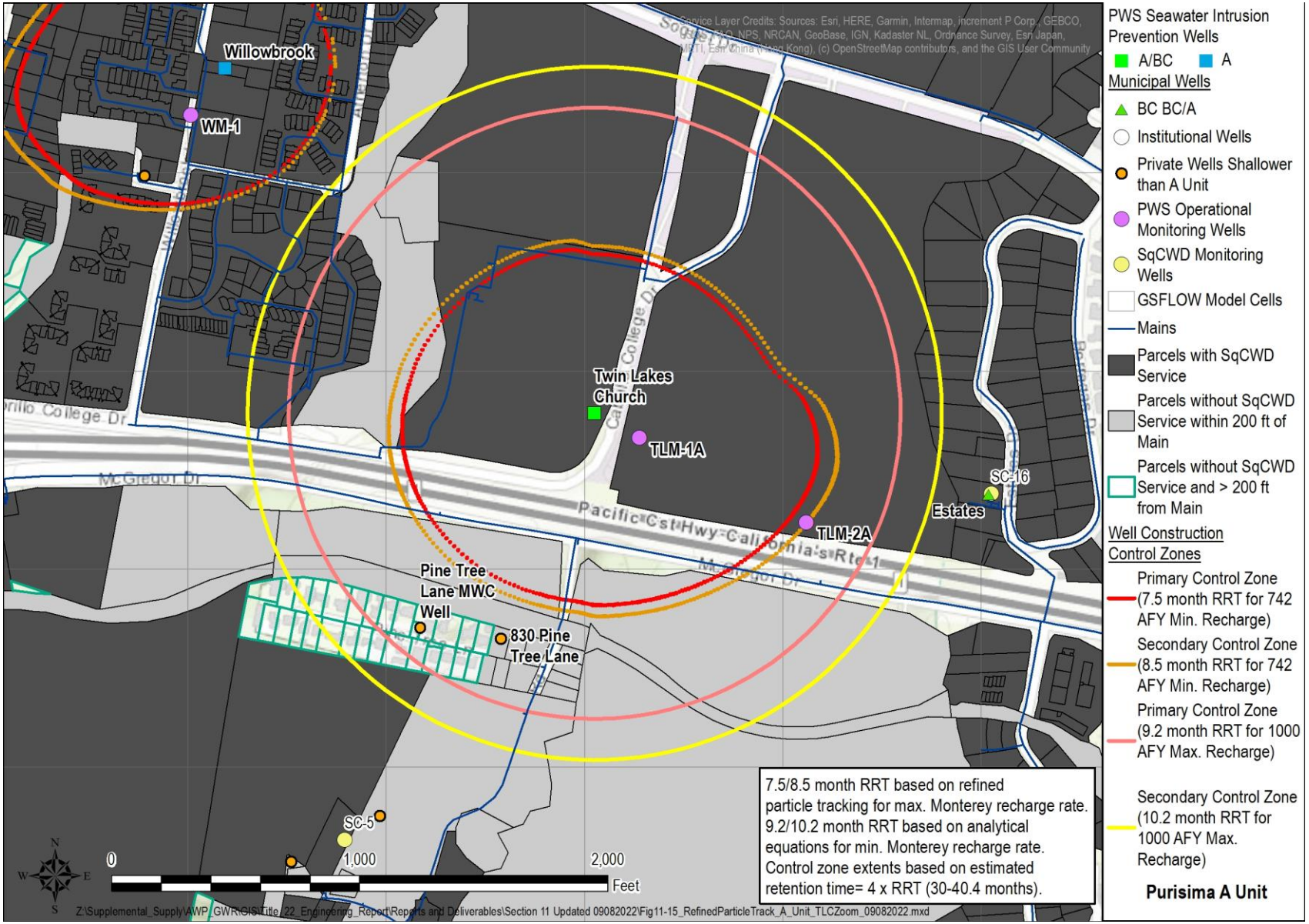

Figure 11-15. Primary and secondary well construction control zones for TLC SWIP well in Purisima A unit



Figure 11-16. Primary and secondary well construction control zones for Willowbrook SWIP well in Purisima A unit

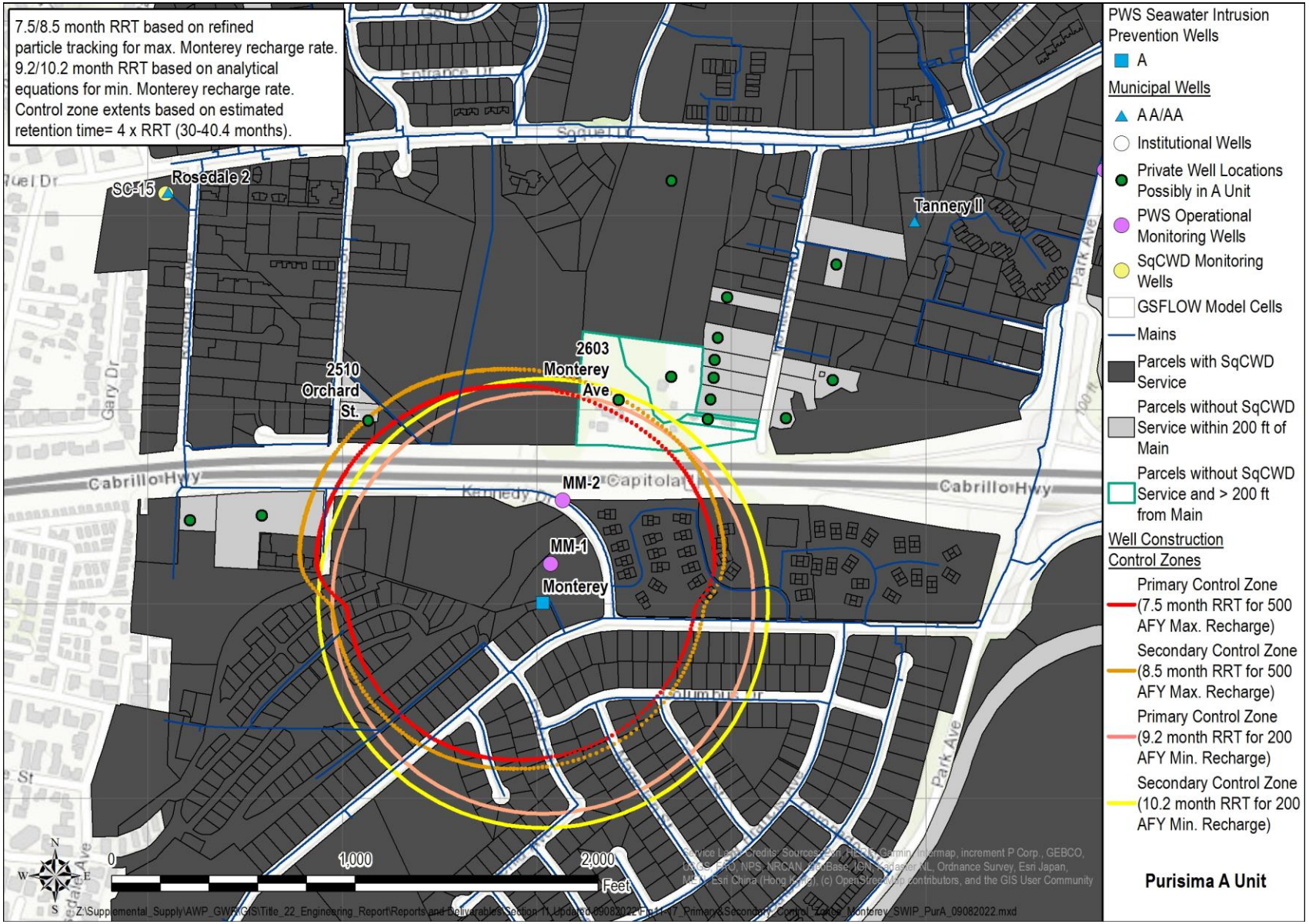

Figure 11-17. Primary and secondary well construction control zones for Monterey SWIP well in Purisima A unit

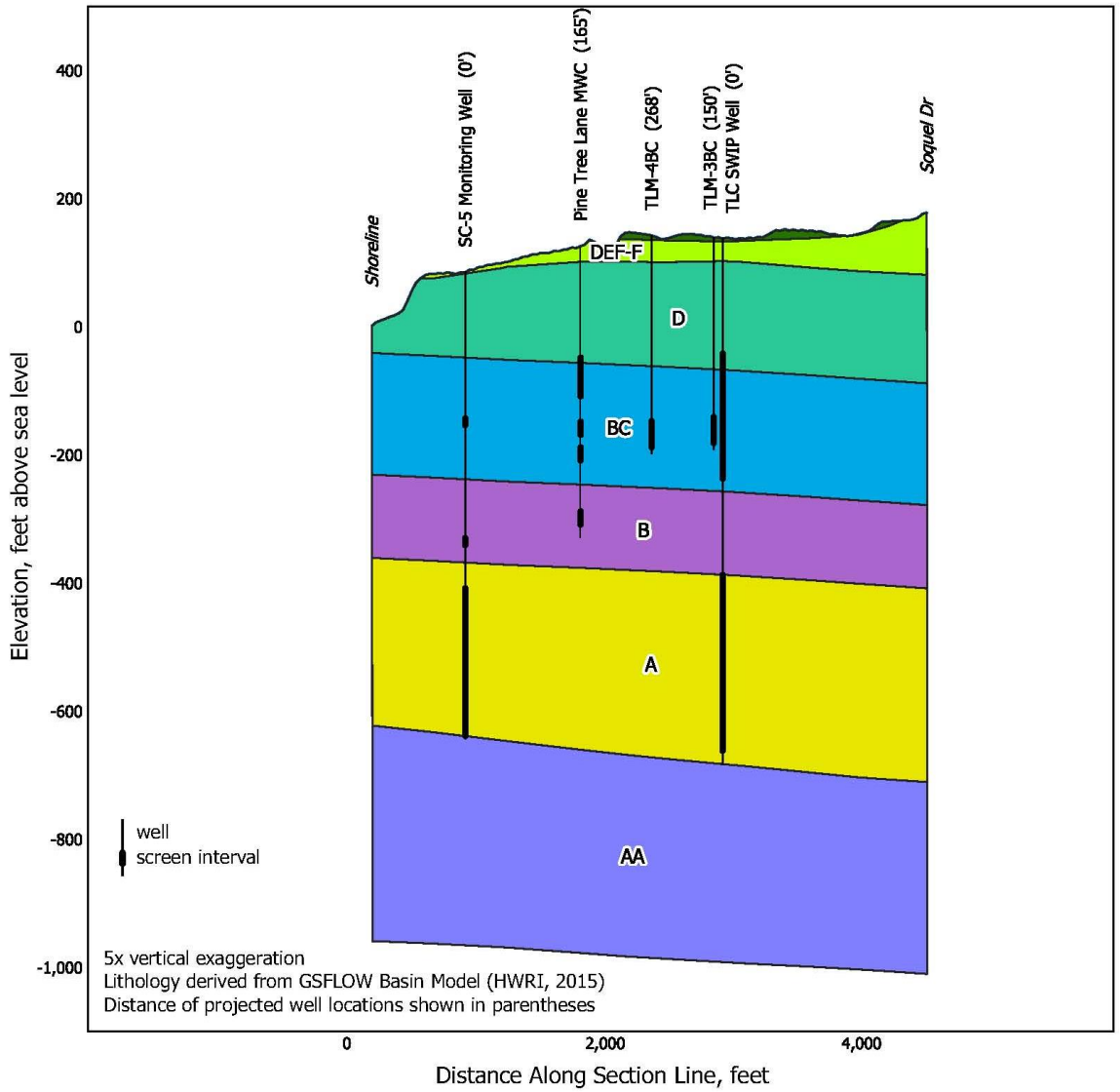

Figure 11-18. Hydrogeologic Cross-section for TLC SWIP Well and Pine Tree Lane MWC Well

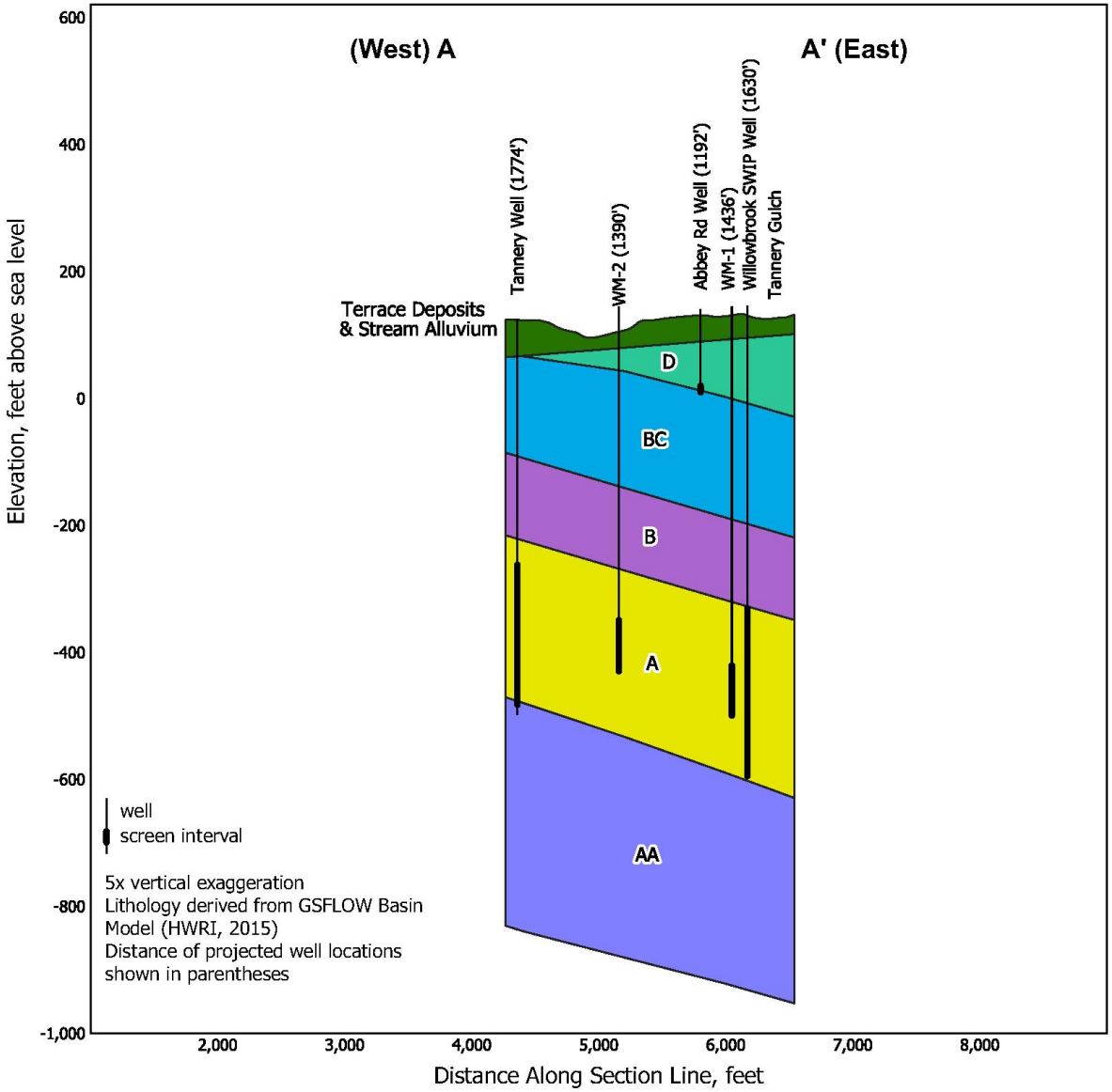

Figure 11-19. Hydrogeologic Cross-section for Willowbrook SWIP Well and Abbey Rd. Well

The drinking water well at 2603 Monterey Avenue (APN 37-191-12) is in the secondary control zone for the Monterey SWIP well in the Purisima A unit. The drinking water well at 2510 Orchard Street (APN 37-171-09) is in the secondary control zone for the Monterey SWIP well in the Purisima A unit based on the maximum recharge at the Monterey SWIP well. The analytical equations do not account for extraction rates at private domestic wells. However, extraction rates at the private domestic wells are assumed to be low; modeling for the GSP assumed 0.23 acre-feet per residence per year (HydroMetrics WRI, 2017a). These low extraction rates at the private domestic wells in the secondary control zone have minimal effects on the overall flow gradients that develop between the project recharge wells and SqCWD's large capacity production wells. SqCWD will seek access to sample these private wells as part of the tracer study to evaluate whether the three-dimensional control zones should include these wells. The proposed control zone extents have been developed in regard to the construction of new private domestic wells screened in the same aquifer unit as the control zone's SWIP well. Like the two existing wells in the secondary control zone for the Monterey SWIP well, new private wells would have low extraction rates relative to large municipal water supply wells, and which would not be expected to change the overall flow gradients. If new high capacity municipal production wells, or changes to municipal production well pumping rates, are planned in the future, these changes would impact large scale flow gradients and inter-well travel times, and this analysis would need to be updated and revised.

The County of Santa Cruz, which is the local well permitting agency, prohibits new drinking water well construction for parcels within 200 feet of a SqCWD water distribution main and within the SqCWD service area of the Basin. In August 2022, SqCWD submitted an update of its service area boundary to only include areas served by SqCWD in response to a request from the Monterey office of DDW. **Figure 11-17** show that most parcels overlying primary and secondary control zones are subject to the County's prohibition. The prohibition includes all parcels overlying the primary and secondary control zones for the BC unit **Figure 11-14**.

SqCWD has been in communication with the County of Santa Cruz and will continue to work with the County staff to enforce the requirements that no drinking water wells be constructed in the control zones for PWS Project to be in compliance with CA Title 22 Section 60320.200(e). County staff plans to develop an update to its well ordinance with the goal of Board of Supervisors adoption by the end of 2023. County staff plans to propose that the update include compliance with state requirements for restrictions on new and replacement drinking water well construction in control zones for Project and Management Actions in adopted GSPs. This would apply to control zones for PWS as a project in the adopted GSP for the Basin. Additionally, SqCWD will adopt a resolution supporting the County's proposed actions for construction of new drinking water wells to comply with these state regulations.

Until the County adopts a new well ordinance, SqCWD and County will use available legal means to restrict or discourage well construction in the control zones. The County currently sends permit applications for wells in SqCWD's jurisidiction to SqCWD for review. SqCWD will object to any permit application for new wells in the current control zones and work with the County and applicant to postpone submittal of applications for well construction until after the control zones are updated based on the tracer study. In addition, in compliance with the Governor's Executive Order N-7-22 for the current drought emergency, the County is not allowed to approve a permit or a non-deminimus (>2 AFY) non-public[4] well in the Basin unless it receives written verification from the MGA that the well is not inconsistent with the GSP. As PWS is a project in the GSP for achieving sustainability, well construction in the control zones would be inconsistent with the GSP.

[4] Public water systems are exempt from this executive order, but it appears that State small water systems are not exempt. As the public water system for the area, SqCWD will not construct drinking water wells in the control zones.

The primary and secondary control zones will be re-assessed based on the tracer study to begin within the first three months of the onset of purified water recharge at the SWIP wells (see **Section 14.7**). In addition, any needed revision to control zones for operational changes including recharge and municipal pumping rates would be based on analytical equations and/or modeling calibrated to tracer study results.

11.5 Anti-Degradation Assessment

One of the requirements for a recycled water project is that it must be compatible with SWRCB Resolution 68-16 (Antidegradation Policy) and the Recycled Water Policy (SWRCB, 2018). Under the new version of the Recycled Water Policy (SWRCB, 2018), a groundwater recharge project where no SNMP is in development defaults to a project-specific antidegradation analysis study instead of being able to use basin-wide assimilative capacity.

A Final-Draft version of an Antidegradation Evaluation was prepared in late 2018. Due to ongoing changes in recycled water policy and further interpretation while the Antidegradation Evaluation drafts were in development, completion was postponed until the monitoring program details required for this Title 22 Engineering Report for the Project became available. Groundwater Monitoring Plan details are provided in **Section 14**. The full Final Antidegradation Evaluation Report is being provided separately, with only summary results and discussion provided in this report.

The Basin Plan applies antidegradation policy as follows:

"*Wherever the existing quality of water is better than the quality of water established herein as objectives, such existing quality shall be maintained unless otherwise provided by the provisions of the State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," including any revisions thereto" (Chapter 3, Section II.A)*. "

The main focus of the antidegradation analysis was on TDS, chloride and nitrate. Boron and sodium are also minerals of concern for agricultural beneficial uses. Other minerals that can sometimes be susceptible to mobilization were also evaluated.

Groundwater quality objectives were taken from the Basin Plan for municipal, industrial, and agricultural beneficial uses. The municipal and industrial water quality objectives were the Title 22 primary and sMCLs. An agricultural boron water quality objective of 0.75 mg/L was applied based on the Basin Plan language and RWQCB staff guidance. An agricultural fluoride water quality objective of 1.0 mg/L was also applied. All other agricultural water quality objectives are higher than drinking water MCLs.

The antidegradation evaluation was performed on the combined AA, A, and BC aquifer unit volumes within the Basin boundary. Phase 2 project modeling (M&A, 2020a) was performed after aquifer and hydraulic testing data had been obtained from the TLC Pilot well. As described earlier in this Section, the model simulated recommended recharge and pumping conditions for recharge starting in year 2023 and extending to 2069 for the assumed model hydrology.

11.5.1 Assimilative Capacities

The antidegradation evaluation involved both an assimilative capacity evaluation and a direct comparison of Project impacts with the oldest readily available groundwater quality data since 1968. Concentrations of most constituents have trended flat to slightly upward since the oldest post-1968 available data.

The advantage of an assimilative capacity evaluation is that the results will be compatible with any future SNMP related efforts in the Basin. If applying maximum benefit factors, a comparison with Basin Plan water quality is also necessary under Antidegradation Policy to show that a project "will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."

The Recycled Water Policy states that available assimilative capacity for a constituent shall be calculated by comparing the mineral water quality objective with the average concentration of the basin/sub-basin, either over the most recent five years of data available or using a data set approved by the RWQCB. The minimum time frame for evaluating the impacts of the project must be at least ten years.

Water quality objectives, recent average water quality results, and historical water quality are provided in **Table 11-9**.

Table 11-9. Relevant Groundwater Quality Objectives and Existing and Historical Concentrations

Constituent	Water Quality Objective (mg/L)	Type	Existing Background[a] (mg/L)	Historical[b] (mg/L)	Trend (mg/L per year)[c]
Chloride	250/500[d]	Secondary	41.2	55.9	-0.146
Nitrate (as N)	10	Primary	0.06	0.25	-0.005
TDS	500/1000	Secondary	436	513	1.15
Arsenic	0.010	Primary	0.0006	ND	NS
Boron	0.75	Basin Plan/Ag	-	0.22	0.007
Cadmium	0.005	Primary	-	ND	ND
Chromium	0.050	Primary	-	ND	ND
Fluoride	1.0	Basin Plan/Ag	-	0.34	0.0017
Hexavalent Chromium[e]	0.010	Primary (suspended)	ND	0.0016	ns
Iron	0.3	Secondary	0.2-0.758	0.3	0.023
Manganese	0.050	Secondary	0.096-0.277	0.14	0.005
Nickel	0.1	Primary	-	ND	NS
Sodium	NA	NA	-	63.7	0.083
Sulfate	250/500	Secondary	-	87.3	0.39

a. Mostly 2016 values for AA, A, BC subunits including monitoring wells and City of Santa Cruz Beltz wells.
b. Earliest multi-year data since 1968 for SqCWD Estates, Monterey, Rosedale 2, Tannery, and Tannery II wells.
c. Trends are calculated as later period averages minus early concentrations divided by the number of years. Trends were calculated using available data. Recent concentrations for existing background were not always available, especially for wells that have been replaced.
d. Where applicable for secondary objectives, values shown are recommended/upper limits
e. The hexavalent chromium limit was judicially suspended and is under review for modification and reissuance.
NA=not applicable
ND= non detect
NS= insufficient samples

The anticipated water quality of the purified water used for recharge was provided in **Section 8**. Except for nitrate-N, the concentrations of constituents of concern are all projected to be lower than the historical water quality values shown in **Table 11-9**. This indicates that state antidegradation policy is satisfied on a straight mixing basis without considering geochemistry effects (discussed later).

Two guidelines included in **Table 3-1** in the Basin Plan refer to permeability risks associated with agricultural irrigation use of water having a high SAR and low EC. The projected SAR for the stabilized purified water is 0.5, which is far below where research shows significant permeability effects, even with water low in EC.

Using the values for existing background groundwater quality and the water quality objectives for the main salt and nutrient constituents (TDS, chloride, and nitrate) as listed in **Table 11-10**, assimilative capacities were calculated. These assimilative capacities are shown in **Table 11-11**.

Table 11-10. Salt and Nutrient Mass Totals and Assimilative Capacities

Subunit	Volume (af)	TDS		Cl		NO_3-N	
		mg/L	tons	mg/L	tons	mg/L	tons
AA	239,000	377.0	122,000	33.3	10,800	0.06	18.0
A	593,000	471.0	380,000	46.0	37,100	0.06	45.8
BC	57,000	381.0	30,000	33.0	2,600	0.05	3.9
Totals or Weighted Avg.	889,000	440.0	532,000	41.7	50,500	0.06	67.7
Objectives	889,000	500	604,000	250	302,000	10	12,100
Assimilative Capacities (rounded)		60.0	72,000	210	251,500	9.9	12,030
10% of Assimilative Capacities		6.0	7,200	21.0	25,200	1.0	1,200

Table 11-11. Assimilative Capacity Usage Projection (2023–32)

Constituent	Recharge Water (mg/L)	Difference from Background (mg/L)	Assimilative Capacity		
			Usage (tons)	Usage (mg/L)	% of Total
Chloride	10.1	-31.6	-634	-0.5	-0.25%
Nitrate (as N)	1.7	1.6	32	0.03	0.27%
TDS	101	-339	-6,790	-5.7	-9.44%

Relevant water quality objectives were shown in Table 11-7.
*Assimilative capacity usage projections are based on the mass balance values on drawing 000-G-7003 (**Appendix C**)*

The usage of assimilative capacity was calculated for the first 10 years of groundwater recharge by the project. These results are shown in **Table 11-11**. Because the purified water is very low in mineral content, the assimilative capacity usages for TDS and chloride are actually negative.

The concentrations for the PWS Project scenario in **Table 11-12** below provide an estimate of average concentrations in water recovered from the nearby SqCWD wells after the injectate reaches those wells, assuming chloride and TDS are conservative in the aquifer zones. Based on the information presented previously in **Table 11-11**, average nitrate-N concentrations in the managed aquifer volume are not expected to be affected by an appreciable amount relative to the water quality objective. Actual constituent concentrations will be affected by dispersion, mixing, and geochemical reactions.

Table 11-12. Estimated Effects on Production Well Salinity After Beginning of Capture								
		Recharge Water			Chloride		TDS	
Well	Production (AF)	Captured (% of total particles released)	Captured (AF)	Captured (% of production)	Current (mg/L)	Project (mg/L)	Current (mg/L)	Project (mg/L)
Estates	10,277	11.4	4,155	40	49	30	472	318
Tannery II	14,710	16.1	5,966	41	61	38	561	371
Rosedale	13,635	7.1	2,626	19	44	36	496	418
Cunnison	9,580	2.5	917	10	53	48	529	487

Note:
Well production based on 2028 - 2047 projections for pumping
Assumes approximately 5 years until beginning of capture for Tannery II and Estate wells
Assumes approximately 15 years until beginning of capture for Rosedale and Cunnison wells
Assumes 37,000 AF total injected through 2047

11.5.2 Geochemistry Effects

Aquifer soil samples were collected during drilling of the TLC Pilot Well for a Phase II Geochemical Characterization evaluation (BC, 2020b), which is provided in **Appendix F**. The objective of the Phase II geochemical characterization program was to collect samples from the pilot borehole for geochemical laboratory analyses, evaluate the geochemical conditions present in the aquifer units of the injection well, identify the constituents which could become mobilized during the injection process, and evaluate if the chemistry of the treated water could be adjusted to minimize or mitigate constituent mobilization.

An overview of the analytical methods, the aquifer subunits analyzed, and additional notes on the methodology are summarized in **Table 11-13**.

Table 11-13. Phase II Geochemical Characterization Laboratory Analysis				
Analysis	Target Subunits	Number of Composite Samples	Investigation	Methodology Details
Soil Leaching				
Modified SPLP (4:1 solution:solids ratio) (USEPA, 1994)	Purisima D, BC, B, A, AA	5	Phase I and Phase II	De-ionized and 3 stabilized pure water aliquots from existing treatment plants
Modified MWMP (1:1 ratio, 4 cycles) (ASTM, 2013)	Purisima BC, A	2	Phase II	One stabilized pure water type, week-long submersion, repeated 4 times
HA-HCL extraction (Tessier et al. 1979)	Purisima BC, D, B, A, AA	5	Phase II	Metals only
Mineralogical Characterization				
Whole-rock chemistry	Purisima D, BC, B, A, AA	5	Phase II	Major, minor and trace elements
XRD	Purisima D, BC, B, A, AA	5	Phase I and Phase II	Major and trace mineral phases

ASTM = American Society of Testing Materials; HA-HCl = hydroxylamine-hydrochloride; MWMP = Meteoric Water Mobility Procedure.

Using the results of the testing, the constituents of interest were classified according to presence and potential mobility as shown in **Figure 11-20**.

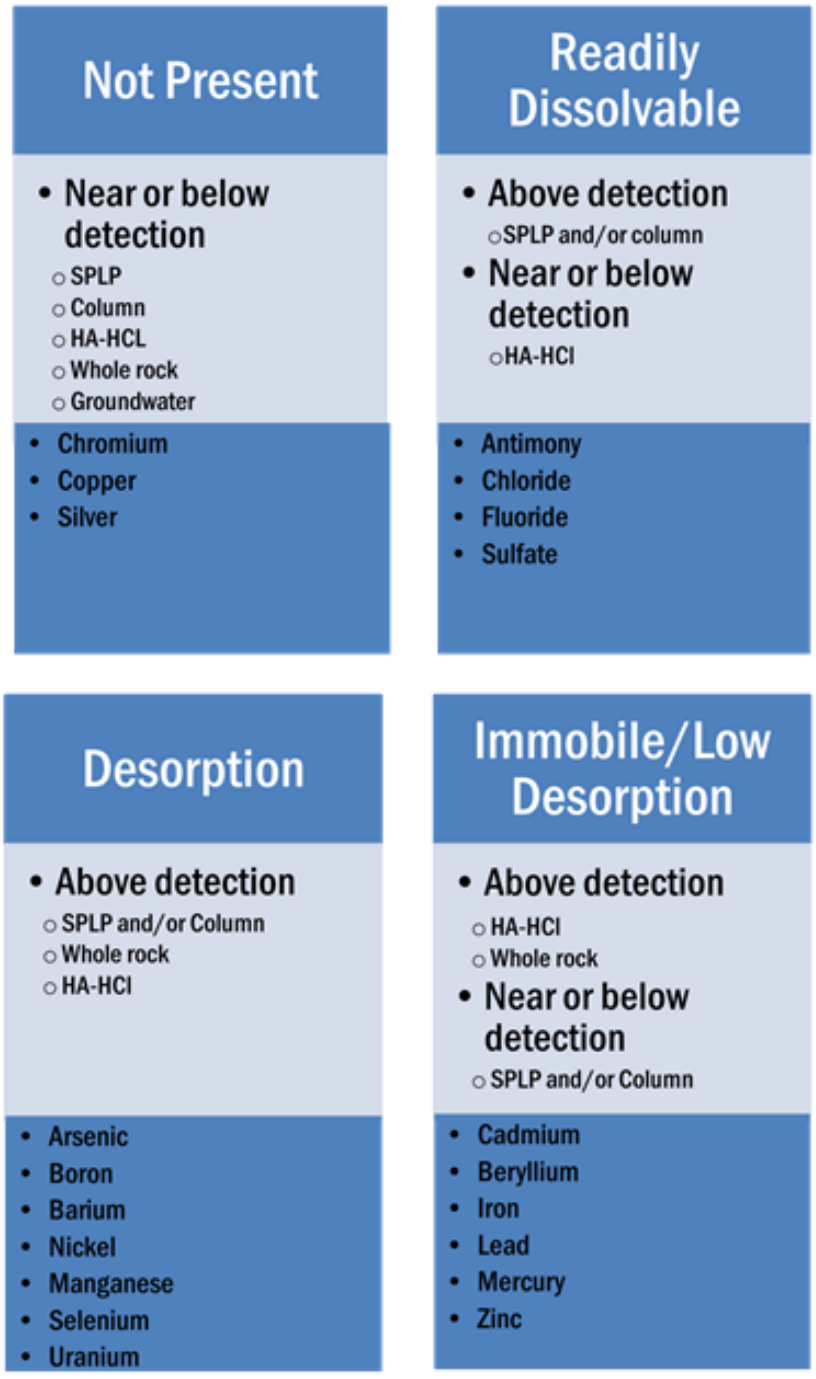

Figure 11-20. Classification of constituents and potential mobility

Interpretations of the potential water quality effects based on results of the TLC SWIP Pilot Project, the geochemistry testing, and the supporting information are listed below:

- Several regulated constituents are likely not present in the TLC SWIP Pilot well samples and will potentially not be of concern for the project:
  - Chromium, copper and silver were near or below the analytical detection limit for all laboratory geochemical analyses and zone groundwater quality analyses.
- Metals can be desorbed from clay or iron and/or manganese oxide minerals in the samples:
  - Concentrations of arsenic, barium, nickel, strontium, and uranium were detected in the aggressive HA-HCl soil leaching test and the modified SPLP and column tests.
- All three purified waters used for testing mobilized some metals and other constituents, although to a lesser degree than would cause MCL exceedances:
  - The tested advanced purified waters mobilized some arsenic from the Purisima A and BC units, although concentrations were below the MCL for the SPLP test and for successive rinses in the MWMP tests.
- Most constituent concentrations tended to decrease over the short-term, as multiple pore volumes of purified water were allowed to react the target units:
  - Arsenic, barium, calcium, magnesium, potassium, sodium, strontium, and uranium showed decreasing trends for one or both of the Purisima A and BC units evaluated in the modified column tests.
  - Decreasing trends were likely the desorption of constituents from clay and oxide minerals and the dissolution of dissolvable mineral phases.
- Multiple rinses altered the equilibrium of the system:
  - Increasing fluoride and decreasing calcium concentrations could have indicated the dissolution of fluorite with multiple rinses.
  - Increasing extracted solution pH values could have indicated the removal of iron oxide mineral phases with multiple rinses, although iron concentrations remained well below the MCL.

Results from subsequent geochemical modeling analysis provided some support to the observations from the Geochemical Characterization analysis which indicated potential reactions such as constituents mobilizing through desorption and the dissolution of mineral phases could occur during the interactions of the purified water with the Purisima units. The geochemical modeling also indicated that stabilizing the purified water could mitigate the release of some metals (arsenic and antimony).

A Phase III Geochemical Characterization study (BC, 2022), provided in Appendix G, was also recently completed using similar methods as the Phase II study on samples from the entire Purisima A unit of the Willowbrook SWIP and from high conductivity zones of the Willowbrook and TLC SWIP wells. Samples of purified water from additional treatment plants were also tested. Trends were generally similar to the Phase II study results, although peak concentrations of constituents of interest were generally lower in the Phase III study.

Overall, the geochemistry results indicated that with proper post-treatment stabilization of the purified recharge water, the geochemistry effects are most likely to be temporary and not cause exceedances of water quality objectives. The geochemistry results are also likely to be conservative results in that samples from the entire depth range of the respective subunits were used in the Phase II tests, whereas most recharge water will travel in the coarser, higher permeability portions of the subunits that are less likely to be reactive as shown in the Phase III tests. Some discrepancies between results for different test methodologies for fluoride and boron highlight the need for some initial extra scrutiny of those constituents as part of the groundwater monitoring program.

The City has also obtained data from a pilot aquifer storage and recovery (ASR) project using municipal drinking water and the Beltz wells west of the PWS project area. These wells are also completed in the Purisima A unit. Preliminary results show some arsenic mobilization at the leading edge of travel for the recharge water; however, concentrations did not exceed the drinking water MCL.

Based on the geochemistry studies, the monitoring program (described in Section 14) will include groundwater ORP and pH and will especially focus on results for constituents that could be mobilized. Groundwater piezometric levels will also be monitored in the BC unit near the TLC SWIP well to help determine the potential for transport between aquifer units. The tracer study (described in Section 14) will also help determine transport effects and the potential timing of geochemistry effects.

11.5.3 Impacts on Contaminant Plumes

An analysis to determine whether the PWS Project would cause groundwater to intersect a pre-existing contaminant plume was conducted as part of the Project EIR (ESA, 2018).

The SqCWD has identified 1,2,3-TCP as exceeding the state drinking water standard at its Country Club production well, which is drilled within the Aromas Red Sands and Purisima F unit aquifers. The source of the 1,2,3-TCP in groundwater at this location is believed to be past use of fumigants that contained 1,2,3-TCP as an impurity, based on past agricultural land uses near the well. SqCWD is currently not pumping from this well but has plans to use a replacement Country Club well once a treatment plant for 1,2,3-TCP has been constructed and water from this well again meets or exceeds state drinking water quality standards.

Concentrations of other minerals in groundwater are unlikely to be adversely affected by the Project. There is a localized plume of 1,2,3 - TCP near the Country Club well, but the Project is expected to slow its movement away from the Country Club well. Organic chemicals are not addressed by SNMPs, and the treatment process train of the PWS Project complies with the Title 22 Groundwater Replenishment Using Recycled Water regulations and will prevent groundwater degradation from organic chemicals. Therefore, other specific minerals and organic chemicals are not addressed in this report, except in the geochemistry discussion and monitoring recommendations. No active contaminant plumes have been identified near the SqCWD's service area that would be affected by purified water recharge. The PWS Project would raise groundwater levels in SqCWD's service areas and could alter local groundwater flow directions due to changes in groundwater gradients. However, these localized changes in groundwater flow and gradient would not result in groundwater degradation because there are no known, active contaminant plumes in SqCWD's service areas. Furthermore, known and undiscovered shallow soil contamination, which could be spread by rising groundwater levels, would not be disturbed because the PWS Project would not be operated under conditions where groundwater draw up would approach the ground surface and shallow soils where soil contamination is typically found.

11.5.4 Maximum Benefit Analysis

In determining whether to allow some additional degradation above historical quality but below water quality objectives, Regional Boards are directed to also consider the following factors for determining maximum benefit:

- Economic considerations
- The need for developing housing within the region
- The need to develop and use recycled water

- Relevant benefits listed in the Policy and Action Plan (SWRCB, 1978) associated with the PWS Project are:
  - Augmentation of local supplies and improvement of groundwater quality
  - Postponement of the need for water development and conveyance project construction (i.e. inter-basin or desalination projects)
  - Reduction of the need for further inter-basin freshwater transfers in the State
  - Reduction of energy requirements in situations where reclamation is an alternative to importation of freshwater or disposal for freshwater (i.e. lower energy costs than the previously planned desalination project)
  - Reduction of pollution loads (to the ocean outfall)
  - Reduction of land subsidence and groundwater overdrafting when used for groundwater recharge (especially a reduction in seawater intrusion risks)

The list of the following six constraints in the 1978 Policy and Action Plan possibly associated with the use of reclaimed water in general are as follows:

1. The possible presence of pathogenic organisms, such as bacteria and virus; and toxic constituents, such as stable organic compounds, heavy metals, etc., which raises questions that need resolution for certain uses and requires that the quality of reclaimed water be carefully matched to other beneficial uses
2. Environmental impacts, such as groundwater degradation, accumulation of toxic materials in soil, plants, animals, etc.
3. A requirement that the reliability of conventional waste treatment facilities be maintained at a high level
4. A requirement for the development of improved and more expensive monitoring techniques
5. The possible economic disadvantage including energy costs when compared with the pricing structure of many other water supply sources
6. The lack of public and user understanding of reclamation and the potential uses of reclaimed water

The PWS Project treatment process eliminates constraint 1 through compliance with the Title 22 Groundwater Replenishment Using Recycled Water regulations using above-ground processes and underground retention. The PWS Project eliminates constraint 2 through providing improved groundwater quality for major minerals and through conditioning of injectate to prevent adverse mobilization of trace constituents. Constraint 3 is addressed in this Engineering Report. Constraint 4 is not relevant because monitoring techniques and standards have been given in the Title 22 regulations. Constraint 5 is not relevant because the PWS Project is less energy intensive than the prior planned alternative (desalination). Constraint 6 has been mitigated by a very extensive public outreach and education program by SqCWD.

Since no degradation in water quality is expected for the major water quality parameters, and no effects on beneficial uses are expected due to any other water quality parameters, the burden-of-proof for any of the constraints would be considered very low.

Overall, the six relevant benefits from the proposed PWS Project strongly outweigh the possible constraints, and the PWS Project is consistent with providing the overall benefits of recycled water stated in the SWRCB Recycled Water Policy.

11.5.5 Groundwater Quality Effects Summary

Assuming proper conditioning to prevent geochemical mobilization in excess of water quality objectives is in place prior to injection, the PWS Project conforms with Resolution 68-16 Antidegradation Policy including Maximum Benefit analysis and would be consistent with a SNMP, should one ever be developed for the Basin. Additional detailed discussion of recent geochemistry evaluation results will be provided in the upcoming full Final Antidegradation Report.

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Section 12: Response Retention Time

Title 22 Section 60320.224 requires that GRRPs using subsurface application propose an RRT as part of the project's Engineering Report for approval by DDW. The RRT is the minimum time that the recycled water must be retained underground before extraction for use as drinking water to allow treatment system failures to be identified and to implement corrective actions. Per Title 22 Section 60320.224, the RRT shall be no less than two months. The RRT is intended to provide ample time for the project sponsor to identify treatment failures and implement actions necessary for the protection of public health from inadequately treated purified water. Such actions may include providing an alternative source of drinking water or supplemental drinking water treatment.

Title 22 Section 60320.224 specifies that the underground retention time be no less that the approved RRT. The underground retention time from the SWIP recharge well site(s) to the closest drinking water well(s) must be confirmed by a tracer study initiated within three months of project startup and under hydraulic conditions representative of normal GRRP operations. As detailed in Title 22 Section 60320.224, tracer study credits awarded towards the RRT are as follows:

- Tracer study using an added tracer receives 1.0 RRT credit per month underground,
- Tracer study using an intrinsic tracer receives 0.67 RRT credit per month underground.

For project planning purposes, RRT credits are estimated based on the methodology used to estimate underground retention times:

- Numerical modeling using validated and verified computer codes to simulate groundwater flow receives 0.5 RRT credit per month underground,
- Analytical modeling using equations (e.g., Darcy's Law) to estimate groundwater flow based on assumptions about the aquifer receives 0.25 RRT credit per month underground.

The estimated underground retention times from the SWIP recharge wells to the nearest drinking water wells for the PWS Project are based on groundwater analytic element modeling results presented in **Section 11**. For each month of modeled underground retention, the PWS Project conservatively applies a 0.25 RRT credit per month to calculate the Project's RRT.

12.1 Proposed RRT Concept

The proposed RRT must provide sufficient time to secure a safe drinking water supply, either through an alternative supply(ies) or wellhead treatment. The proposed RRT allows time for appropriate actions to be taken in the event that (1) off-specification purified water is injected, or (2) mixing of the purified water into the aquifer has caused dissolution of a contaminant adversely impacting groundwater quality and resulting in concentrations exceeding a California or federal drinking water standard and preventing a well from being used as a drinking water supply as determined by DDW.

The proposed RRT is comprised of three components:

1. The time necessary to perform water quality tests and obtain results to confirm an issue with the treatment process train.
2. The time necessary to coordinate with regulatory agencies (DDW and RWQCB).
3. The time necessary to provide an alternative safe drinking water supply or wellhead treatment at the impacted drinking water well(s).

12.1.1 Time Necessary to Test Water Quality and Obtain Results

For RRT compliance, water quality will be monitored in purified water produced by the AWPF and in groundwater at the groundwater monitoring well network described herein and in **Section 14**.

The proposed RRT is based on the time it would take for operators to discover a problem based on routine water quality testing of acute toxic parameters. Most chemical contaminants monitored in drinking water pose potential chronic health risks due to long-term exposure. The proposed RRT is based on water quality parameters that represent acute public health risks that require immediate attention. If the parameters listed in **Table 12-1** are measured above permitted limits in the purified water, the RRT Response Protocol will be initiated. A detailed RRT Response Protocol will be developed and included in the Operation Optimization Plan (See **Section 15**). The maximum time to identify a water quality problem is shown in **Table 12-2**.

Table 12-1. Acute Parameters and Concentrations at which RRT Response Protocol Is Initiated

Analyte	Units	RRT ALs	Method
Nitrate-Nitrogen	mg/L	10	EPA 300.0
Nitrite-Nitrogen	mg/L	1	EPA 300.0
Perchlorate	mg/L	0.006	EPA 314.0 or EPA 332.0
Total Coliform	MPN/100 mL	2.2 (7-day median), 23 (in more than 1 sample in any 30-day period), or 240 (any sample)	SM 9921B or Colilert

Source: Title 22, Division 4, Environmental Health, Chapter 15, Article 4, Section 64431 and Chapter 3, Water Recycling Criteria.

Table 12-2. Routine Monitoring Details for Acute Parameters in Purified Water

Analyte[a]	Monitoring Frequency	Sample Delivery (days)	Analysis Time (days)	Estimated Notification Time (days)	Total Time to Identify Water Quality Problem[b,c] (days)
Nitrate-Nitrogen	Twice/week	0	1	2	7
Nitrite-Nitrogen	Twice/week	0	1	2	7
Perchlorate	Monthly	1	1	10	42
Total Coliform	Daily	0	1	1	3

a. *Sampling final product water (purified water) from the AWPF.*
b. *Total Time = Sampling Frequency (1/Frequency) + Sample Delivery + Analysis Time + Estimated Notification Time.*
c. *In addition to the routine monitoring of purified water produced by the AWPF for subsurface application at the SWIP recharge wells, groundwater quality monitoring will occur on a regular basis and as needed to investigate or confirm any issues at the AWPF. Routine groundwater monitoring will include acute parameters as well as potentially mobilized dissolved contaminants. Chapter 14 presents the groundwater monitoring program.*

Analyses for perchlorate will have the longest turnaround time because samples will be sent to an outside laboratory; analyses for the remaining acute parameters will be conducted locally. The routine estimated times are conservative (longer than anticipated). If a result indicates that an exceedance may have occurred, the notification period will likely be shorter than routine reporting.

An exceedance will trigger the need for confirmation sampling and analyses of the purified water and groundwater at the closest downgradient monitoring well. It is anticipated that analyses of the confirmation sample will be expedited, resulting in estimated times described in **Table 12-3** to confirm a water quality problem.

Table 12-3. Expedited Monitoring Details for Acute Parameters in Purified Water				
Analyte[a]	**Sample Delivery (days)**	**Analysis Time (days)**	**Estimated Notification Time (days)**	**Total Time to Confirm Water Quality Problem[b,c] (days)**
Nitrate-Nitrogen	0	1	1	2
Nitrite-Nitrogen	0	1	1	2
Perchlorate	1	1	2	4
Total Coliform	0	1	1	2

a. Sampling final product water (purified water) from the AWPF.
b. Total Time = Sample Delivery + Analysis Time + Estimated Notification Time.
c. Expedited times for confirmation purposes.

Along with the purified water confirmation sampling at the AWPF, SqCWD will begin weekly groundwater sampling at the nearest monitoring wells to the SWIP wells (MM-1, WM-1, and TLM-1A). If the exceedance in the purified water is confirmed, the weekly groundwater sampling will continue through a period covering at least four weeks beyond the estimated range of underground travel times (1.1-1.6 months, or 4.9-6.9 weeks, or 34-48 days) from the SWIP recharge well to the nearest monitoring well (Monterey SWIP to MM-1 according to **Table 12-4**) based on **Table 12-4** or updated based on tracer study results. Weekly sampling of the purified water and groundwater at the nearest monitoring well will continue until four consecutive weekly sample results are below the acute parameter's drinking water MCL.

Table 12-4. Summary of Estimated Underground Retention Times for Monitoring for RRT Compliance								
SWIP Recharge Well	**Recharge Rate Range (afy)**		**Closest Downgradient Drinking Water Well**			**Monitoring Wells**		
			Estimated Underground Retention Time from SWIP Well (months)[a]			**Estimated Underground Retention Time from SWIP Well (months)[a]**		
	Min	**Max**		**Min**	**Max**		**Min**	**Max**
Monterey	200	500	Private Well (APN 037-191-12)	33	39	MM-1	1.1	1.6
			Tannery II	80[b]	107	MM-2	9	12
Willowbrook	233	500	Tannery II	56	72	WM-1	3	4
						WM-2	35	46
TLC	742	1,000	Estates (A unit)	43	52	TLM-1A	1.5	2.1
						TLM-2A	27	32
	742	1,000	Pine Tree Lane (BC unit)	211	280	TLM-2BC	191	252
						TLM-3BC	4	4
						TLM-4BC	71	94

*a. Estimates less than 36 months based on refined particle tracking using analytic element method for PWS Scenario simulated with Basin Model. Other estimates based on analytical equations. Estimates based on range of evaluated recharge rates (200-500 afy at Monterey SWIP, 233-500 afy at Willowbrook SWIP and 742-1000 afy at TLC SWIP) to estimate range of retention times. See **Section 11** for details on estimate methodology. See **Section 14** for locations of monitoring wells.*
*b. Corrected from **Appendix E**.*

The proposed RRT includes an underground retention time credit of 0.25 per month for travel time to the closest monitoring well as presented below based on estimates of underground travel time using modeling with analytic element method.

Table 12-4 summarizes the estimated underground retention times from SWIP recharge wells to (1) closest drinking water wells presented in **Section 11** and (2) monitoring wells presented in **Section 14**. The estimated minimum retention time underground from the three SWIP wells to their respective closest drinking water wells ranges from 33 to 56 months (in the Purisima Formation, Unit A) (See **Section 11.3**). Of the three SWIP recharge wells, the estimated shortest underground travel time is 33 months from the Monterey SWIP well to a private domestic well at assessor's parcel number (APN) 037-191-12. This estimate is based on the maximum recharge rate assumed for the Monterey SWIP well.

With respect to monitoring wells that will provide water quality information pertaining to acute parameters and potential contaminant dissolution and mobilization, the closest monitoring wells to the three SWIP recharge wells will be sampled. The maximum underground travel time to the nearest monitoring well from a SWIP well is estimated at 1.6 months (6.9 weeks or 48 days) from the Monterey SWIP recharge well to monitoring well MM-1. This estimate is based on the minimum recharge rate assumed for the Monterey SWIP well to conservatively estimate RRT.

For the purpose of estimating the RRT credit for underground retention time, the range of underground travel times to the nearest monitoring well of 1.1-1.6 months (34-48 days or 4.9-6.9 weeks from Monterey SWIP recharge well to monitoring well MM-1) is used based on refined particle tracking and analytical equations assuming recharge rates ranging from 200-500 afy that reflect uncertainty about operational recharge rates and provide operational flexibility (**Section 11.3)**. The RRT proposal applies a factor of 0.25 underground retention time credit/month to the resulting range of estimated retention times as discussed in **Section 12.2**.

Groundwater quality will be monitored for the same acute parameters (nitrate-nitrogen, nitrite-nitrogen, perchlorate, and total coliform), plus potentially mobilized contaminants on a quarterly basis at the monitoring wells. Groundwater monitoring is described in **Section 14.5**.

In summary, the time necessary to test purified water quality and obtain confirmed results is estimated to be up to 46 days as determined by the sum of the first three components listed in **Table 12-5**. As soon as confirmation of an acute parameter in the purified water quality has been determined, indicating that "off-specification" water may have been recharged, weekly groundwater monitoring at the nearest monitoring well will commence. The total event tracking time is estimated at 108-122 days.

Table 12-5. Summary of Longest Time Required to Identify and Confirm a Water Quality Problem

RRT Component	Description	Time (days)
Longest elapsed time between routine sampling events	1 month for perchlorate	30
Longest turnaround time for routine monitoring	12 days for perchlorate	12
Longest turnaround time for expedited confirmation results	4 days for perchlorate	4
Underground travel time from SWIP well to nearest monitoring well	1.6 months from Monterey SWIP well to monitoring well MM-1 at minimum recharge rate of 200 afy	48
	1.1 months from Monterey SWIP well to monitoring well MM-1 at maximum recharge rate of 500 afy	34
Monitoring well weekly sampling after "off-specification" purified water reaches the monitoring well to demonstrate compliance with MCLs	4 weeks	28
	Total[a]	108-122

a. Total time is a range depending on the recharge rate at Monterey SWIP well (200–500 afy). Total time is a range and based on the sum of the listed RRT components, allowing for a range of underground travel times from Monterey SWIP to MM-1 for the noted recharge rates.

12.1.2 Time Necessary to Coordinate with Regulatory Agencies

SqCWD will notify DDW and the RWQCB if the RRT Response Protocol is initiated and will keep regulators informed of the findings. After the final set of water quality sampling results are confirmed and notifications have been made, it is estimated that approximately one week will be needed for SqCWD, DDW, and RWQCB to assess the results and determine a course of action.

12.1.3 Time Necessary to Provide an Alternative Safe Source of Drinking Water

Impacts from temporary suspensions of PWS Project operations could result in the need to establish an alternate drinking water supply while the AWPF is brought back into compliance and/or while the impacts to the groundwater basin are investigated and a strategy is implemented to protect public health.

SqCWD is committed to providing safe drinking water for its customers. As part of this commitment, SqCWD will provide an alternative safe source of drinking water for its customers and affected well owners in the event that the PWS Project adversely impacts drinking water well(s), either owned by SqCWD or non-owned by SqCWD (e.g., small, private wells)

Changes to the SqCWD's water distribution system: At present, 100% of SqCWD's water supply is from local groundwater sources. Because SqCWD owns and operates sixteen municipal drinking water wells and two additional standby drinking water wells, the initial alternative to address water quality issues caused by the PWS Project would be to remove the adversely impacted SqCWD-owned well(s) from service and rely on its other wells. The network of pipelines and pump stations throughout the system allows for various service areas to be fed from alternative wells.

The SqCWD Emergency Response Plan outlines steps to take in the event that SqCWD-owned well(s) must be removed from service and how a short-term, long-term or emergency water shortage would be resolved by relying on standby drinking water wells or alternative supplies. A similar approach would be used for adversely impacted non-owned SqCWD drinking water wells. SqCWD would install an emergency connection to its water distribution system to supply the owner of any adversely impacted small, private well with an adequate supply of drinking water. SqCWD would provide bottled water until the replacement supply was in place.

SqCWD has contingency plans in place to protect public health and ensure a safe interim drinking water supply is delivered to the public. Elements of the contingency plan include water quality monitoring, management of sources, including interties and blending, and installing well-head treatment. It is envisioned that these actions will be implemented as soon as SqCWD has evidence of a problem caused by the PWS Project.

Examples of short-term changes to the SqCWD water distribution system to address short-term issues are: (1) switching to non-impacted or standby SqCWD-owned drinking water wells, (2) blending groundwater from multiple SqCWD-owned wells, (3) receiving supplemental water through intertie(s) with neighboring agencies as detailed below, (4) providing bottled water to affected party(ies), or (5) installing temporary connection(s) or trucked water to replace adversely impacted non-owned SqCWD wells (small, private wells).

Examples of long-term changes to the SqCWD water system are: (1) construct well-head treatment facilities at the adversely impacted SqCWD-owned drinking water well, (2) continue use of the (former) standby SqCWD-owned well(s), and (3) monitor groundwater quality to track and determine the fate of contaminant(s) originating from the PWS Project with the goal to be able to re-activate the adversely impacted well(s) in the future.

SqCWD will take the following steps if water quality problems at the PWS AWPF cannot be corrected and off-specification water has been recharged into the aquifer, potentially impacting the groundwater supply:

1. Notify owner(s) of the potentially adversely impacted non-SqCWD well(s) and coordinate appropriate actions; notify DDW and the RWQCB.
2. Confirmation sampling in monitoring wells and potentially impacted non-SqCWD well(s).
3. Initiate accelerated groundwater quality sampling in downgradient monitoring wells and SqCWD-owned water supply wells; anticipate downgradient SqCWD-owned and non-SqCWD-owned (private) water supply wells that may be impacted
4. Suspend operation of the drinking water well(s) if impacted such that constituents of concern are detected in the drinking water well or adjacent monitoring well at concentrations deemed by DDW to make the well unsuitable as a drinking water source as a result of the PWS Project.
5. Periodically sample the affected drinking water well(s) (e.g., weekly, depending on the concentrations) to examine changes over time and to determine if concentrations are returning to acceptable levels.
6. Consider blending options for SqCWD-owned wells
7. Shift production from impacted well(s) to standby SqCWD-owned wells
8. Provide bottled water for the impacted non-SqCWD (private) well owner
9. Install temporary water service or trucked water to the impacted non-SqCWD (private) well owner
10. Initiate wellhead treatment planning and construction or consider replacement well(s) as appropriate for a long-term solution
11. Install permanent water service from the SqCWD distribution system for the adversely impacted non-SqCWD well (small, private well) for a long-term solution
12. Continue suspension of use of adversely impacted SqCWD-owned and non-ScCWD-owned (small, private) drinking water well(s) until the problem is resolved

SqCWD has received notification from the SWRCB regarding interest in consolidation of small neighboring agencies and will continue to assess the statewide direction on this and work with Local Agency Formation Commission of Santa Cruz County (LAFCO), as necessary.

Receive supplemental water through intertie with neighboring agency: SqCWD's Urban Water Management Plan (Water Systems Consulting, 2021) describes the Water Shortage Contingency Plan, which would be used as necessary to address alternative water supply needs for the PWS Project. Activation of the RRT Response Protocol would trigger notification of SqCWD Board of Directors and likely qualify the event as a short-term water supply shortage as defined in the Urban Water Management Plan. SqCWD would take specific actions in its Emergency Response Plan (ERP) which may include notification of customers to reduce their water demands, changes in distribution system operation to convey groundwater from other areas to impacted areas where well(s) may be off-line and purchasing supplemental water from the City and/or Central Water District delivered via system interties. SqCWD's water distribution system has interties with neighboring agencies: Central Water District, City Water Department, Pure Source Water, Inc., Trout Gulch Mutual Water Company, and Cabrillo College. One or more of these sources could be tapped as an alternative safe source of drinking water for SqCWD customers and adversely impacted private well owners on an emergency basis or until improvements to SqCWD's water distribution system can be made or wellhead treatment could be installed for drinking water well(s) adversely impacted by the PWS Project.

The three interties with the City include one bi-directional intertie allowing for limited water exchanges, and two uni-directional (to SqCWD) interties that provide SqCWD with greater reliability in the event of an emergency. Two other uni-directional (to SqCWD) interties with Central Water District are also available to provide an emergency water source. The other interties are uni-directional (from SqCWD) providing

backup supplies for other agencies. All interties are existing and operated in accordance with interagency agreements.

In conclusion, it is estimated that changes to SqCWD water distribution system could be made in as little as one day. Bottled water could be furnished to adversely impacted non-SqCWD (small, private) drinking water well owner(s) in a day as a short-term remedy. It is estimated that the time necessary for SqCWD to receive supplemental alternative water supply from a neighboring system is less than one week. SqCWD could install a temporary water service on an emergency basis from its distribution system for owner(s) of a non-SqCWD (small, private) well adversely impacted by the PWS Project in about a week. In the long-term, wellhead treatment of adversely impacted well(s) or changes in the distribution system, may also be potential solutions depending on the nature of the problem.

12.2 Proposed RRT

As shown below in **Table 12-6**, the proposed RRT for the PWS Project is presented as a range: from 7.5 to 9.2 months, allowing variable recharge rates at the Monterey SWIP well. For a minimal recharge rate of 200 afy at the Monterey SWIP well, the RRT is 9.2 months. This is a conservative value because the RRT could be reduced to 7.5 months by recharging at a maximum rate of 500 afy at the Monterey SWIP well (a higher recharge rate would shorten the underground travel time to MM-1). In summary, the proposed RRT is comprised of the time necessary to:

1. Identify and confirm that a water quality problem exists
2. Assess the results and make decisions for appropriate responses to protect public health with DDW and RWQCB input
3. Procure a safe alternative drinking water supply solution by utilizing other SqCWD wells or activating regional interties or potential wellhead treatment

The time to identify and confirm a water quality problem (Factor 1) is the sum of:

a. Longest routine sampling frequency, which is once per month (for perchlorate)
b. Longest turnaround time for routine results, which is 12 days (0.4 month) (for perchlorate)
c. Longest turnaround time for expedited confirmation results, which is 4 days (0.13 month) (for perchlorate)
d. Travel time to nearest monitoring well, which varies from 1.1 to 1.6 months to MM-1 for recharge rates ranging from 200 to 500 afy at the Monterey SWIP well. Applying an RRT credit factor of 0.25 credit/month is applied, yields 4.5 to 6.3 months for RRT purposes, I.e., estimated travel time divided by the RRT credit factor to be conservative.
e. Continued groundwater monitoring at nearest monitoring well (MM-1) after travel time to demonstrate compliance with MCL (e.g., for perchlorate)

Table 12-6. Summary of Proposed Response Retention Time

Factors Contributing to RRT	Duration for RRT Calculation (rounded up) (days)	(weeks)	(months)	RRT Credit Factor[a] (credit/month)	Proposed RRT (days)	(weeks)	(months)
1. Time to identify water quality problem and complete confirmation[b,c]	122 97	17.5 13.0	4.1 3.3	--	266 164	38.0 23.5	8.8 7.0
a. Longest time between routine sampling frequency	*30*	*4.3*	*1.0*	--	*30*	*4.3*	*1.0*
b. Longest turnaround routine sample results	*12*	*1.7*	*0.4*	--	*12*	*1.7*	*0.4*
c. Longest turnaround expedited confirmation sample results	*4*	*0.6*	*0.13*	--	*4*	*0.6*	*0.13*
d. Travel time to nearest monitoring well (MM-1)				*0.25*			
Based on minimum recharge	*48*	*6.9*	*1.6*		*192*	*27.4*	*6.3*
Based on maximum recharge	*34*	*4.9*	*1.1*		*136*	*19.4*	*4.5*
e. Post-arrival weekly groundwater monitoring for compliance	*28*	*4*	*1.0*	--	*28*	*4*	*1.0*
2. Time to assess results and make decisions for appropriate responses based on DDW and RWQCB input	7	1	0.25	--	7	1	0.25
3. Time to procure alternative drinking water supply (intertie, if needed)	7	1	0.25	--	7	1	0.25
Total RRT (rounded, no less than 2 months allowed)[c]					**280** **224**	**40.0** **32.0**	**9.2** **7.5**

a. RRT credit factor for underground retention time. Proposed RRT = (1.1 to 1.6 months) / 0.25 per month = 4.5 to 6.3 months for underground travel time.

b. Factor 1 is the sum of five components a-e. Perchlorate is the acute parameter with the longest sampling and analysis times. For purposes of determining the proposed RRT, monthly monitoring is used per Title 22 Section 60320.201(i), even though Title 22 Section 60320.212(a) allows for quarterly monitoring after 12 consecutive months of results having no exceedances of MCLs and NLs.

c. A range is shown based on recharge rates at the Monterey SWIP well of 200 afy (minimum) to 500 afy (maximum). Minimal recharge results in a longer travel time and greater RRT; maximum recharge results in a shorter travel time and lesser RRT.

The time to confer with DDW and the RWQCB about the actions to be taken is estimated at up to a week (0.25 month).

SqCWD could make adjustments within its own distribution system to replace production of the adversely impacted well with that of other wells in as little as one day. While SqCWD has numerous distribution system interties with neighboring agencies that could be exercised typically the same day, to provide an estimate, up to a week is assumed (0.25 month).

The proposed RRT is conservative because it allows for a factor of 0.25 RRT credit per month underground to account for use of an analytic element groundwater model and analytical equations. The proposed 7.5-9.2-month RRT includes the 0.25 per month RRT credit as calculated in **Table 12-6**; the proposed RRT is greater than 2 months and less than the adjusted travel times as shown in **Table 12-7**. This will provide ample time to identify and respond to water quality or operational problems at the treatment facilities before inadequately treated purified water injected at the SWIP recharge wells reaches their respective closest drinking water wells.

Table 12-7. Comparison of Response Retention Times to Underground Retention Times

Recharge Rate at Monterey SWIP well	Modeled Retention Time to Nearest Drinking Water Private Well at APN 037-191-12	Adjusted Retention Time to Nearest Drinking Water Private Well at APN 037-191-12	RRT (from Table 12-6)	Comparison: Is the Adjusted Retention to the Nearest Drinking Water Well ≥ RRT?
500 afy (maximum recharge rate)	33 months	33 x 0.25 = 8.25 months	7.5 months	Yes 8.25 > 7.5
200 afy (minimum recharge rate)	39 months	39 x 0.25 = 9.75 months	9.2 months	Yes 9.75 > 9.2

A tracer study will be initiated within the first three months of the PWS Project operational startup to demonstrate underground retention time from the SWIP recharge wells to the drinking water wells (closest being the private domestic well at APN 037-191-12 as estimated by the model) is not less than the proposed RRT. The proposed RRT will be updated after the tracer study is complete based on observed travel time to the nearest monitoring well during the tracer study. As discussed in **Section 14**, a work plan for the tracer study will be submitted to DDW for review and approval prior to implementation of the tracer study. A draft preliminary plan for the tracer study is included in **Appendix H**.

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Section 13: Contingency Plan

To produce a water supply that is reliably protective of public health and the environment, the Pure Water Soquel facilities will be equipped with automatic control and monitoring equipment as well as necessary standby equipment to facilitate both planned and unplanned service of equipment. **Section 5** discusses and summarizes the level of standby for each process.

The PWS Project contingency plan includes measures that will be taken during process and control upsets triggered by equipment failures, treatment failures, or a loss of power. The goal of this contingency plan is to ensure the availability of an alternative water source for all groundwater users by any drinking water well(s) that are adversely impacted by the PWS Project as determined by DDW. CCPs are summarized in **Section 15.4.1**; the OOP will include detailed information on CCPs. Diversion points for off-specification water are shown in **Figure 13-1**.

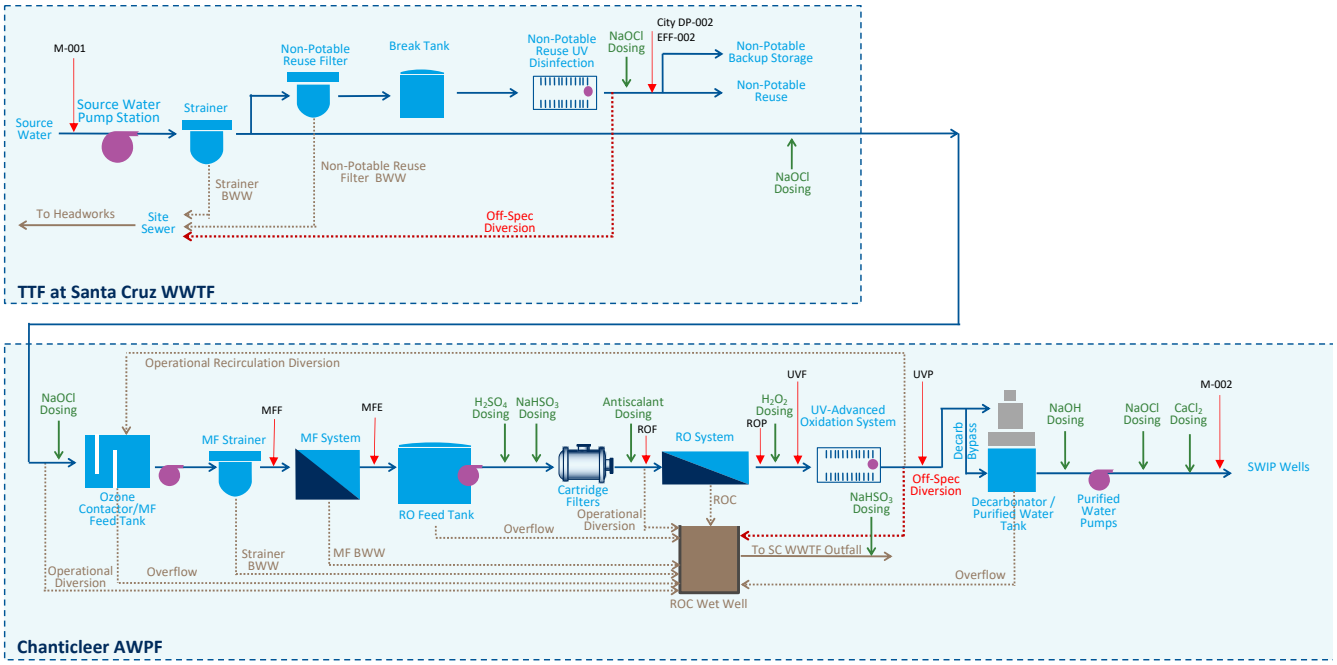

Figure 13-1. Diversion points at SC WWTF and Chanticleer AWPF

The contingency plan for the SC NPR Project is described separately in the Santa Cruz NPR Engineering Report.

13.1 SC WWTF Upset

In the event of a SC WWTF process upset triggered by primary and/or secondary treatment operating outside of an operational limit defined in the OOP, SC WWTF operations staff will acknowledge alarms, notify SqWCD Contract Operator and SqWCD Operations Staff, and determine if the upset will be short-term or long-term. The downstream TTF, AWPF, and SWIP wells will remain in operation until the upset is resolved only if non-potable reuse system effluent and/or purified water meets permit requirements based on online monitoring parameters. If the upset is anticipated to be long-term and the non-potable reuse

system effluent and/or purified recycled water quality shows a negative trend (such as a decline in a water quality parameter that may indicate a process issue) in online water quality monitoring, the non-potable reuse system and/or AWPF will be shut down until the upstream processes are restored to normal operating conditions to eliminate the potential for non-compliance. In the event of an upset, there are two options for diverting source water, either:

1. SWPS: SWPS will be shut down and will not send flow to Chanticleer AWPF (note that this shuts down flow to both the TTF and to the AWPF)
2. Chanticleer AWPF: Source water would be conveyed to the Chanticleer AWPF and diverted to the ROC wetwell for return through the ROC pipeline and ultimate discharge to the SC WWTF ocean outfall.

13.2 Tertiary Treatment Facility Upset

A TTF equipment or process upset could trigger tertiary treatment operating outside of a limit measured at one of the control points, defined in the OOP for the AWPF pretreatment. Refer to the City of Santa Cruz Non-Potable Reuse Engineering Report for the contingency plan for the Santa Cruz NPR Project facilities. These equipment and process upset parameters will be defined in the OOP.

For AWPF source water, SC WWTF operations staff will acknowledge alarms, notify Chanticleer AWPF operations staff, and determine if the upset will be short-term or long-term. The downstream AWPF and SWIP wells will remain in operation until the upset is resolved only if purified water meets permit requirements based on online monitoring parameters. If the upset is anticipated to be long-term and the purified recycled water quality shows an upward trend in online constituents which triggers the DCS to produce an alarm, the SC WWTF operations staff will notify SqCWD operations staff to shut down the AWPF until the upstream processes are restored to normal operating conditions to eliminate the potential for non-compliance and increased operating costs.

In the event of an upset of the automatic strainers at the TTF, water can be diverted to the

- influent diversion point at Chanticleer, upstream of ozone, through the ROC pipeline to the ocean outfall.

13.3 AWPF Upset

In the event of an AWPF treatment process upset triggered by AWPF treatment operating outside of a critical limit measured at one of the control points, defined in the OOP, Chanticleer AWPF operations staff will acknowledge alarms, confer with SC WWTF operations staff, and determine if the upset will be short-term or long-term. The SWIP wells will remain in operation until the upset is resolved only if purified water meets permit requirements based on online monitoring parameters. If the upset is anticipated to be long-term and the purified recycled water quality shows an upward trend in online constituents which triggers the DCS to produce an alarm, the AWPF will be shut down until the processes are restored to normal operating conditions to eliminate the potential for non-compliance. In the event of an AWPF shutdown the DCS will reduce the SWPS flow to minimum flow to meet non-potable demand only; excess Source Water will be diverted to the ROC wet well at the AWPF and returned for discharge at SC WWTF's ocean outfall. Following a shutdown, purified water will continue to be diverted until water quality meets all CCP requirements.

In the event of an upset of the Chanticleer AWPF, off-specification water can be diverted from the UV-AOP effluent diversion point, through the ROC pipeline and ultimately to the ocean outfall. Diversion points are described in **Figure 13-1** and include:

- **AWPF influent operational diversion.** Off-spec water exiting the Source Water pipeline can be actively diverted prior to the ozone contact tank. This diversion will be sent to the ROC Wet Well for discharge at SC WWTF's ocean outfall.
- **RO feed operational diversion.** Off-spec water that may have exited the MF system can be actively diverted at the RO bypass after the cartridge filters. This diversion will be sent to the ROC Wet Well for discharge at SC WWTF's ocean outfall.
- **UV-AOP effluent regulatory off-spec diversion.** Located on the UV-AOP effluent header before flowing to post-treatment, off-spec water will be sent either to the MF Feed Tank for AWPF recirculation or to the ROC Wet Well for discharge at SC WWTF's ocean outfall.
- **Tank overflow operational diversions.** The MF Feed Tank, RO Feed Tank, and Purified Water Tank are all designed to passively overflow to the ROC Wet Well for discharge at SC WWTF's ocean outfall.

Additional information about operational and off-spec diversions is included in **Section 15**.

13.4 Power Failure

Existing topology at the SC WWTF is distributed via a primary dual loop system fed from one utility power source (PG&E) at 20.8 kilovolt (kV). The Title 22 equipment will be fed from the existing SC WWTF electrical system. In the event of a power outage, the Title 22 equipment will be shut down in according to the SC WWTF's existing power failure protocol.

A new PG&E power feed with a metering enclosure, a fused 600A loadbreak switch, pad mounted transformer and secondary circuit breaker will be provided for the TTF SWPS. In the event of a power outage, the TTF SWPS will be shut down and Source Water delivery to the AWPF and Title 22 will be interrupted.

The AWPF is a greenfield site that currently does not have an installed utility service. A new utility service will be established with PG&E. A new transformer will power the AWPF. In the event of a power outage or failure, a standby diesel-fueled generator will be used to provide emergency power for the RO flushing pumps, the ozone destruct units, and other small emergency loads; thus purified water delivery will be interrupted. Uninterruptible Power Supplies (UPS) will provide backup power to the main plant PLC, SCADA server, and operations computers to allow for the transition to the standby generator and allow for communication during a shorter power outage.

The UPS will allow the plant's control system to send open/close signals to automatic diversion valves, and the compressed air storage capacity of the plant air receiver will allow diversion valves to actuate. This will allow for initiation of automatic diversion in the event of grid power supply failure to the AWPF. Additionally, all pumps will stop and so water will stop flowing through processes. In the event of a long-term interruption, SqCWD will decide if initiating the alternative water supply activities of **Section 13.5** is necessary to maintain long-term potable supply.

Upon system startup, product water will be diverted to the ROC Wet Well via the off-spec diversion line after the UV-AOP system until all monitoring equipment is operational and the system is meeting regulatory requirements and system setpoints. This approach will ensure that any off-spec water that remained in the system during and after the power failure will be flushed from the system prior to sending purified water to the SWIP wells.

The following list describes the control system steps that will be taken in the event of a power failure at Chanticleer:

- Upon loss of power all running equipment will stop immediately.
- The Automatic Transfer Switch (ATS) will detect the loss of normal plant power and will send a start command to the emergency power generator.
- The emergency power generator will start and send a running feedback signal to the Plant Control System when it is running at full speed.
- When the Plant Control System receives the generator running signal, it will automatically start the Ozone Destruct unit and send an "Auto Flush" command to the RO PLC to flush the RO trains that were running before the loss of plant power.
- The Ozone Destruct Unit will run for an operator entered duration before it shuts down automatically. The RO flush pump will also shut down automatically when the flushing sequence is finished.
- When the plant power is restored, the plant will automatically re-start. All product water will be diverted to the ROC Wet Well after the UV-AOP system until all operating setpoints and regulatory requirements are met. For additional details regarding startup procedures, refer to **Section 15.4.1.1.1.**

13.5 Alternative Water Source

In the event purified water does not meet permit requirements or is not available for recharge, SqCWD will communicate, monitor, and replace as necessary the water supply for affected customers with its existing groundwater supply from unaffected wells or an alternate potable source. While SqCWD is generally 100 percent reliant on its groundwater supply, its distribution system includes interties with Central Water District (CWD), SCWD, Pure Source Water Inc., Trout Gulch Mutual Water Company, and Cabrillo College for emergency aid or as an alternative water supply. One or more of these sources could be tapped as an alternative safe source of drinking water for SqCWD customers and adversely impacted private well owners on an emergency basis or until wellhead treatment can be installed for drinking water well(s) adversely impacted by the PWS Project. Refer to **Section 12** for more information on an alternative safe source of drinking water. If off-specification water is sent to the aquifer before the AWPF production and SWIP wells' operation can be suspended, then the steps outlined in **Section 12** will be followed to ensure a safe interim drinking water supply. The alternative drinking water source would be furnished either on a short-term or long-term basis for the public in SqCWD's service area who are adversely impacted by the PWS Project, including those supplied by SqCWD-owned wells and those supplied by non-SqCWD-owned wells (e.g., small, private wells).

If necessary due to adverse impacts on SqCWD well(s) or non-SqCWD (small, private) wells, SqCWD would manage alternative water source(s) using the methodology outlined in its latest Urban Water Management Plan (SqCWD, 2020), which includes a water shortage contingency plan. The water shortage contingency plan provides guidance on declaring a water shortage stage and how to mitigate supply deficits. The water shortage contingency plan defines stages of water shortage and outlines actions relative to each stage. While addressing a water shortage in the entire service area, elements of the water shortage continency plan could be applied to a specific area of well(s) (SqCWD or non-SqCWD) that may be adversely impacted by the PWS. **Section 12** provides more detail regarding the time requirements to implement an alternative water supply.

SqCWD has received notification from the SWRCB regarding interest in consolidation of small neighboring agencies and will continue to assess the statewide direction on this and work with Local Agency Formation Commission of Santa Cruz County (LAFCO), as necessary.

Section 14: Monitoring and Reporting Program

The proposed MRP for the PWS Project is presented in this section. The SqCWD will be responsible for the PWS Project MRP.

The existing SC WWTF operates under permit requirements for discharging secondary treated wastewater (secondary effluent) to the Pacific Ocean via the existing ocean outfall specified in NPDES No. CA0048194 (RWQCB Order No. R3-2017-0030) (RWQCB, 2017). The SC WWTF permit also specifies requirements for recycled water (disinfected tertiary-treated effluent) production and non-potable reuse in the future. The monitoring and reporting provisions in the SC WWTF permit, for which the City is responsible, reference the requirements in the Uniform Statewide Recycling Criteria (CCR, 2018) as set forth in the SWRCB General Order for WRRs for Recycled Water Use (SWRCB, 2016). The Santa Cruz NPR Project is described in the City of Santa Cruz Non-Potable Reuse Engineering Report.

14.1 General Monitoring Provisions

General provisions of the MRP include flow metering and sampling locations and frequencies. Laboratory certification requirements and quality assurance measures are also discussed below.

14.1.1 Monitoring Locations

Figure 14-1 shows the proposed sampling locations for the PWS Project. Monitoring wells that will sample groundwater are described in **Section 14.5**. The City's discharge points DP-002 and EFF-02 are shown in **Figure 14-1** but described separately in the City of Santa Cruz Non-Potable Reuse Engineering Report and are not part of the PWS Project.

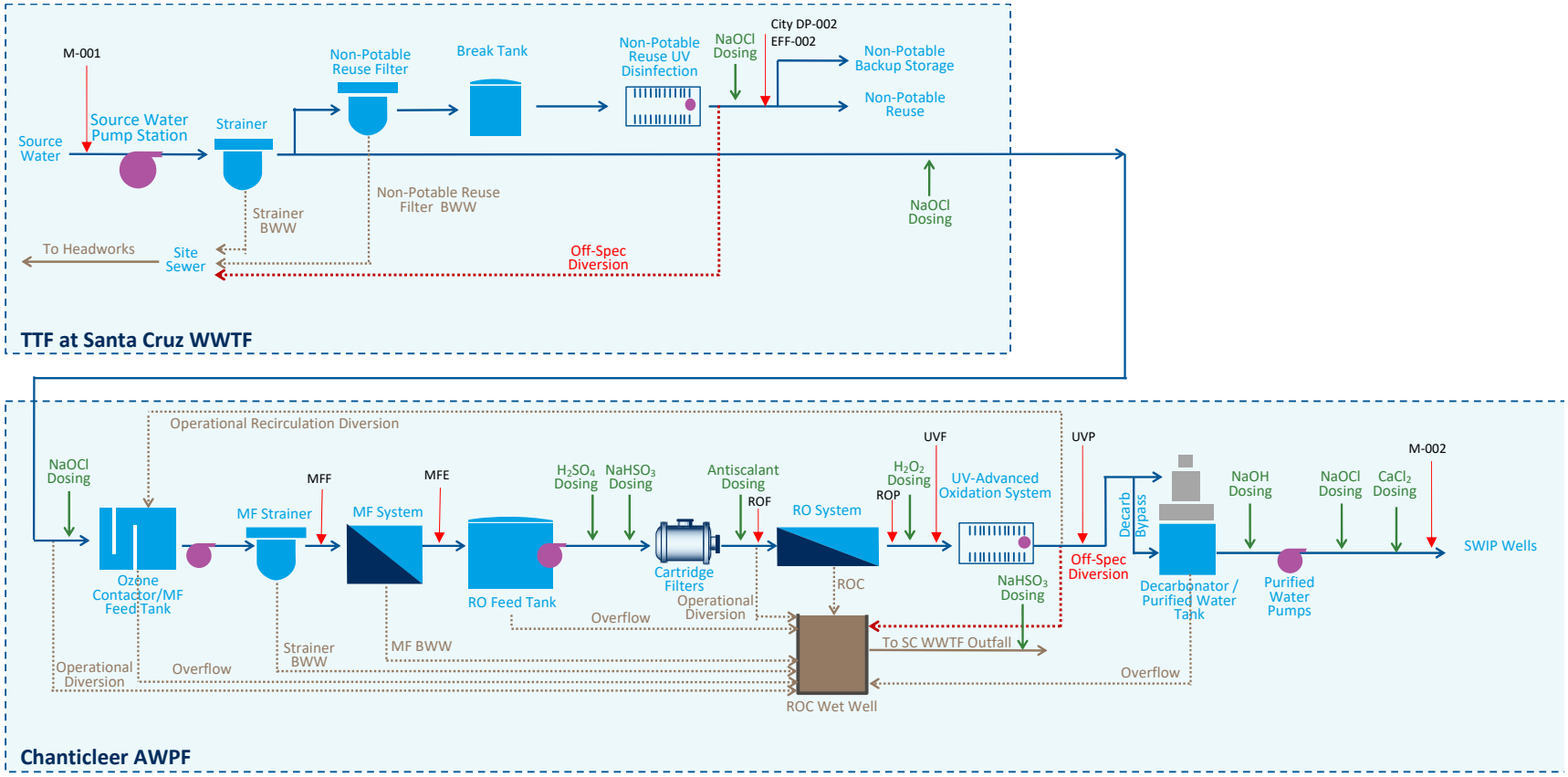

Figure 14-1. PWS project flow schematic with monitoring points

SqCWD proposes to monitor flow and water quality of the flow streams listed in **Table 14-1**, with the exception of flow streams that are monitored by the City for compliance with the existing SC WWTF permit (RWQCB, 2017). Monitoring and reporting requirements at the SC WWTF for influent (raw) wastewater, secondary effluent discharged to the ocean, and non-potable recycled water (disinfected tertiary effluent) are specified in the SC WWTF permit. New monitoring points will be designated for the PWS Project, where some monitoring stations for the PWS Project are for permit compliance and others are for indicating performance of the treatment processes. Operation of the facilities will involve other monitoring analyzers and sampling points in addition to those listed below; the Operation Optimization Plan will provide a complete description of installed monitoring devices and locations.

Table 14-1. Summary of Monitoring Stations

Flow Stream	Description	Monitoring Point Designation[a]	Responsible Agency
Influent	Raw Wastewater	INF-001	City
UV-Disinfected Secondary Effluent	WWTF Effluent to ocean outfall	EFF-001	City (DP-001)
Source Water	Secondary effluent pumped to AWPF (Ozone System Influent)	M-001	City
Purified Water	Purified water (Final full advanced-treated water produced by the AWPF for injection)	M-002	SqCWD
Membrane Feed	MF Feed for MF process performance	MFF	SqCWD
Membrane Effluent	MF Effluent for MF process performance	MFE	SqCWD
RO Feed	RO Feed for RO process performance	ROF	SqCWD
RO Product	RO Effluent for RO process performance	ROP	SqCWD
UV-AOP Feed	UV Influent for UV-AOP process performance	UVF	SqCWD
UV-AOP Product	UV Effluent for UV-AOP process performance	UVP	SqCWD
Groundwater	Monitoring Wells	MM-1, MM-2, WM-1, WM-2, TLM-1A, TLM-2A, TLM-2BC, TLM-3BC, TLM-4BC,	SqCWD

a. *INF-001, EFF-001, and EFF-002 are monitoring points designated in the City's existing permit for the SC WWTF (RWQCB, 2017). All other monitoring points are new for the PWS Project.*

Table 14-2 summarizes the proposed monitoring program for the PWS Project showing the minimum frequency for each of the sampling locations for anticipated permit compliance.

Table 14-2. Summary of Proposed Compliance Monitoring Program for Pure Water Soquel Project			
Constituent Category [c,d,e,f]	**Monitoring Frequency and Location** [a,b]		
	Source Water from Existing SC WWTF to Ozone System at AWPF site	**Purified Water from AWPF**	**Monitoring Wells**
	M-001	M-002	MM-1, MM-2, WM-1, WM-2, TLM-1A, TLM-2A, TLM-2BC, TLM-3BC, TLM-4BC
Flow	C	C	--
pH	C	C	--
Turbidity	C	C	--
Total Coliform	--	D	--
TSS	D	--	--
TDSs and EC	--	M	Q
Constituents with Primary Drinking Water MCLs	--	M[g]	Q
Inorganic Constituents, Except Nitrogenous Compounds	--	Q	--
Copper and Lead	--	M[g]	Q
Acute Contaminants	-	Varies[h]	Q
Constituents with Secondary Drinking Water MCLs	--	A	Q
Constituents with NLs		M[g]	Q
Priority Toxic Pollutants	-	Q	Q
Total Nitrogen	--	SW	Q
TOC	W[i]	W[j]	--
Recycled Water Policy CECs, Surrogates and Bioanalytical Screening Tools	--	Initial assessment: Q Baseline: SA &Q Standard: A & SA[f]	--
Additional Chemicals Specified by DDW or RWQCB	As required	As required	As required

a. *Minimum frequencies: C = continuous, D = daily, SW = semi-weekly (twice per week), M = monthly, Q = quarterly, SA = semi-annually (twice per year), A = annually*
b. *See **Figure 14-1** and **Table 14-1** for monitoring locations. Monitoring well locations are presented in **Section 14.5.2**.*
c. *Abbreviations: MCLs = maximum contaminant levels, CECs = constituents of emerging concern*
d. *Some analytes fit into multiple categories (e.g., aluminum has a primary MCL and a sMCL; NDMA is a constituent with a NL and also one of the Recycled Water Policy's CECs).*
e. *See subsequent tables in this chapter for complete lists of constituents to be monitored.*
f. *See **Section 14.4.5**. RO feed and purified recycled water prior to injection. Three monitoring phases: initial assessment, baseline, and standard. (1) Initial assessment monitoring phase requires first year, quarterly monitoring of health-based and performance indicator CECs and surrogates as specified for the Project by the RWQCB. Initial assessment phase also requires three years of quarterly monitoring for bioanalytical screening tools. (2) Baseline monitoring phase requires three years of semi-annual monitoring of CECs and surrogates specified by the RWQCB. Baseline phase also requires one year of quarterly monitoring for bioanalytical screening tools. (3) Standard operation monitoring phase requires semi-annual or annual monitoring of CECs and bioanalytical screening tools (frequency per RWQCB direction based on baseline phase findings) and surrogates as specified by the RWQCB while the Project is in operation. Monitoring will be in accordance with Recycled Water Policy (SWRCB, 2018) for subsurface application projects.*
g. *Per Title 22 Section 60320.201(i), monthly frequency may be reduced to no less than quarterly upon approval if no results exceed a primary MCL, AL, or notification level for 12 consecutive months, with the exception of asbestos and acute contaminants. For asbestos, if four consecutive quarterly results are below the 0.2 million fibers per liter detection limit, then sampling may be reduced to once every three years.*
h. *Acute contaminant monitoring frequency varies: Constituents with Primary MCLs = Monthly; Total coliform = Daily. Acute contaminants include: nitrate, nitrite, perchlorate, and total coliform.*
i. *Secondary effluent TOC is monitored by the City three times per week (24-hour composite samples) for the ocean discharge in lieu of BOD5 per the existing SC WWTF permit.*
j. *TOC monitoring of Full Advanced Treated Recycled Water for compliance with Title 22 Section 60320.218(a). TOC monitoring of secondary effluent (by City – see note i) for compliance with Title 22 Section 60301.650 requirement for oxidized wastewater as source water for AWPF.*

14.1.2 Flow

Flow measurement devices will be calibrated at least once per year to ensure continued accuracy. The flow rates and total volumes of the following water streams will be continuously measured and recorded:

- Ozone system influent, AWPF feedwater from SC WWTF (FE210003, drawing 210-X-7001)
- MF feed (FE210002, drawing 210-X-7001)
- MF filtrate flow (sum of skid flows FE220001, FE220002, FE220003, drawings 220-X-7001, 220-X-7002, 220-X-7003)
- RO feed (FE230001, drawing 230-X-7001)
- RO permeate (sum of RO skid flows FE230003, FE230004, drawing 230-X-7003)
- UVAOP influent (FE240001, drawing 240-X-7001)
- Recirculation lines (FE240001, drawing 240-X-7001)
- AWPF influent operational diversion (drawing 210-X-7001, same flow meter as MF feed)
- RO feed operational diversion (drawing 230-X-7001, same flow meter as RO feed)
- UV-AOP effluent regulatory off-spec diversion (drawing 240-X-7001, same flow meter as UV-AOP influent)
- Decarbonator bypass flow (FE240003, drawing 240-x-7001).
- Purified water flow (FE260001, drawing 260-X-7002, total AWPF production of final advanced treated water)
- Recharged purified water at each SWIP recharge well (TLC SWIP Well: FE1008; Monterey SWIP Well: FE1008; Willowbrook SWIP Well: FE1008, each well is equipped with a flow meter with the same tag number. See the Injection Well Site Typical P&ID in **Appendix I** for typical flow meter set up)
- Waste streams discharged to the ocean outfall flow (FE120013, drawing 120-X-7013, per agreement)
- RO concentrate discharged to the ocean outfall (sum of FE230003, FE230005, drawings 230-X-7003, 230-X-7004 120-X-7013, per agreement)

14.1.3 Sampling and Laboratory Analyses

All sampling and sample preservation activities will be conducted in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All lab procedures will be performed by a state-certified laboratory in accordance with procedures under 40 CFR 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants," promulgated by the USEPA, unless otherwise specified by DDW or the RWQCB. The laboratory will be certified by the SWRCB Environmental Laboratory Accreditation Program (ELAP). In addition, the DDW, RWQCB and/or USEPA may specify test methods which are more sensitive than those specified in 40 CFR 136.

Laboratories are required to calibrate the analytical system down to the Reportable Detection Limits (RDLs) or Minimum Levels (MLs) as listed in the permit and summarized in the tables included in this section. An alternative RDL may be used if approved by the DDW and RWQCB. For priority pollutants without effluent limitations, the laboratory is required to quantify constituent concentrations to the lowest achievable reporting limit (RL) as determined by the testing procedure in 40 CFR 136. If possible, constituents will be analyzed using analytical methods in the DDW California Laboratory Intake Portal (CLIP) database. CLIP is periodically updated by DDW as new methods and analytes are added or removed. The CLIP constituent names and analytical methods referenced in this report were downloaded on February 14, 2023.

For unregulated chemical analyses and where practical, drinking water methods, DDW-recommended methods, or USEPA-approved methods if available, will be used. If those are unavailable, then the laboratory analyses will use methods available in published scientific literature or commercially available, after consultation with DDW. If the laboratory is unable to upload analytical results to CLIP, then a portable document format (PDF) copy of laboratory reports will be sent to DDW. At this time, 2-chloroethyl vinyl ether is the only constituent identified that cannot be reliably analyzed with a CLIP method because of the laboratory holding time, but SqCWD has identified alternative ELAP-certified methods that can be used.

The laboratory will have in place quality assurance/quality control (QA/QC) procedures, including documentation of the chain of custody. QA/QC analyses will be run on the same dates as the actual sample analyses. Copies of the QA/QC reports will be retained on file and available for inspection when requested by DDW or the RWQCB.

The reporting protocol calls for results greater than or equal to the ML to be reported as measured by the laboratory. Sample results less than the reported ML but greater than or equal to the laboratory's Method Detection Limit (MDL) are reported as "Detected, but Not Quantified (DNQ)". In that case, the estimated chemical concentration of the sample must also be reported. MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the concentration is greater than zero, as defined in 40 CFR 136. Sample results not detected above the laboratory's MDL are reported as ND.

Samples for bacterial analyses will be diluted as required to obtain meaningful results. Methods used for dilution will be reported with the results of the analyses.

Depending on the constituent, samples will be taken on a continuous basis, as a 24-hour composite, or as a grab specimen at regularly scheduled intervals (daily, weekly, semi-weekly, monthly, quarterly, semi-annually, or annually) as defined below:

- A "grab" sample is defined as any individual sample collected in less than 15 minutes.
- A "composite" sample is defined as a combination of no fewer than eight individual grab samples obtained over the specified sampling period. The volume of each individual grab sample should be proportional to the discharge flowrate at the time of sampling or, the number of equal volume samples should be proportional to the flow over the sampling period. The compositing period should be equal to the specific period, or 24 hours if no period is specified in the permit.
- Daily samples should be collected on each day of the week.
- Maximum daily concentration is defined as the measurement made on any single grab sample or composite sample.
- Average weekly or monthly discharge limitations are determined from the average of the analytical results of all samples collected during a calendar week or month, respectively. Where a calendar week overlaps with two different months, compliance will be determined for the month in which the week ends.
- 12-month average limits should be determined monthly by arithmetic mean of the last 12 monthly averages.
- Semi-weekly samples should be collected twice during a week, at least three days apart.
- Monthly samples should be collected on any representative day of each month.
- Quarterly samples should be collected in January, April, July, and October, or in the months designated in the permit.
- Semi-annual samples should be collected in January and July, or six months apart as specified in the permit.
- Annual samples should be collected in January or in the month designated in the permit.

14.2 AWPF Feedwater Monitoring

The PWS Project source water will be secondary effluent pumped from the PWPS at the SC WWTF to the new ozone facility installed at the AWPF site (See **Figure 14-1**). The PWS Project source water will be fully oxidized wastewater and compliant with Title 22 Section 60320.201 requirements that specify the use of oxidized wastewater (defined in Title 22 Section 60320.650).

Secondary effluent from the SC WWTF is currently monitored by the City at Monitoring Point EFF-001 as it is discharged to the ocean outfall in accordance with the permit (RWQCB, 2017). The secondary effluent TOC is routinely monitored and serves as an indication of oxidized, treated wastewater. The RWQCB approved use of TOC in lieu of $CBOD_5$ to demonstrate that the minimum level of effluent quality attainable by secondary treatment is achieved and has established secondary effluent TOC limits for the SC WWTF (RWQCB, 2017). The SC WWTF monitors secondary effluent at EFF-001 at least three times per week (24-hr composite samples), and complies with the permit limits of an average monthly TOC of no greater than 17 mg/L and an average weekly TOC of no greater than 23 mg/L.

The new SWPS at the SC WWTF will convey source water to the AWPF site for treatment by the ozone process for reduction of nitrite and partial oxidation of TOC.

Table 14-3 summarizes the parameters that will be monitored in the source water conveyed from the SC WWTF to the ozone facility located at the AWPF site. These parameters will provide information for AWPF operation and performance.

Table 14-3. PWS Project Source Water Monitoring

Constituent	Units	Type of Sample	Minimum Monitoring Frequency[a]	Required Analytical Test Method[b]
Flow	mgd	Recorder/Totalizer	Continuous[a]	--
pH	--	Recorder	Continuous[a]	--
Turbidity	NTU	Recorder	Continuous[a]	--
TSS	mg/L	24-hr Composite	Daily	SM 2540D[c]
TOC	mg/L	24-hr Composite	1/Week	SM 5310C[c]

a. The monthly minimum, maximum, and daily average values will be reported for constituents that are continuously monitored.
b. As required under 40 CFR Part 136 "Guidelines Establishing Test Procedures for Analysis of Pollutants".
c. Standard Methods for the Examination of Water and Wastewater, 2018 or latest edition, Washington, D.C., American Public Health Association, American Water Works Association, and Water Environment Federation.

14.3 Treatment Process Performance Monitoring

As presented in **Section 9**, the PWS Project must achieve continuous pathogen LRVs through the combined treatment train and underground retention totaling at least 12-log enteric virus reduction, 10-log *Giardia* cyst reduction, and 10-log *Cryptosporidium* oocyst reduction in accordance with Title 22 Section 60320.208. The expected LRV performance for the PWS Project is repeated in Table 14-4 for reference for the MRP. The performance of treatment processes will be monitored at critical control points (CCPs) to confirm that the processes achieve the expected LRV performance.

Table 14-4. Pathogenic Microorganism Control for Groundwater Recharge

Pathogen	Minimum Required LRV Credits	Minimum Expected LRV Credits[a]						Minimum Underground Retention Credits[b]	Total Minimum Expected LRV Credits
		SC WWTF	AWPF						
		Source Water	O_3	MF	RO	UV-AOP	Post-Treatment and Chlorination		
Virus	12	0	0	0	1.5	6	0	6	13.5
Giardia cyst	10	0	0	4	1.5	6	0	0	11.5
Cryptosporidium oocyst	10	0	0	4	1.5	6	0	0	11.5

*a. See **Section 9** for more detail.*
*b. See **Section 11** for more detail.*

14.3.1 MF Treatment Monitoring for Pathogen Control

As discussed in **Section 9**, the Federal and State LT2ESWTF require that both direct integrity testing and continuous indirect integrity monitoring be performed in order to receive treatment credit for removal of *Giardia* cysts and *Cryptosporidium* oocysts by the MF process. A PDT will be conducted daily for each MF module as the proposed method of direct integrity testing. Turbidity will be monitored continuously on the individual MF filtrate streams to meet the requirements for continuous indirect monitoring and to demonstrate that the MF process is meeting the turbidity targets. If the individual MF filtrate turbidity is greater than 0.2 NTU for more than 5% of the time in a 24-hour period or 0.5 NTU for more than 15 minutes, a PDT must be performed to directly test the membrane integrity.

MF membranes selected for the PWS Project will be required to be certified by the State for use in drinking water with at least 4-log reduction credits for both *Giardia* cysts and *Cryptosporidium* oocysts. The actual MF LRV credits achieved will be calculated daily using PDT criteria outlined in the *Membrane Filtration Guidance Manual* (USEPA, 2005).

14.3.2 RO Treatment Monitoring for Pathogen Control

The RO system performance will be monitored continuously using TOC as the primary surrogate to demonstrate membrane integrity and pathogen reduction in compliance with Title 22 Section 60320.208. EC will be used as the secondary (backup) surrogate. The PWS Project will install online TOC analyzers on the combined ROF line and common ROP line and EC analyzers on the ROF and train permeates to measure the reduction of the surrogate indicator across the overall RO system. Continuous TOC and EC monitoring complies with the FAT criteria established in Title 22 Section 60320.201 for RO treatment of the entire flow.

The calculated TOC removal will be used to indicate the virus, *Giardia* cyst, and *Cryptosporidium* oocyst LRV credits awarded to the RO process. It is anticipated that the RO system will achieve a minimum 1.5-log reduction of each of these pathogens based on TOC removal data. If TOC data are unavailable, then EC reduction will be used to calculate the LRV credits. For standby purposes, the anticipated EC reduction is expected to be a minimum of 1-log for each pathogen. For planning purposes, the RO system will be credited for 1.5-log reduction each of virus, *Giardia* cysts, and *Cryptosporidium* oocysts. Actual operation is expected to achieve at least 2 LRV credits of these pathogens.

ROP monitoring is also required for compliance with the SWRCB Recycled Water Policy (SWRCB, 2018), which is described in **Section 14.4.5**.

14.3.3 UV-AOP Treatment Monitoring for Pathogen Control

The UV-AOP system will be monitored continuously in compliance with the oxidation process requirements for FAT of the entire flow per Title 22 Section 60320.201. The UV-AOP system will be monitored using online analyzers for:

- UVT equal to or greater than 95 percent
- UV flowrate
- UV dose equal to or greater than 276 mJ/cm^2

By consistently achieving the above operating parameters, it is expected that the UV-AOP system will achieve 6-log LRV each of virus, *Giardia* cysts, and *Cryptosporidium* oocysts.

14.3.4 Summary of Pathogen Control Monitoring

Daily LRV credits will be determined for each advanced treatment process at the AWPF: MF, RO, and UV-AOP. No LRV credits will be taken for the ozone, post-treatment, or chlorination processes. Based on a calculation of log reduction achieved each day for the aforementioned parameters for each treatment process, the total LRV credits achieved by the entire PWS Project (AWPF plus underground retention) will be reported as a "Yes" or "No" in regard to the required total LRVs (i.e., 12-log reduction for virus, 10-log reduction for *Giardia* cysts, and 10-log reduction for *Cryptosporidium* oocysts). Monthly pathogen control compliance reports will be submitted to DDW and the RWQCB.

14.3.5 UV-AOP Treatment Performance Monitoring

Prior to AWPF start-up, a demonstration test of the UV-AOP system will be conducted to show that it has been designed to provide at least 0.5-log reduction of 1,4-dioxane under normal full-scale operating conditions. A testing protocol for challenge or spiking tests using 1,4-dioxane will be submitted for DDW review and approval prior to conducting the test. The test will be used to establish surrogate or operational parameters that reflect whether the minimum 0.5-log 1,4-dioxane reduction criteria are being met. At least one surrogate or operational parameter will be established that can be monitored continuously, recorded and have associated alarms that indicate when the UV-AOP process is not operated as designed.

As discussed in **Section 5.3.4.1**, the UV-AOP system is designed to achieve at least 0.5-log reduction of 1,4-dioxane using hydrogen peroxide and UV light to generate hydroxyl radicals and achieve advanced oxidation. During full-scale operation, the UV-AOP process performance will be monitored continuously and recorded for the designated surrogate or operational parameter based on the demonstration test results to show compliance with the minimum 0.5-log 1,4-dioxane reduction requirement.

14.4 Purified Water Monitoring

The quality of the purified water produced by the AWPF for groundwater recharge will be monitored downstream of the advanced treatment train at Monitoring Point M-002 near the Purified Water Pump Station (**Figure 14-1**).

Purified water monitoring will be conducted for the PWS Project to:

- Comply with permit conditions issued by the RWQCB for groundwater recharge
- Comply with requirements for monitoring of acute regulated contaminants for compliance with the RRT approved by DDW
- Support treatment process operation and help optimize AWPF performance

The proposed purified water monitoring program for the PWS Project to satisfy requirements for confirming public health protection as required under Title 22 for groundwater recharge is summarized in **Table 14-5** and discussed in more detail below.

Table 14-5. Purified Water Monitoring Plan

Constituent[a]	Units	Type of Sample	Minimum Monitoring Frequency	Reference Table for Complete List of Constituents[b]
General Physical Characteristics				
Flow	mgd	Recorder/Totalizer	Continuous	---
pH	units	Recorder	Continuous	---
Turbidity	NTU	Recorder	Continuous	---
Temperature	°F	Recorder	Continuous	---
Total Coliform	MPN/ 100 mL	Grab	Daily	---
EC	µm/cm	Grab	Daily	---
General Minerals				
Inorganic Chemicals with Primary MCLs (except nitrogenous compounds)	mg/L	Grab	Monthly[c]	**Table 14-6**
Radionuclides	pci/L	Grab	Monthly[c]	**Table 14-7**
Regulated Organic Chemicals	mg/L	Composite or Grab	Monthly[c]	**Table 14-8**
DBPs	mg/L	Grab	Monthly[c]	**Table 14-9**
Lead and Copper AL	mg/L	Grab	Monthly[c]	**Table 14-10**
Acute Contaminants	mg/L	Grab	Varies by Contaminant	**Table 14-11**
Chemicals with sMCLs (except TDS)	varies	Grab	Annually	**Table 14-12**
TDS	mg/L	Composite	Monthly	**Table 14-12**
Additional Chemicals and Contaminants				
TOC	mg/L	Composite	Weekly	**Section 14.4.1**
Total Nitrogen (TN = sum of nitrate-N + nitrite-N + ammonia-N + organic N)	mg/L as N	Composite or Grab	Semi-weekly at least 3 days apart	**Section 14.4.1**
Chemicals with NLs	mg/L	Grab	Monthly[c]	**Table 14-13**
Remaining Priority Pollutants	µg/L	Grab	Quarterly	**Table 14-14**
CECs	varies	Grab	Quarterly[d]	**Table 14-15**
Surrogates for CECs	mg/L	Grab	Quarterly[d]	**Table 14-15**
Bioanalytical Screening Tools	mg/L	Grab	Quarterly[d]	**Section 14.4.5**
Additional Chemicals specified by DDW or RWQCB	TBD	TBD	TBD	TBD

a. MCLs = maximum contaminant levels. Some constituents fit into multiple categories.

b. See noted reference table for a complete list of constituents to be monitored.

c. Per Title 22 Section 60320.201(i), monthly frequency may be reduced to no less than quarterly upon approval if no results exceed a primary MCL, AL, or NL for 12 consecutive months, with the exception of asbestos and acute contaminants. For asbestos, if four consecutive quarterly results are below the 0.2 million fibers per liter detection limit, then sampling may be reduced to once every three years.

*d. Monitoring for compliance with SWRCB Recycled Water Policy - Minimum monitoring frequency shown for initial assessment phase. For frequency for subsequent baseline and standard phases, see **Section 14.4.5.***

14.4.1 Total Organic Carbon and Total Nitrogen Compliance Monitoring

TOC is used as a surrogate for treatment performance, organics removal, and CEC removal. The maximum TOC concentration at the advanced treatment plant effluent (purified water) prior to injection shall not exceed 0.5 mg/L (CCR, Title 22 §60320.218). Compliance with the maximum TOC concentration is based on the 20-week running average of all TOC results and the average of the last four TOC results. The efficacy of the RO process must be demonstrated during the first 20 weeks of operation by achieving a TOC concentration in the ROP stream no more than 0.25 mg/L in 5% of the results based on a minimum of weekly samples.

TN is the sum of nitrate, nitrite, ammonia, and organic nitrogen, all expressed as N. Sampling for TN will be conducted in the applied purified water twice a week, at least three days apart. Monitoring for TOC and TN will be conducted as described in **Table 14-5**.

14.4.2 Regulated Contaminants Monitoring

Monitoring of purified water will be conducted for the following constituents to comply with Title 22 Section 60320.212:

- Inorganic chemicals with primary drinking water MCLs (including nitrogen compounds), listed in **Table 14-6**
- Radionuclides with primary MCLs, listed in **Table 14-7**
- Regulated organic chemicals with primary MCLs, listed in **Table 14-8**
- DBPs, listed in **Table 14-9**
- Lead and copper ALs, listed in **Table 14-10**
- Acute contaminants for compliance with the DDW-approved RRT, listed in **Table 14-11**
- Constituents and parameters with secondary drinking water MCLs, listed in **Table 14-12**

14.4.3 Contaminants with Notification Levels Monitoring

Table 14-13 shows the chemicals with NLs that will be monitored in the purified water.

14.4.4 Remaining Priority Toxic Pollutants Monitoring

Table 14-14 presents the remaining priority toxic pollutants (i.e., those that are not primary MCLs, sMCLs or NLs noted in the earlier tables) that will be monitored in the purified water. The remaining priority pollutants are categorized by type (pesticides, metals, base/neutral extractables, acid extractables, and volatile organics). The SWRCB Amended Recycled Water Policy (SWRCB, 2018) requires groundwater recharge projects to monitor recycled water for priority pollutants on a quarterly basis. The frequency may be reduced to annually with DDW approval if the first two years' results show none of the priority toxic pollutants have been detected above the RL.

Table 14-6. Inorganic Chemicals with Primary MCLs				
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**
Aluminum		mg/L	1	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 D, SM 3113 B, SM 3120 B
Antimony	Antimony, Total	mg/L	0.006	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B
Arsenic		mg/L	0.010	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B, SM 3114 B
Asbestos		millions of fibers per liter for fibers exceeding 10 microns in length	7	EPA 100.1, EPA 100.2
Barium		mg/L	1	EPA 200.5, EPA 200.7, EPA 200.8, SM 3111 D, SM 3113 B, SM 3120 B
Beryllium	Beryllium, Total	mg/L	0.004	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B, SM 3120 B
Cadmium		mg/L	0.005	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B
Chromium		mg/L	0.05	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM3113B, SM 3120B
Cyanide		mg/L	0.15	EPA 335.4, EPA Kelada 01, OIA 1677, QC 10-204-00-1-X, SM 4500-CN-E-99, SM 4500-CN-F-99
Fluoride		mg/L	2.0	EPA 300.0, EPA 300.1, SM 4110 B-00, SM 4500-F-B-97, SM 4500-F-C-97, SM 4500-F-E-97
Hexavalent Chromium[a]		mg/L	0.010	EPA 218.6, EPA 218.7
Mercury		mg/L	0.002	EPA 200.8, EPA 245.1, EPA 245.2, SM 3112 B
Nickel		mg/L	0.1	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B
Nitrate (as N)[b]	Nitrate	mg/L	10	CALC, EPA 300.0, EPA 300.0-r2.1, EPA 300.1, EPA 353.2, HACH 10206, SM 4110 B-00
Nitrate+Nitrite (sum as N)	Nitrate-Nitrite	mg/L	10	CALC, EPA 300.0, EPA 300.1, EPA 353.2, SM 4500-NO3-E-00
Nitrite (as N)[b]	Nitrite	mg/L	1	EPA 300.0, EPA 300.1, EPA 353.2, SM 4110 B-00, SM 4500-NO2-B-00, SM 4500-NO3-E-00, SM 4500-NO3-F-00
Perchlorate[b]		mg/L	0.006	EPA 314.0, EPA 314.1, EPA 314.2, EPA 331.0, EPA 332.0
Selenium		mg/L	0.05	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B, SM 3114 B
Thallium		mg/L	0.002	EPA 200.8, EPA 200.9

Source: Title 22, Division 4, Environmental Health Chapter 15, Article 4, Section 64431

a. The primary MCL for hexavalent chromium is under review and not in effect at this time.

*b. Designated as an acute contaminant for compliance with RRT requirements in Title 22 Division 4, Environmental Health, Chapter 3, Water Recycling Criteria, Section 60320.224. See **Table 14-11** for complete list of acute contaminants for RRT compliance.*

Table 14-7. Radionuclides with Primary MCLs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Radium-226 and Radium-228		pCi/L	5	CALC, EPA Ra-04, SM 7500-RA	GA Institute of Technology Method
Gross Alpha Particle Activity (excluding radon and uranium)		pCi/L	15	EPA 00-01, EPA 00-02, EPA 900.0, P1 EPA 600/4-75-008, SM 7110 B, SM 7110 C, USGS R-1120-76	
Uranium	Combined Uranium	pCi/L	20	ASTM D2907-97, ASTM D3972-97, ASTM D5174-97, ASTM D5673-03, DHS U-02, DHS U-04, EPA 00-07	EPA 200.8
Beta/photon Emitters		millirem/year	4	EPA 00-01, EPA 900.0, P1 EPA 600/4-75-008, SM 7110 B, USGS R-1120-76	
Strontium-90	38-Strontium-90	pCi/L	8	EPA 905.0, SM 7500-SR B	
Tritium		pCi/L	20,000	ASTM D4107-91, EPA 906, EPA H-02, P34 EPA 600/4-75-008, SM 7500-3H B, USGS R-1171-76	

Source: Title 22, Division 4, Environmental Health Chapter 15, Article 5, Sections 64442 and 64443

Table 14-8. Organic Chemicals with Primary MCLs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
VOCs					
Benzene		mg/L	0.001	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Carbon Tetrachloride		mg/L	0.0005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
1,2-Dichlorobenzene	O-Dichlorobenzene	mg/L	0.6	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1
1,4-Dichlorobenzene	P-Dichlorobenzene	mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1
1,1-Dichloroethane		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,2-Dichloroethane		mg/L	0.0005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,1-Dichloroethylene		mg/L	0.006	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
cis-1,2-Dichloroethylene		mg/L	0.006	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
trans-1,2-Dichloroethylene		mg/L	0.01	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Dichloromethane		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,2-Dichloropropane		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,3-Dichloropropene		mg/L	0.0005	EPA 524.2, EPA 524.3, EPA 524.4, EPA 502.2	
Ethylbenzene		mg/L	0.3	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
MTBE		mg/L	0.013	EPA 524.2, EPA 524.3, EPA 524.4	
Monochlorobenzene	Chlorobenzene	mg/L	0.07	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Styrene		mg/L	0.1	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,1,2,2-Tetrachloroethane		mg/L	0.001	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Tetrachloroethylene		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
Toluene		mg/L	0.15	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,2,4-Trichlorobenzene		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1
1,1,1-Trichloroethane		mg/L	0.200	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
1,1,2-Trichloroethane		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
Trichloroethylene		mg/L	0.005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
Trichlorofluoromethane		mg/L	0.15	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,1,2-Trichloro-1,2,2-trifluoroethane	Trichlorofluoromethane	mg/L	1.2	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Vinyl chloride		mg/L	0.0005	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	

Table 14-8. Organic Chemicals with Primary MCLs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Xylenes (single isomer or sum or isomers)	Xylenes, Total	mg/L	1.750	EPA 524.2, EPA 524.3, EPA 524.4	
Non-Volatile SOCs					
Alachlor	Lasso	mg/L	0.002	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1	
Atrazine		mg/L	0.001	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1	
Bentazon		mg/L	0.018	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555	
Benzo(a)pyrene		mg/L	0.0002	EPA 525.2, EPA 525.3, EPA 550, EPA 550.1, EPA 8270C	
Carbofuran		mg/L	0.018	EPA 531.1, EPA 531.2, EPA 8270C, SM 6610 B,	
Chlordane		mg/L	0.0001	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 8270C	
2,4-D		mg/L	0.07	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555	
Dalapon		mg/L	0.2	EPA 515.1, EPA 515.3, EPA 515.4, EPA 552.1, EPA 552.2, EPA 552.3, EPA 557	
Dibromochloropropane	1,2-Dibromo-3-Chloropropane	mg/L	0.0002	EPA 504.1, EPA 524.3, EPA 551.1, EPA 8270C	
Di(2-ethylhexyl)adipate		mg/L	0.4	EPA 506, EPA 525.2, EPA 525.3	
Di(2-ethylhexyl) phthalate		mg/L	0.004	EPA 506, EPA 525.2, EPA 525.3, EPA 8270C	
Dinoseb		mg/L	0.007	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555, EPA 8270C	
Diquat		mg/L	0.02	EPA 549.2	
Endothall		mg/L	0.1	EPA 548.1	
Endrin		mg/L	0.002	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	
Ethylene dibromide		mg/L	0.00005	EPA 504.1, EPA 524.3, EPA 551.1	
Glyphosate		mg/L	0.7	EPA 547, SM 6651 B	
Heptachlor		mg/L	0.00001	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	
Heptachlor epoxide		mg/L	0.00001	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	
Hexachlorobenzene		mg/L	0.001	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	

Table 14-8. Organic Chemicals with Primary MCLs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Hexachlorocyclo-pentadiene		mg/L	0.05	EPA 505, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	EPA 525.1
Lindane	BHC-Gamma	mg/L	0.0002	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	EPA 525.1
Methoxychlor		mg/L	0.03	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	
Molinate		mg/L	0.02	EPA 507, EPA 525.2, EPA 525.3	
Oxamyl		mg/L	0.05	EPA 531.1, EPA 531.2, SM 6610 B	
Pentachlorophenol		mg/L	0.001	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 525.2, EPA 525.3, EPA 555	
Picloram		mg/L	0.5	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555	
PCB	PCB	mg/L	0.0005	EPA 505, EPA 508, EPA 508.1, EPA 508A, EPA 525.2, EPA 525.3	
Simazine		mg/L	0.004	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1	
Thiobencarb	Thiobencarb (BOLERO)	mg/L	0.07	EPA 525.2, EPA 525.3	
Toxaphene		mg/L	0.003	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 8270C	
TCP	1,2,3-Trichloropropane	mg/L	0.000005	SRL 524M-TCP	EPA 524.2
2,3,7,8-TCDD (Dioxin)	2,3,7,8-TCDD	mg/L	$3x10^{-8}$	EPA 1613	EPA 1613B
2,4,5-TP (Silvex)	2,4,5-TP	mg/L	0.05	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555	

Source: Title 22 Division 4, Environmental Health Chapter 15, Article 5.5, Section 64444

Table 14-9. DBPs with Primary MCLs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Total Trihalomethanes (TTHM) Bromodichloromethane Bromoform Chloroform Dibromochloromethane	TTHM	mg/L	0.080	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1	
Haloacetic Acids (HAA5) Monochloroacetic Acid Dichloroacetic Acid Trichloroacetic Acid Monobromoacetic Acid Dibromoacetic Acid		mg/L	0.060	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B	
Bromate		mg/L	0.010	EPA 300.1, EPA 302, EPA 317, EPA 321.8, EPA 326.0, EPA 557	
Chlorite		mg/L	1.0	EPA 300.0, EPA 300.1, EPA 317, EPA 326.0, EPA 327, SM 4500-CLO2 E-00	

Source: Title 22 Division 4, Environmental Health Chapter 15.5, Article 2, Section 64533

Table 14-10. Lead and Copper ALs					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**AL**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Lead		mg/L	0.015	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B	
Copper	Copper, Free	mg/L	1.3	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B	

Source: Title 22, Division 4, Environmental Health Chapter 17.5, Article 3, Section 64678

Table 14-11. Acute Contaminants for RRT Compliance[a]					
Constituent	**CLIP Constituent Name (if different)**	**Unit**	**Primary MCL or Limit**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Nitrate[b]		mg/L as N	10	CALC, EPA 300.0, EPA 300.0-r2.1, EPA 300.1, EPA 353.2, HACH 10206, SM 4110 B-00	
Nitrite[b]		mg/L as N	1	EPA 300.0, EPA 300.1, EPA 353.2, SM 4110 B-00, SM 4500-NO2-B-00, SM 4500-NO3-E-00, SM 4500-NO3-F-00	
Perchlorate[b]		mg/L	0.006	EPA 314.0, EPA 314.1, EPA 314.2, EPA 331.0, EPA 332.0	
Total Coliform		MPN/100 mL	2.2	None available	9221B or Colilert

a. For compliance with Title 22 Division 4, Environmental Health, Chapter 3, Water Recycling Criteria, Section 60320.224
*b. Constituent is also a primary MCL. Perchlorate MCL is under review at this time. See **Table 14-6** for a complete list of constituents to be monitored.*

Table 14-12. Constituents and Parameters with sMCLs					
Constituent	**CLIP Constituent Name (if different)**	**Units**	**Secondary MCL/ Upper Limit**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Aluminum[a]		mg/L	0.2	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 D, SM 3113 B, SM 3120 B	
Color[b]		Units	15	SM 2120 B	
Copper	Copper, Free	mg/L	1.0	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B	
Foaming Agents, MBAS[b]	Foaming Agents (Surfactants)	mg/L	0.5	SM 5540 C-00	
Iron[b]		mg/L	0.3	EPA 200.5, EPA 200.7, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B	
Manganese[b]		mg/L	0.05	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B	
MTBE[c]	Methyl Tert-Butyl Ether	mg/L	0.005	EPA 524.2, EPA 524.3, EPA 524.4	
Odor - Threshold	Odor	Units	3	EPA 140.1, SM 2150 B	
Silver		mg/L	0.1	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B	
Thiobencarb[c]		mg/L	0.001	EPA 525.2, EPA 525.3	
Turbidity[b]		NTU	5	EPA 180.1, SM 2130 B-01	
Zinc		mg/L	5.0	EPA 200.5, EPA 200.7, EPA 200.8, SM 3111 B, SM 3120 B	
TDS[b]		mg/L	1,000	SM 2540 C	EPA 160.1
Specific Conductance	Conductivity at 25 C UMHOS/CM	µS/cm	1,600	SM 2510 B	
Chloride[b]		mg/L	500	EPA 300.0, EPA 300.1, SM 4110 B-00, SM 4500-CL-B-97, SM 4500-CL-D-97	
Sulfate[b]		mg/L	500	EPA 300.0, EPA 300.0-r2.1, EPA 300.1, EPA 375.2, SM 4110 B-00, SM 4500-SO42-C-97, SM 4500-SO42-E-97	

Source: Title 22, Division 4, Environmental Health Chapter 14, Article 4, Section 64449

*a. Constituent is also a primary MCL. See **Table 14-6**.*

b. Constituent is also a RWQCB Basin Plan groundwater quality objective.

*c. Constituent is also a regulated organic primary MCL. See **Table 14-8**.*

Table 14-13. Chemicals with NLs					
Constituent	**CLIP Constituent Name (if different)**	**Units**	**NL[a]**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Boron	Boron, Total	mg/L	1	EPA 200.7, EPA 200.8	
n-Butylbenzene		mg/L	0.26	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
sec-Butylbenzene		mg/L	0.26	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
tert-Butylbenzene		mg/L	0.26	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Carbon disulfide		mg/L	0.16	EPA 524.2, EPA 524.3, EPA 524.4	EPA 624.1
Chlorate		mg/L	0.8	EPA 300.0, EPA 300.1	
2-Chlorotoluene	Chlorotoluene	mg/L	0.14	EPA 524.2	
4-Chlorotoluene	P-Chlorotoluene	mg/L	0.14	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM3113B, SM 3120B	
Diazinon	Spectracide	mg/L	0.0012	EPA 525.3	EPA 525.2
Dichlorodifluoromethane (Freon 12)	Dichlorodifluoromethane	mg/L	1	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,4-Dioxane		mg/L	0.001	EPA 522	SW8260B
Ethylene glycol		mg/L	14	EPA 8015B	MAI-Alcohols
Formaldehyde		mg/L	0.1	EPA 556	SW 8315A
HMX	HMX	mg/L	0.35	EPA 8330A	EPA 8330
Isopropylbenzene		mg/L	0.77	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Methyl-isobutyl ketone (MIBK)	4-Methyl-2-Pentanone	mg/L	0.12	EPA 524.2, EPA 524.3	
Naphthalene		mg/L	0.017	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 525.2, EPA 625.1
NDEA	N-Nitrosodiethylamine (NDEA)	mg/L	0.00001	EPA 521, EPA 8270C	
NDMA	N-Nitrosodimethylamine	mg/L	0.00001	EPA 521, EPA 8270C	EPA 625
NDPA	N-Nitrosodi-N-Propylamine	mg/L	0.00001	EPA 521, EPA 8270C	EPA 625
PFBS	Perfluorobutanesulfonic Acid (PFBS)	mg/L	0.005	EPA 533, 537.1	
PFHxS	Perfluorohexane Sulfonic Acid (PFHXS)	ng/L	3	EPA 533, 537.1	
PFOA	Perfluoroctanoic Acid (PFOA)	mg/L	0.0000051	EPA 533, 537.1	
PFOS	Perfluoroctane Sulfonic Acid (PFOS)	mg/L	0.0000065	EPA 533, 537.1	
Propachlor		mg/L	0.09	EPA 508, EPA 508.1, EPA 525.3	EPA 525.2

Table 14-13. Chemicals with NLs					
Constituent	**CLIP Constituent Name (if different)**	**Units**	**NL[a]**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
n-Propylbenzene		mg/L	0.26	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
RDX		mg/L	0.0003	EPA 529, EPA 8330A	EPA 8330
TBA	Tertiary Butyl Alcohol (TBA)	mg/L	0.012	EPA 524.2, EPA 524.3, EPA 524.4	EPA 524.2 SIM
1,2,4-Trimethylbenzene		mg/L	0.33	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
1,3,5-Trimethylbenzene		mg/L	0.33	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
TNT	2,4,6-Trinitrotoluene (TNT)	mg/L	0.001	EPA 529, EPA 8330A	EPA 8330
Vanadium	Vanadium, Total	mg/L	0.05	EPA 200.8, EPA 200.9	

a. NL as of March 5, 2021.

Table 14-14. Remaining Priority Toxic Pollutants			
Constituent	**CLIP Constituent Name (if different)**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
Pesticides			
Aldrin		EPA 505, EPA 508, EPA 525.2, EPA 525.3, EPA 8270C	
Dieldrin		EPA 505, EPA 525.2, EPA 525.3, EPA 8270C	
4,4'-DDT	Para-Para DDT	EPA 508, EPA 525.2, EPA 525.3, EPA 8270C	EPA 505, EPA 8081A
4,4'-DDE	Para-Para DDE	EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A
4,4'-DDD	Para-Para DDD	EPA 508, EPA 525.2, EPA 8270C	EPA 505
Alpha-endosulfan	Endosulfan I	EPA 508, EPA 525.2, EPA 8270C	EPA 505
Beta-endosulfan	Endosulfan II	EPA 508, EPA 525.2, EPA 8270C	EPA 505
Endosulfan sulfate		EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A
Endrin aldehyde		EPA 505, EPA 508, EPA 525.2, EPA 8270C	EPA 8081A
Alpha-BHC	Alpha.-BHC	EPA 508, EPA 8270C	EPA 505, EPA 525.2
Beta-BHC	Beta.-BHC	EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A
Delta-BHC	Delta.-BHC	EPA 508, EPA 525.2, EPA 525.3, EPA 8270C	EPA 505, EPA 8081A
Volatile Organics			
Acrolein		EPA 524.2	EPA 624, EPA 624.1
Acrylonitrile		EPA 524.2	EPA 624, EPA 624.1
Chlorobenzene		EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Chloroethane		EPA 524.2	
1,1-dichloroethylene		EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4	
Methyl chloride	Chloromethane	EPA 524.2, EPA 524.3	
Methyl bromide	Bromochloromethane	EPA 524.2, EPA 524.3, EPA 524.4	
2-chloroethyl vinyl ether[a]		EPA 524.2, EPA 525.3,	EPA 624.1 and 625
Acid Extractables			
2,4,6-Trichlorophenol		EPA 8270C, SM 6251 B	EPA 625.1
3-Methyl-4-chlorophenol (P-chloro-m-cresol)	P-Chloro-M-Cresol	EPA 625.1, EPA 8270C	
2-Chlorophenol		EPA 625.1, EPA 8270C	
2,4-Dichlorophenol		EPA 625.1, EPA 8270C	

Table 14-14. Remaining Priority Toxic Pollutants			
Constituent	**CLIP Constituent Name (if different)**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
2,4-Dimethylphenol		EPA 625.1, EPA 8270C	
2-Nitrophenol		EPA 625.1, EPA 8270C	
4-Nitrophenol		EPA 515.1, EPA 515.3, EPA 8270C	EPA 625.1
2,4-Dinitrophenol		EPA 625.1, EPA 8270C	
2-Methyl-4,6-dintrophenol (4,6-dinitro-o-cresol)	2-Methyl-4,6-Dinitrophenol	EPA 625.1, EPA 8270C	
Phenol	Phenols	EPA 625.1	
Metals			
Chromium (III) trivalent	Chromium (III)	CALC	EPA 200.8
Base/Natural Extractables			
Acenaphthene		EPA 550.1, EPA 8270C	EPA 525.2, EPA 625.1
Benzidine		EPA 625.1, EPA 8270C	
Hexachloroethane		EPA 524.2, EPA 8270C	EPA 625.1
Bis(2-chloroethyl)ether		EPA 524.2, EPA 8270C	EPA 625.1
2-Chloronaphthalene		EPA 625.1, EPA 8270C	
1,3-Dichlorobenzene	M-Dichlorobenzene	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 625.1, EPA 8270C	
3,3'-Dichlorobenzidine		EPA 625.1, EPA 8270C	
2,4-Dinitrotoluene		EPA 525.2, EPA 525.3, EPA 529, EPA 8270C	EPA 625.1
2,6-Dinitrotoluene		EPA 525.2, EPA 525.3, EPA 529, EPA 8270C	EPA 625.1
1,2-Diphenylhydrazine		EPA 625.1, EPA 8270C	
Fluoranthene		EPA 525.2, EPA 8270C	EPA 625.1
4-Chlorophenyl phenyl ether		EPA 625.1, EPA 8270C	
4-Bromophenyl phenyl ether		EPA 625.1, EPA 8270C	
Bis(2-chloroisopropyl)ether		EPA 625.1, EPA 8270C	
Bis(2-chloroethoxy)methane		EPA 625.1, EPA 8270C	
Hexachlorobutadiene		EPA 524.2, EPA 524.3, EPA 8270C	
Isophorone		EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1
Nitrobenzene		EPA 524.2, EPA 529, EPA 8270C	EPA 625.1

Table 14-14. Remaining Priority Toxic Pollutants			
Constituent	**CLIP Constituent Name (if different)**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**
N-Nitrosodiphenylamine		EPA 625.1, EPA 8270C	
Butylbenzyl phthalate		EPA 525.2, EPA 8270C	EPA 625.1
Di-n-butyl phthalate		EPA 525.2, EPA 8270C	EPA 625.1
Di-n-octyl phthalate		EPA 525.2, EPA 8270C	EPA 625.1
Diethyl phthalate		EPA 525.2, EPA 8270C	EPA 625.1
Dimethyl phthalate		EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1
Benzo(a)anthracene		EPA 525.2, EPA 8270C	EPA 625.1
Benzo(b)fluoranthene		EPA 525.2, EPA 8270C	EPA 625.1
Benzo(k)fluoranthene		EPA 525.2, EPA 8270C	EPA 625.1
Chrysene		EPA 525.2, EPA 8270C	EPA 625.1
Acenaphthylene		EPA 525.2, EPA 550.1, EPA 8270C	EPA 625.1
Anthracene		EPA 525.2, EPA 8270C	EPA 625.1
1,12-Benzoperylene	Benzo(G,H,I)Perylene	EPA 525.2, EPA 8270C	EPA 625.1
Fluorene		EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1
Phenanthrene		EPA 525.2, EPA 8270C	EPA 625.1
1,2,5,6-Dibenzanthracene	Dibenzo (A,H) Anthracene	EPA 525.2, EPA 8270C	EPA 625.1
Indeno(1,2,3-cd)pyrene	Ideno(1,2,3-CD)Pyrene	EPA 525.2, EPA 8270C	EPA 625.1
Pyrene		EPA 525.2, EPA 8270C	EPA 625.1

Source: USEPA, 2000. Remaining priority toxic pollutants that are not primary MCLs, sMCLs, or NLs.

a. 2-chloroethyl vinyl ether will be analyzed using an ELAP-certified method that is not in CLIP; results will be submitted to DDW as a PDF copy.

14.4.5 Recycled Water Policy CECs and Surrogates

The amended "Water Quality Control Policy for Recycled Water" (aka Recycled Water Policy) adopted by the SWRCB on December 11, 2018, in Resolution 2018-0057 (SWRCB, 2018) establishes CEC monitoring requirements for recycled water groundwater recharge projects. It also instructs all Regional Water Boards to not issue requirements for monitoring of additional CECs in recycled water beyond the requirements provided in the Recycled Water Policy, except when recommended by DDW or requested by the project sponsor. The Recycled Water Policy establishes goals for increasing recycled water use in California and sets forth annual reporting requirements for the volumes of wastewater collected, treated wastewater discharged, and recycled water distributed for a variety of uses, including groundwater recharge. Furthermore, the Recycled Water Policy describes coordination between agencies to support water recycling, including water rights issues associated with wastewater change petitions. The Policy establishes requirements for salt and nutrient management plans, which are used to support permits for recycled water projects and associated anti-degradation analyses that may provide technical information for possible amendment(s) to RWQCB Basin Plans.

The Recycled Water Policy specifies that monitoring be conducted for designated CEC monitoring parameters, which are comprised of the following four groups of constituents and parameters:

1. Health-based CECs
2. Performance indicator CECs
3. Surrogates
4. Bioanalytical screening tools

Table 14-15 summarizes the CEC and surrogate monitoring requirements for groundwater recharge via subsurface application (injection). The Recycled Water Policy groups constituents and assigns a relevance or indicator type to the CECs – either health or performance. The Recycled Water Policy also requires bioanalytical screening tools to be monitored for CECs. Prior to beginning CEC monitoring, the Recycled Water Policy requires that the project sponsor develop a Quality Assurance Project Plan (QAPP) for review and approval by the RWQCB.

Table 14-15. Recycled Water Policy Constituents of Emerging Concern and Surrogates for Groundwater Recharge Reuse via Subsurface Applications

Constituent		Constituent or Parameter
CECs to Be Monitored[a]		
Health-Based CECs	Performance Indicator CECs	Surrogates to Be Monitored[b]
1,4-Dioxane		EC
NDMA[c]	NDMA[c]	DOC
NMOR	Sucralose	UV Light Absorbance
PFOS	Sulfamethoxazole	
PFOA		

a. Performance indicator CECs are shown for the initial assessment monitoring phase and may be refined for subsequent monitoring phases. For subsurface application projects, recycled water and groundwater quality must be monitored. See below for a brief description of the initial assessment monitoring phase requirements. See Table 1 of the Recycled Water Policy for CEC RLs (SWRCB, 2018).

b. Other surrogates may be monitored pending approval by the RWQCB and DDW. Surrogates may be monitored by online or handheld devices that are properly calibrated. From Table 2 of the Recycled Water Policy (SWRCB, 2018).

c. NDMA is both a health-based and performance-indicator CEC.

The Recycled Water Policy also requires endpoint activity monitoring for two bioanalytical screening tools for CECs:

- ER-α (e.g., estradiol, bisphenol A, and nonylphenol)
- AhR (e.g., dioxin-like chemicals, polycyclic aromatic hydrocarbons, pesticides)

Table 3 of the Recycled Water Policy (SWRCB, 2018) provides the required RLs for CECs used as bioanalytical screening tools.

The PWS Project will comply with the SWRCB's amended Recycled Water Policy (SWRCB, 2018). The Recycled Water Policy provides for development of a CEC monitoring program for a recycled water groundwater recharge project by completing three phases:

1. Initial monitoring phase
2. Baseline monitoring phase
3. Standard operation phase

The Recycled Water Policy requires that an initial assessment monitoring phase be conducted to assess the occurrence of health-based CECs and bioanalytical screening in purified recycled water prior to injection. Monitoring for performance-indicator CECs is required prior to RO treatment and in the purified recycled water prior to injection. Surrogates for CECs will be monitored at the PWS Project AWPF to demonstrate treatment process performance at locations approved by the RWQCB, such as prior to and after RO treatment by taking same-day samples upstream and downstream of the RO process. With the exception of bioanalytical screening, the initial assessment monitoring must be conducted for one year and may begin after approval of the project's Quality Assurance Project Plan and Title 22 Engineering Report. The initial assessment monitoring for bioanalytical screening tools shall be conducted for three years. This initial phase requires quarterly monitoring of health-based CECs, performance-indicator CECs, and bioanalytical screening tools, plus monitoring of surrogates on a project-by-project basis as directed by the RWQCB. Purified recycled water quality monitoring must be conducted prior to injection.

Based on the findings of the initial assessment monitoring phase, the RWQCB, with input from DDW, will select project-specific performance-indicator CECs and surrogates for monitoring during the subsequent three-year baseline monitoring phase. The monitoring phase requirements are similar to those for the initial phase, except that the sampling frequency will be reduced to semi-annually. Health-based CECs will continue to be monitored, but only selected performance-indicator CECs and surrogates must be monitored to establish a project-specific baseline. Quarterly monitoring for bioanalytical screening tools must be conducted for one year during the baseline phase.

The findings of the baseline monitoring phase will be used to establish the standard operation monitoring program for the PWS Project. (All projects must conduct standard operation monitoring.) As above, the RWQCB with DDW will refine and select the project-specific requirements for monitoring health-based and performance-indicator CECs, surrogates, and bioanalytical screening tools in the standard operation monitoring program for the PWS Project. The Recycled Water Policy requires semi-annual monitoring for selected health-based CECs, selected performance-indicator CECs and surrogates for treatment process performance, and bioanalytical screening tools in the purified recycled water quality. Performance-indicator CECs will be monitored prior to RO treatment, and surrogates will be monitored at approved locations. Annual monitoring may be allowed with approval by the RWQCB and DDW.

During all monitoring phases, the results must be evaluated and reported. For performance-indicator CECs and surrogates, the percent removal of each constituent shall be calculated and reported. For health-based CECs and bioanalytical screening tools, the results shall be evaluated in terms of the calculated measured environmental concentrations (MECs) and MTLs and the MEC/MTL ratios as compared with the thresholds for response actions.

14.4.6 Non-Potable Recycled Water Monitoring

Disinfected tertiary recycled water monitoring requirements for the Santa Cruz NPR Project can be found in the City of Santa Cruz Non-Potable Reuse Engineering Report.

14.5 Groundwater Monitoring

Title 22 requires monitoring of groundwater quality prior to the start of a GRRP such as the PWS Project, termed herein as "background monitoring," and after the initiation of a GRRP, termed "operational monitoring." A summary of Title 22-required groundwater monitoring parameters and analyte groups is provided in **Table 14-16**. This table also indicates whether that parameter/analyte group will be for background or operational monitoring. The groundwater monitoring frequency at the monitoring wells is shown in **Table 14-2**. **Table 14-17**, **Table 14-18**, **Table 14-19**, **Table 14-20** and **Table 14-21** at the end of **Section 14.5** provide detailed summaries of individual constituents within each analyte group (primary MCLs, sMCLs, priority toxic chemicals, constituents with NLs, and additional DDW requested parameters), and their analytical methods, lab RLs (LRLs), detection limit for reporting (DLRs), and MCLs.

Table 14-16. Summary of Constituents in Groundwater Monitoring Program

Constituents	Operational Monitoring	Background Monitoring
Total nitrogen (60320.210 and 60320.226)	√	√
Inorganic chemicals in Table 64431-A (60320.212)		√
Radionuclide chemicals in Table 64442 and 64443 (60320.212)		√
Organic chemicals in Table 64444-A (60320.212)		√
DBPs in Table 64533-A (60320.212)		√
Lead and copper (60320.212)		√
Chemicals/Parameters with sMCLs in Table 64449-A and B (60320.212)	√	√
TOC (60320.218)		√
Priority toxic pollutants in 40 CFR section 131.38 (60320.220)		√
Chemicals with NLs (60320.200c and 60320.220b		√
Nitrate (60320.226)	√	√
Nitrite (60320.226)	√	√
DDW and RWQCB-specified chemicals per 60320.226b and 60320.220a	√	√
Bromide and iodide (specified by DDW)	√	√
Field ORP and pH (requested by DDW)	√	√

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Tables 64431-A, 64432-A[a], Inorganic Contaminants							
Aluminum		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 D, SM 3113 B, SM 3120 B		20	50	1
Antimony	Antimony, Total	µg/L	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B		1.0	6	0.006
Arsenic		µg/L	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B, SM 3114 B		1.0	2	0.01
Asbestos		MFL	EPA 100.1, EPA 100.2		0.2	0.2	7 MFL[c]
Barium		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, SM 3111 D, SM 3113 B, SM 3120 B		2.0	100	1
Beryllium	Beryllium, Total	µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B, SM 3120 B		1.0	1	0.004
Cadmium		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B		0.50	1	0.005
Total Chromium	Chromium	µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B, SM 3120 B		1.0	1	0.05
Cyanide		mg/L	EPA 335.4, EPA Kelada 01, OIA 1677, QC 10-204-00-1-X, SM 4500-CN-E-99, SM 4500-CN-F-99		0.025	0.1	0.15
Fluoride		mg/L	EPA 300.0, EPA 300.1, SM 4110 B-00, SM 4500-F-B-97, SM 4500-F-C-97, SM 4500-F-E-97		0.050	0.1	2
Mercury		µg/L	EPA 200.8, EPA 245.1, EPA 245.2, SM 3112 B		0.20	1	0.002
Nickel		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3113 B		5.0	10	0.1
Nitrate		mg/L	CALC, EPA 300.0, EPA 300.0-r2.1, EPA 300.1, EPA 353.2, HACH 10206, SM 4110 B-00		0.88	2	10 as N
Nitrate + Nitrite (sum as nitrogen)	Nitrate-Nitrite	mg/L	CALC, EPA 300.0, EPA 300.1, EPA 353.2, SM 4500-NO3-E-00		0.10	0.4	10
Nitrite (as nitrogen)	Nitrite	mg/L	EPA 300.0, EPA 300.1, EPA 353.2, SM 4110 B-00, SM 4500-NO2-B-00,		0.050	0.4	1

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
			SM 4500-NO3-E-00, SM 4500-NO3-F-00				
Perchlorate		µg/L	EPA 314.0, EPA 314.1, EPA 314.2, EPA 331.0, EPA 332.0		0.5 - 2	4	0.006
Selenium		µg/L	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B, SM 3114 B		5.0	5	0.05
Thallium	Thallium, Total	µg/L	EPA 200.8, EPA 200.9		1.0	1	0.002
Table 64442[a], Radionuclide Chemicals							
Combined radium-226 and -228		pCi/L	CALC, EPA Ra-04, SM 7500-RA	GA Institute of Technology	--	--	5 pCi/L
Radium-226		pCi/L	ASTM D2460-97, DHS RA-03, DHS RA-04, DHS RA-05, EPA 903.0, EPA 903.1, GA		0.48	1	--
Radium-228		pCi/L	EPA 904.0, EPA RA-05, GA, P24 EPA 600/4-75-008, SM 7500-RA D-01, USGS R-1142-76		0.66	1	--
Gross alpha particle activity (excluding rPFBS and uranium)		pCi/L	EPA 00-01, EPA 00-02, EPA 900.0, P1 EPA 600/4-75-008, SM 7110 B, SM 7110 C, USGS R-1120-76		3	3	15 pCi/L
Uranium	Combined Uranium	pCi/L	ASTM D2907-97, ASTM D3972-97, ASTM D5174-97, ASTM D5673-03, DHS U-02, DHS U-04, EPA 00-07	EPA 200.8	0.001	1	20 pCi/L
Table 64443[a], Radionuclide Chemicals							
Beta/photon emitters	Gross Beta Particle Activity	millirem/ year	EPA 00-01, EPA 900.0, P1 EPA 600/4-75-008, SM 7110 B, USGS R-1120-76		3	4	4 millirem/yr (annual dose equivalent to the total body or any internal organ)
Strontium-90	38-Strontium-90	pCi/L	EPA 905.0, SM 7500-SR B		2	2	8 pCi/L (= 4 millirem/yr dose to bone marrow)
Tritium		pCi/L	ASTM D4107-91, EPA 906, EPA H-02, P34 EPA 600/4-75-008, SM 7500-3H B, USGS R-1171-76		347	1	20,000 pCi/L (= 4 millirem/yr dose to total body)

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Tables 64444-A, 64445.1-A[a], Organic Chemicals							
Benzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.001
Carbon tetrachloride		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	0.5	0.0005
1,2-Dichlorobenzene[c]	O-Dichlorobenzene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1	0.50	0.5	0.6
1,4-Dichlorobenzene[c]	P-Dichlorobenzene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1	0.50	0.5	0.005
1,1-Dichloroethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.005
1,2-Dichloroethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.0005
1,1-Dichloroethylene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.006
cis-1,2-Dichloroethylene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.006
trans-1,2-Dichloroethylene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.01
Dichloromethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.005
1,2-Dichloropropane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.005
1,3-Dichloropropene		µg/L	EPA 524.2, EPA 524.3, EPA 524.4, EPA 502.2		0.50	0.5	0.0005
Ethylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.3
MTBE		µg/L	EPA 524.2, EPA 524.3, EPA 524.4		0.50	3	0.013
Monochlorobenzene	Chlorobenzene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.07
Styrene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.1
1,1,2,2-Tetrachloroethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.001

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Tetrachloroethylene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	0.5	0.005
Toluene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.15
1,2,4-Trichlorobenzene[c]		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 625.1	0.50	0.5	0.005
1,1,1-Trichloroethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	0.5	0.2
1,1,2-Trichloroethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	0.5	0.005
Trichloroethylene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	0.5	0.005
Trichlorofluoromethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	5	0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane	Trichlorofluoromethane	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	10	1.2
Vinyl Chloride		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.30	0.5	0.0005
Xylenes	Xylenes, Total	µg/L	EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	1.750[b]
Tables 64444-A, 64445.1-A[a, b], Organic Chemicals							
Alachlor	LASSO	µg/L	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1		0.10	1	0.002
Atrazine		µg/L	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1		0.05	0.5	0.001
Bentazon		µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555		0.50	2	0.018
Benzo(a)pyrene		µg/L	EPA 525.2, EPA 525.3, EPA 550, EPA 550.1, EPA 8270C		0.02	0.1	0.0002
Carbofuran		µg/L	EPA 531.1, EPA 531.2, EPA 8270C, SM 6610 B,		0.50	5	0.018
Chlordane		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 8270C		0.10	0.1	0.0001
2,4-D		µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555		0.10	10	0.07

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Dalapon		µg/L	EPA 515.1, EPA 515.3, EPA 515.4, EPA 552.1, EPA 552.2, EPA 552.3, EPA 557		1.0	10	0.2
Dibromochloropropane	1,2-Dibromo-3-Chloropropane	µg/L	EPA 504.1, EPA 524.3, EPA 551.1, EPA 8270C		0.01	0.01	0.0002
Di(2-ethylhexyl)adipate		µg/L	EPA 506, EPA 525.2, EPA 525.3		0.60	5	0.4
Di(2-ethylhexyl)phthalate		µg/L	EPA 506, EPA 525.2, EPA 525.3, EPA 8270C		0.60	3	0.004
Dinose[b]		µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555, EPA 8270C		0.20	2	0.007
Diquat		µg/L	EPA 549.2		0.40	4	0.02
Endothall		µg/L	EPA 548.1		7.5	45	0.1
Endrin		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.20	0.1	0.002
Ethylene dibromide		µg/L	EPA 504.1, EPA 524.3, EPA 551.1		0.01	0.02	0.00005
Glyphosate		µg/L	EPA 547, SM 6651 B		6.0	25	0.7
Heptachlor		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.01 (0.04)	0.01	0.00001
Heptachlor epoxide		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.01 (0.05)	0.01	0.00001
Hexachlorobenzene		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.05	0.5	1
Hexachlorocyclopentadiene		µg/L	EPA 505, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	EPA 525.1	0.05	1	0.05
Lindane	BHC-GAMMA	µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C	EPA 525.1	0.01 (0.04)	0.2	0.0002
Methoxychlor		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.05 (0.1)	10	0.03
Molinate		µg/L	EPA 507, EPA 525.2, EPA 525.3		0.10	2	0.02

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Oxamyl		µg/L	EPA 531.1, EPA 531.2, SM 6610 B		0.50	20	0.05
Pentachlorophenol		µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 525.2, EPA 525.3, EPA 555		0.04	0.2	0.001
Picloram		µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555		0.10	1	0.5
PCBs	Total PCB	µg/L	EPA 505, EPA 508, EPA 508.1, EPA 508A, EPA 525.2, EPA 525.3		0.10	0.5	0.0005
Simazine		µg/L	EPA 505, EPA 507, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1		0.05	1	0.004
Thiobencarb	Thiobencarb (Bolero)	µg/L	EPA 525.2, EPA 525.3		0.20	1	0.001
Toxaphene		µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 8270C		0.50	1	0.003
TCP	1,2,3-Trichloropropane	µg/L	SRL 524M-TCP	EPA 524.2	0.50	0.005	0.000005
2,3,7,8-TCDD (Dioxin)	2,3,7,8-TCDD	pg/L	EPA 1613	EPA 1613B	5	5	0.00000003
2,4,5-TP (Silvex)	2,4,5-TP	µg/L	EPA 515.1, EPA 515.2, EPA 515.3, EPA 515.4, EPA 555		0.20	1	0.05
Table 64443[a], DBPs							
Total trihalomethanes (TTHM)	Tthm	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	--	0.080
HAA5	Total HAA5	µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		2.0	--	0.060
Monochloroacetic Acid		µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		2.0	2.0	--
Dichloroacetic Acid		µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		1.0	1.0	--
Trichloroacetic Acid		µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		1.0	1.0	--
Monobromoacetic Acid		µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		1.0	1.0	--
Dibromoacetic Acid		µg/L	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251 B		1.0	1.0	--
Bromate		µg/L	EPA 300.1, EPA 302, EPA 317, EPA 321.8, EPA 326.0, EPA 557		1.0	1.0	0.010

Table 14-17. Primary Maximum Contaminant Levels (MCLs)							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**MCL (mg/L)**
Chlorite		mg/L	EPA 300.0, EPA 300.1, EPA 317, EPA 326.0, EPA 327, SM 4500-CLO2 E-00		0.010	0.020	1.0
Table 64678-A[a], Lead and Copper Rule (AL)							
Lead		µg/L	EPA 200.5, EPA 200.8, EPA 200.9, SM 3113 B		0.50	5.0	0.015
Copper	Copper, Free	µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		2.0	50	1.3

a. MCLs and DLRs compiled from the Title 17 and 22 CCR. PHGs compiled from the Office of Environmental Health Hazard Assessment (OEHHA) website.

b. MCL is for either a single isomer or the sum of the isomers.

c. Analyzed using two different analytical methods in 4th Quarter 2022 background event; Non-CLIP analytical method results to be included in PDF copy of lab report submitted to DDW.

Table 14-18. sMCLs							
Constituents	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**Regulatory Limits (mg/L)**
Table 64449-A[a], Secondary MCL							
Aluminum		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 D, SM 3113 B, SM 3120 B		20	50	0.2
Color		Units	SM 2120 B		3	--	15 units
Copper	Copper, Free	µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		2.0	50	1.0
Foaming agents (MBAS)	Foaming Agents (Surfactants)	mg/L	SM 5540 C-00		0.10	--	0.5
Iron		mg/L	EPA 200.5, EPA 200.7, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		0.020	0.1	0.3
Manganese		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		2.0	20	0.05
MTBE	Methyl Tert-Butyl Ether	µg/L	EPA 524.2, EPA 524.3, EPA 524.4		0.5	3	0.005
Odor -Threshold	Odor	TON	EPA 140.1, SM 2150 B		1.0	1	3 units
Silver		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		0.50	10	0.1
Thiobencarb	Thiobencarb (Bolero)	µg/L	EPA 525.2, EPA 525.3		0.2	1	0.001
Turbidity		Units	EPA 180.1, SM 2130 B-01		0.10	0.1	5
Zinc		µg/L	EPA 200.5, EPA 200.7, EPA 200.8, SM 3111 B, SM 3120 B		20	50	5.0

Table 14-18. sMCLs									
Constituents	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**Regulatory Limits (mg/L)**		
Table 64449-B[a], Secondary Maximum Contaminant Level Ranges									
Constituents							Recommended	Upper	Short-term
TDS		mg/L	SM 2540C	EPA 160.1	10	--	500	1,000	1,500
Specific conductance	Conductivity at 25 C Umhos/Cm	µS/cm	SM 2510B		2.0	--	900	1,600	2,200
Chloride		mg/L	EPA 300.0, EPA 300.1, SM 4110 B-00, SM 4500-CL-B-97, SM 4500-CL-D-97		0.50	--	250	500	600
Sulfate		mg/L	EPA 300.0, EPA 300.0-r2.1, EPA 300.1, EPA 375.2, SM 4110 B-00, SM 4500-SO42-C-97, SM 4500-SO42-E-97		0.50	0.5	250	500	600

a. MCLs and DLRs compiled from the Title 17 and Title 22 CCR. PHGs compiled from the Office of Environmental Health Hazard Assessment (OEHHA) website.

Table 14-19. Priority Toxic Chemicals Not Previously Listed [a,b]						
Constituent	**CLIP Constituent Name (if different)**	**Units**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**
Acrolein[c]		µg/L	EPA 524.2	EPA 624, EPA 624.1	5	--
Acrylonitrile[c]		µg/L	EPA 524.2	EPA 624, EPA 624.1	2	--
Bromoform		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	1.0
Chlorobenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	--
Bromodichloromethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0. 50	1.0
Chloroform		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	1.0
Dibromochloromethane		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 551.1		0.50	1.0
Chromium III		µg/L	CALC	EPA 200.8	1.0	10
Chromium VI	Chromium, Hex	µg/L	EPA 218.6, EPA 218.7		0.02	1
Chloroethane		µg/L	EPA 524.2		0.50	0. 5
2-Chloroethyl vinyl Ether[d]		µg/L	EPA 524.2, EPA 525.3,	EPA 624.1 and 625	0.50	--
1,3-Dichloropropylene	1,3-Dichloropropene	µg/L	EPA 524.2, EPA 524.3, EPA 524.4, EPA 502.2		0.50	0.5
Methyl bromide	Bromochloromethane	µg/L	EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5
Methyl chloride	Chloromethane	µg/L	EPA 524.2, EPA 524.3		0. 05	0.5
Methylene Chloride	Dichloromethane	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5
1,2-Trans-Dichloroethylene	Trans-1,2-Dichloroethylene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5
2-Chlorophenol		µg/L	EPA 625.1, EPA 8270C		0.49	5
2,4-Dichlorophenol		µg/L	EPA 625.1, EPA 8270C		0.49	5
2,4-Dimethylphenol		µg/L	EPA 625.1, EPA 8270C		0.97	5
2-Methyl-4,6-Dinitrophenol		µg/L	EPA 625.1, EPA 8270C		4.9	5
2,4-Dinitrophenol		µg/L	EPA 625.1, EPA 8270C		4.9	5
2-Nitrophenol		µg/L	EPA 625.1, EPA 8270C		0.49	5
4-Nitrophenol[c]		µg/L	EPA 515.1, EPA 515.3, EPA 8270C	EPA 625.1	9.7	5

Table 14-19. Priority Toxic Chemicals Not Previously Listed [a,b]						
Constituent	**CLIP Constituent Name (if different)**	**Units**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**
3-Methyl-4-Chlorophenol	P-Chloro-M-Cresol	µg/L	EPA 625.1, EPA 8270C		0.49	5
Phenol	Phenols	µg/L	EPA 625.1		0.49	5
2,4,6-Trichlorophenol[c]		µg/L	EPA 8270C, SM 6251 B	EPA 625.1	0.49	5
Acenaphthene[c]		µg/L	EPA 550.1, EPA 8270C	EPA 525.2, EPA 625.1	0.1	5
Acenaphthylene[c]		µg/L	EPA 525.2, EPA 550.1, EPA 8270C	EPA 625.1	0.1	5
Anthracene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.1	5
Benzidine		µg/L	EPA 625.1, EPA 8270C		4.9	5
Benzo(a)Anthracene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.1	10
Benzo(b)Fluoranthene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.1	10
Benzo(ghi)Perylene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.05	10
Benzo(k)Fluoranthene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.02	10
Bis(2-Chloroethoxy)Methane		µg/L	EPA 625.1, EPA 8270C		0.49	5
Bis(2-Chloroethyl)Ether[c]		µg/L	EPA 524.2, EPA 8270C	EPA 625.1	0.49	--
Bis(2-Chloroisopropyl)Ether		µg/L	EPA 625.1, EPA 8270C		0.49	5
Bis(2-Ethylhexyl)Phthalate	Di(2-Ethylhexyl) Phthalate	µg/L	EPA 506, EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1	4.9	--
4-Bromophenyl Phenyl Ether		µg/L	EPA 625.1, EPA 8270C		4.9	5
Butylbenzyl Phthalate[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.5	--
2-Chloronaphthalene		µg/L	EPA 625.1, EPA 8270C		4.9	5
4-Chlorophenyl Phenyl Ether		µg/L	EPA 625.1, EPA 8270C		4.9	5
Chrysene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.02	5
Dibenzo(a,h)Anthracene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.05	5
1,3-Dichlorobenzene	M-Dichlorobenzene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 625.1, EPA 8270C		0.5	--
3,3′-Dichlorobenzidine	3,3-Dichlorobenzidine	µg/L	EPA 625.1, EPA 8270C		4.9	20
Diethyl Phthalate[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.5	5
Dimethyl Phthalate[c]		µg/L	EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1	0.49	5

Table 14-19. Priority Toxic Chemicals Not Previously Listed [a,b]						
Constituent	**CLIP Constituent Name (if different)**	**Units**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**
Di-n-Butyl Phthalate[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	1	5
2,4-Dinitrotoluene[c]		µg/L	EPA 525.2, EPA 525.3, EPA 529, EPA 8270C	EPA 625.1	0.1	5
2,6-Dinitrotoluene[c]		µg/L	EPA 525.2, EPA 525.3, EPA 529, EPA 8270C	EPA 625.1	0.5	5
Di-n-Octyl Phthalate[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	4.9	5
1,2-Diphenylhydrazine		µg/L	EPA 625.1, EPA 8270C		0.49	--
Fluoranthene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0. 1	5
Fluorene[c]		µg/L	EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1	0.05	5
Hexachlorobutadiene		µg/L	EPA 524.2, EPA 524.3, EPA 8270C		0. 5	0. 5
Hexachloroethane[c]		µg/L	EPA 524.2, EPA 8270C	EPA 625.1	0.97	5
Indeno(1,2,3-cd) Pyrene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.05	10
Isophorone[c]		µg/L	EPA 525.2, EPA 525.3, EPA 8270C	EPA 625.1	0. 5	10
Naphthalene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 525.2, EPA 625.1	0. 5	0. 5
Nitrobenzene[c]		µg/L	EPA 524.2, EPA 529, EPA 8270C	EPA 625.1	0.97	--
NDMA	N-Nitrosodimethylamine	µg/L	EPA 521, EPA 8270C	EPA 625	0.49	--
NDPA	N-Nitrosodi-N-Propylamine	µg/L	EPA 521, EPA 8270C	EPA 625	4.9	--
N-Nitrosodiphenylamine		µg/L	EPA 625.1, EPA 8270C		0.49	--
Phenanthrene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.04	5
Pyrene[c]		µg/L	EPA 525.2, EPA 8270C	EPA 625.1	0.05	5
Aldrin		µg/L	EPA 505, EPA 508, EPA 525.2, EPA 525.3, EPA 8270C		0.01 (0.05)	0.075
alpha-BHC[c]	ALPHA.-BHC	µg/L	EPA 508, EPA 8270C	EPA 505, EPA 525.2	0.1	0.01
beta-BHC[c]	BETA.-BHC	µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A	0.1	0.05
Gamma-BHC	BHC-GAMMA	µg/L	EPA 505, EPA 508, EPA 508.1, EPA 525.2, EPA 525.3, EPA 551.1, EPA 8270C		0.02	0.2
delta-BHC[c]	.DELTA.-BHC	µg/L	EPA 508, EPA 525.2, EPA 525.3, EPA 8270C	EPA 505, EPA 8081A	0.1	0.05
4,4′-DDT[c]	PARA-PARA DDT	µg/L	EPA 508, EPA 525.2, EPA 525.3, EPA 8270C	EPA 505, EPA 8081A	0.1	0.02

Table 14-19. Priority Toxic Chemicals Not Previously Listed [a,b]						
Constituent	**CLIP Constituent Name (if different)**	**Units**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**
4,4′-DDE[c]	PARA-PARA DDE	µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A	0.1	0.01
4,4′-DDD[c]	PARA-PARA DDD	µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505	0.1	0.02
Dieldrin		µg/L	EPA 505, EPA 525.2, EPA 525.3, EPA 8270C		0.01 (0.2)	0.02
alpha-Endosulfan[c]	Endosulfan I	µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505	0.1	0.01
beta-Endosulfan[c]	Endosulfan II	µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505	0.1	0.01
Endosulfan Sulfate[c]		µg/L	EPA 508, EPA 525.2, EPA 8270C	EPA 505, EPA 8081A	0.1	0.05
Endrin Aldehyde		µg/L	EPA 505, EPA 508, EPA 525.2, EPA 8270C	EPA 8081A	0.5	0.05

a. Priority Toxic Pollutants (chemicals listed in 40 CFR section 131.38).
b. Compare the results of the priority toxic pollutants monitoring with the criteria for human health for consumption of water and organisms (listed in 40 CFR section 131.38).
c. Non-CLIP analytical method used in 4th Quarter 2022 background event; PDF copy of lab report to be submitted to DDW.
d. 2-chloroethyl vinyl ether will be analyzed using an ELAP-certified method that is not in CLIP; results to be submitted to DDW as a PDF copy.

Table 14-20. Constituents with NLs							
Constituent	**CLIP Constituent Name (if different)**	**Units for LRL and DLR**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL**	**DLR**	**NL (mg/L)**
Boron	Boron, Total	mg/L	EPA 200.7, EPA 200.8		0.050	0.1	1
n-Butylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.26
sec-Butylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.26
tert-Butylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.26
Carbon disulfide		µg/L	EPA 524.2, EPA 524.3, EPA 524.4	EPA 624.1	0.50	0.5	0.16
Chlorate		µg/L	EPA 300.0, EPA 300.1		10	20	0.8
2-Chlorotoluene	Chlorotoluene	µg/L	EPA 524.2		0.50	0.5	0.14
4-Chlorotoluene	P-Chlorotoluene	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4,		0.50	0.5	0.14
Diazinon	Spectracide	µg/L	EPA 525.3	EPA 525.2	0.10	--	0.0012
Dichlorodifluoromethane (Freon 12)	Dichlorodifluoromethane	µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	1
1,4-Dioxane[a]		µg/L	EPA 522	SW 8260B	0.07 -1	1	0.001
Ethylene Glycol[a]		mg/L	EPA 8015B	MAI-Alcohols	5	--	14
Formaldehyde[a]		µg/L	EPA 556	SW 8315A	5	--	0.1
HMX	HMX	µg/L	EPA 8330A	EPA 8330	0.21	--	0.35
Isopropylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.77
Manganese		mg/L	EPA 200.5, EPA 200.7, EPA 200.8, EPA 200.9, SM 3111 B, SM 3113 B, SM 3120 B		0.02	0.002	0.5
MIBK	4-Methyl-2-Pentanone	µg/L	EPA 524.2, EPA 524.3		5.0	5	0.12
NDEA	NDEA	µg/L	EPA 521, EPA 8270C		0.0022	--	0.00001
NDMA	N-Nitrosodimethylamine	µg/L	EPA 521, EPA 8270C	EPA 625	0.0022	--	0.00001
NDPA	N-Nitrosodi-N-Propylamine	µg/L	EPA 521, EPA 8270C	EPA 625	0.0022	--	0.00001
Naphthalene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4, EPA 8270C	EPA 525.2, EPA 625.1	0.5	--	0.017
PFBS	PFBS	ug/L	EPA 533, 537.1		0.002	--	0.0005
PFHxS	PFHXS	ug/L	EPA 533, 537.1		0.002	--	0.000003
PFOA	PFOA	µg/L	EPA 533, 537.1		0.002	--	0.0000051

Table 14-20. Constituents with NLs

Constituent	CLIP Constituent Name (if different)	Units for LRL and DLR	CLIP Analytical Methods	Non-CLIP Analytical Methods	LRL	DLR	NL (mg/L)
PFOS	PFOS	µg/L	EPA 533, 537.1		0.002	--	0.0000065
Propachlor		µg/L	EPA 508, EPA 508.1, EPA 525.3	EPA 525.2	0.05	0.5	0.09
n-Propylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.26
RDX		µg/L	EPA 529, EPA 8330A	EPA 8330	0.21	--	0.0003
TBA	TBA	µg/L	EPA 524.2, EPA 524.3, EPA 524.4	EPA 524.2 SIM	2	2	0.012
1,2,4-Trimethylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.33
1,3,5-Trimethylbenzene		µg/L	EPA 502.2, EPA 524.2, EPA 524.3, EPA 524.4		0.50	0.5	0.33
TNT	2,4,6- TNT	µg/L	EPA 529, EPA 8330A	EPA 8330	0.11	--	0.001
Vanadium	Vanadium, Total	µg/L	EPA 200.8, EPA 200.9		3	3	0.05

a Non-CLIP analytical method used in 4th Quarter 2022 background event; PDF copy of lab report to be submitted to DDW

Table 14-21. Additional Parameters					
Constituent	**CLIP Constituent Name (if different)**	**Units**	**CLIP Analytical Methods**	**Non-CLIP Analytical Methods**	**LRL (MRL)**
Bromide		µg/L	EPA 300.0, EPA 300.1, EPA 317, EPA 326.0		5
Iodide		µg/L	EPA 300.0, EPA 300.1	LC/MS/MS	1
Alkalinity (Total)	Alkalinity, Carbonate	mg/L as $CaCO_3$	SM 2320 B		2.0
Carbonate Alkalinity	Alkalinity, Bicarbonate	mg/L as $CaCO_3$	SM 2320 B	SM 2330 B	2.0
Bicarbonate Alkalinity	Hydroxide As Calcium Carbonate	mg/L as HCO_3	SM 2320 B		2
Hydroxide Alkalinity	Alkalinity, Carbonate	mg/L as OH	SM 2320 B	SM 2330 B	2
Calcium		mg/L	EPA 200.5, EPA 200.7, SM 3111 B, SM 3120 B-99, SM 3500-CA B-97		1.0
Magnesium		mg/L	EPA 200.5, EPA 200.7, SM 3111 B, SM 3120 B-99, SM 3500-MG B-97		0.10
Sodium		mg/L	EPA 200.5, EPA 200.7, SM 3111 B		1.0
pH		Std. Units	EPA 150.1, EPA 150.2, SM 4500-H+B		0.10
Oxidation-Reduction Potential (flow cell)		mV	--		
Total Hardness	Hardness, Total (As $CACO_3$)	mg/L as $CaCO_3$	EPA 200.7, SM 2340 B, SM 2340 C, SM 3120 B-99		3.0
Water Temperature		Celsius	--		
Piezometric Water Level		feet	--		0.1

14.5.1 Background Monitoring

According to Title 22 Section 60320.200 (c), four quarters of background water quality data are required to characterize the water quality in each aquifer that will be receiving recycled water. The sampling for background groundwater quality can be performed in either existing wells or new monitoring wells, as long as the samples are representative of the water in the aquifers under the influence of the PWS Project. A comparison between the existing wells and the monitoring wells installed for the PWS Project recommended that the new PWS operational monitoring wells be used for background groundwater quality sampling (BC, 2021a).

Operational monitoring wells within the SWIP well area will be sufficient to characterize background water quality and water level conditions in the Purisima A and BC units. The new PWS Project operational monitoring wells recommended for background monitoring are listed in **Table 14-22** and highlighted (blue circles) in **Figure 14-2.**

Table 14-22. Proposed Monitoring Wells for Background and Operational Monitoring

Background and Operational Monitoring Well	Description	Purisima Aquifer Unit	Notes
MM-1	Monterey monitoring well	A	Located approximately 160 ft from the Monterey SWIP well within the Purisima A unit[a]
MM-2	Monterey monitoring well	A	Located approximately 460 ft from the Monterey SWIP well within the Purisima A unit
WM-1	Willowbrook monitoring well	A	Located approximately 230 ft from the Willowbrook SWIP well within the Purisima A unit
WM-2	Willowbrook monitoring well	A	Located approximately 1,040 ft from the Willowbrook SWIP well within the Purisima A unit
TLM-1A	TLC monitoring well	A	Located approximately 200 ft from the TLC SWIP well within the Purisima A unit
TLM-2A	TLC monitoring well	A	Located approximately 950 ft from the TLC SWIP well within the Purisima A unit
TLM-3BC	TLC monitoring well	BC	Located approximately 160 ft from the TLC SWIP well within the Purisima BC unit
TLM-4BC	TLC monitoring well	BC	Located approximately 580 ft from the TLC SWIP well within the Purisima BC unit

a. *Revised from **Appendix E** based on well construction plans.*

Beginning in the 4th quarter of 2022, these eight wells at the three locations shown in the figure will be sampled for four quarters prior to GRRP operations to establish background groundwater quality conditions. Subsequent sampling rounds are planned for 1st quarter of 2023, 2nd quarter of 2023, and 3rd quarter of 2024 to characterize seasonality variability and establish current conditions when GRRP operations commence. This may be revised based on the commencement date for GRRP operations. These same eight wells will be used for operational groundwater monitoring as discussed in **Section 14.5.2**.

For the first sampling event in 4th quarter of 2022, a number of constituents were analyzed using non-CLIP methods as noted on **Table 14-17**, **Table 14-19**, and **Table 14-20**. PDF copies of laboratory reports for these analytes will be submitted to DDW.

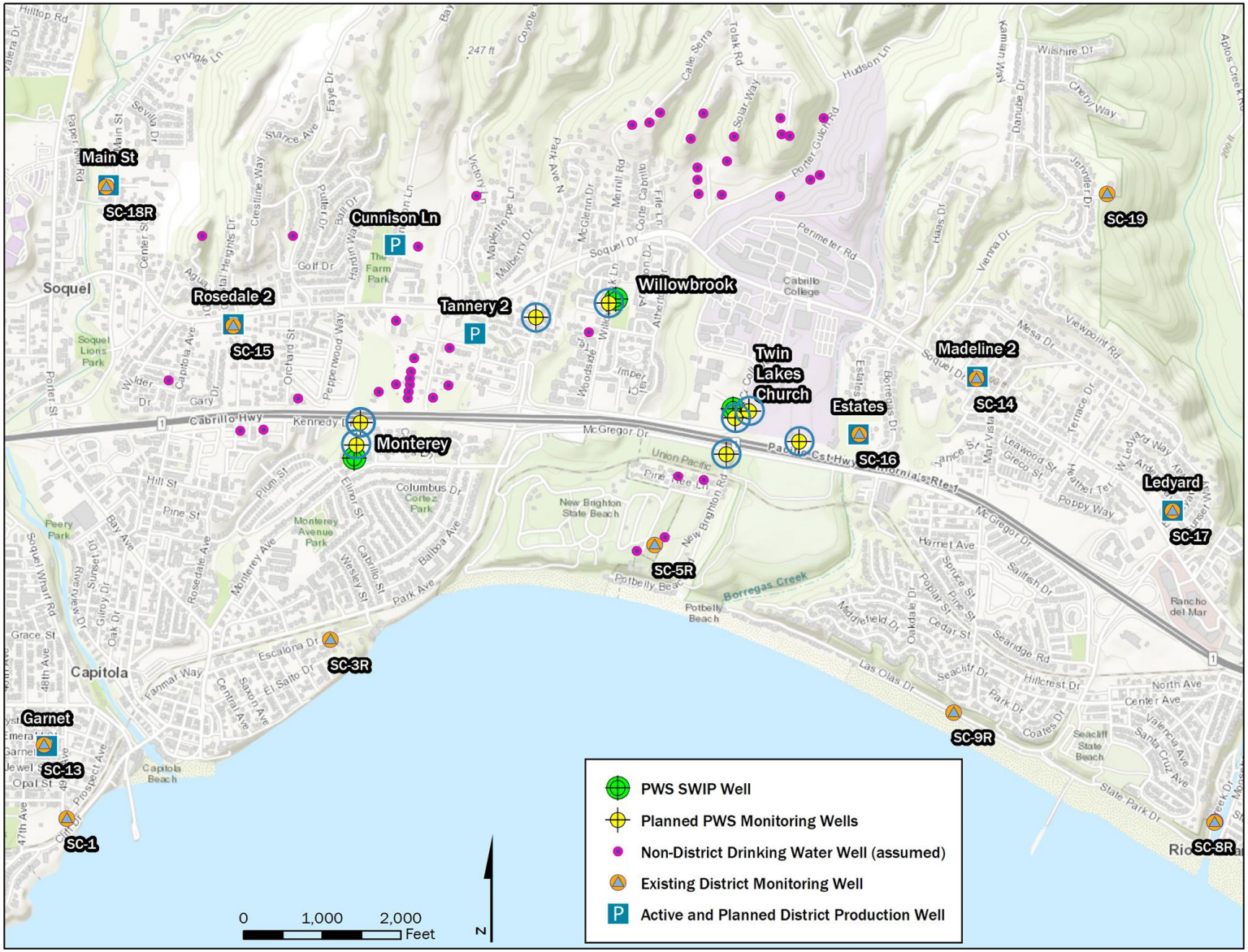

Figure 14-2. Proposed background (blue circle) monitoring wells

14.5.2 Operational Monitoring

Title 22 (Section 60320.224, .226) requires a project sponsor to site and construct at least two monitoring wells downgradient of the GRRP such that:

1. At least one monitoring well is located:
   a. No less than two weeks but no more than six months of travel time from the GRRP, and
   b. At least 30 days upgradient of the nearest drinking water well.
2. In addition to the well(s) in paragraph (1), at least one monitoring well is located between the recharge well and the nearest downgradient drinking water well.
3. One of the monitoring wells should also provide a RRT of no less than 2 months.
4. Two samples must be taken from each of the monitoring wells within 1 year of travel time prior to GRRP operation.

Eight new monitoring wells are proposed to meet Title 22 requirements prior to and during GRRP operations – two monitoring wells for the Monterey SWIP well, two for the Willowbrook SWIP well, and four for the TLC SWIP well. Described earlier in **Section 14.5.1**, **Table 14-22,** and **Figure 14-2**, these eight monitoring wells will be used for both background and operational monitoring.

The SqCWD conducted a monitoring well network analysis (BC, 2019a) to identify private drinking water wells within the PWS Project area that may be under the influence of the PWS Project. The wells identified in the monitoring well network analysis are shown in the figures below as magenta circles and labelled as "Non-District Drinking Water Well (assumed)". As noted in the figure legends, these wells are all conservatively assumed to be used for potable purposes. Also, unless specifically known, all private wells are conservatively assumed to produce from the same aquifer units as the PWS Project; Purisima A and/or BC.

The proposed operational monitoring well locations and monitored aquifer units were selected to satisfy the Title 22 criteria based on refined particle tracking from the modeling described in **Section 11** for travel times from the SWIP wells of less than 36 months. For monitoring wells that are outside of the 36-month particle track contours, the travel times were estimated using the analytical equations described in **Section 11**. Travel times estimated using the analytical equations based on range of recharge rates as presented in **Section 11** are also considered. A tracer study is also required to demonstrate adequate retention time underground after operation begins and is addressed in **Section 14.7**.

The operational monitoring wells will be sampled quarterly, in compliance with applicable sections of Title 22 GRRP regulations.

14.5.2.1 Monterey SWIP Well Monitoring Wells

The Monterey SWIP well will recharge purified recycled water into the Purisima A unit. At this location, the top of the A unit is approximately 230 ft below ground surface and is approximately 250 ft thick. As shown in **Figure 14-3**, there are several private wells near the Monterey SWIP well, with the closest well approximately 895 ft to the northeast at 2603 Monterey Ave on APN 037-191-12. Based on particle tracking and the maximum potential recharge rate of 500 afy, this well is approximately 33 months underground retention time from the Monterey SWIP well. The estimated underground retention time using analytical equations is 39 months for minimum recharge rate of 200 afy.



Figure 14-3. Monterey SWIP well travel time contours and potential monitoring well locations

According to the State's well completion report database (WCR no. 520061), this private well was constructed in 1998 as a domestic supply well. The well is intermittently screened between the depths of 100 to 360 ft, indicating it produces from the Purisima A and overlying B units. Note that at this location, the Purisima BC unit is unsaturated, and therefore would not be produced from any private wells in this area.

The closest municipal supply wells to the Monterey Well are the SqCWD's Rosedale Well and Tannery 2 Well. Both are located approximately 2,200 ft from the Monterey SWIP well and beyond the modeled 36-month travel time of the PWS recharge water.

Two monitoring wells have been installed to monitor groundwater between the Monterey SWIP well and the nearest private well (2603 Monterey Avenue), MM-1 and MM-2, both of which will monitor the Purisima A unit only. MM-1 is located approximately 1.1-1.6 months travel time from the SWIP well and is approximately 32-37 months upgradient of the nearest drinking water well. MM-2 is located approximately 9-12 months travel time from the SWIP well and is approximately 24-27 months upgradient of the nearest drinking water well. As described in **Section 11**, the range of travel times is assessed using refined particle tracking and analytical equations for a range of recharge rates (200-500 afy) at the Monterey SWIP well. The estimated range of travel times meet monitoring well requirements. MM-1 has the shortest travel time to any monitoring well when comparing its travel times of 1.1-1.6 months to ranges estimated at all operational monitoring wells (see below). **Section 12** describes the use of the range of travel times to MM-1 to calculate RRT.

14.5.2.2 Willowbrook SWIP Well Monitoring Wells

The Willowbrook SWIP well will recharge purified recycled water into the Purisima A unit. At this location, the top of the A unit is approximately 460 ft below ground surface and 255 ft thick. As shown in **Figure 14-4**, there is one private irrigation well approximately 445 ft to the southwest of the Willowbrook SWIP well that is on APN 037-221-54 (6120 Abbey Road). On March 4, 2020 the SqCWD measured the depth of this well at 130 ft below ground surface, corresponding to the top of the Purisima BC unit. Groundwater level monitoring at the well showed no response to pump testing of the Willowbrook SWIP well as described in **Section 11.2.2.** Therefore, the well does not produce from the same unit (Purisima A unit) that the Willowbrook SWIP well will recharge. Groundwater modeling described in **Section 11.2** also shows that purified water will not flow vertically from the A unit to the overlying unit where this private irrigation well is located. As such, monitoring wells are not required between this private irrigation well and the Willowbrook SWIP well.

The closest municipal supply well is the SqCWD's Tannery 2 well, approximately 1,800 ft to the west. Tannery 2 is screened from 365 to 605 ft and produces from the Purisima A unit. Note that the Purisima Formation is tilted and becomes shallower to the west, and that is why the top of the Purisima A unit at the Tannery well site is shallower than at the Willowbrook SWIP well site.

Two monitoring wells have been installed to monitor groundwater between the Willowbrook SWIP well and the SqCWD's Tannery well, WM-1 and WM-2; both of which will monitor the A unit only. WM-1 is located approximately 3-4 months travel time from the SWIP well and is estimated as 53-69 months upgradient of the nearest drinking water well. WM-2 is located at an estimated 35-46 months travel time from the SWIP well and is estimated to be 21-26 months upgradient of the nearest drinking water well. As described in **Section 11**, the range of travel times is assessed using refined particle tracking and analytical equations for a range of recharge rates (233-500 afy) at the Willowbrook SWIP well. The estimated range of travel times meet monitoring well requirements.

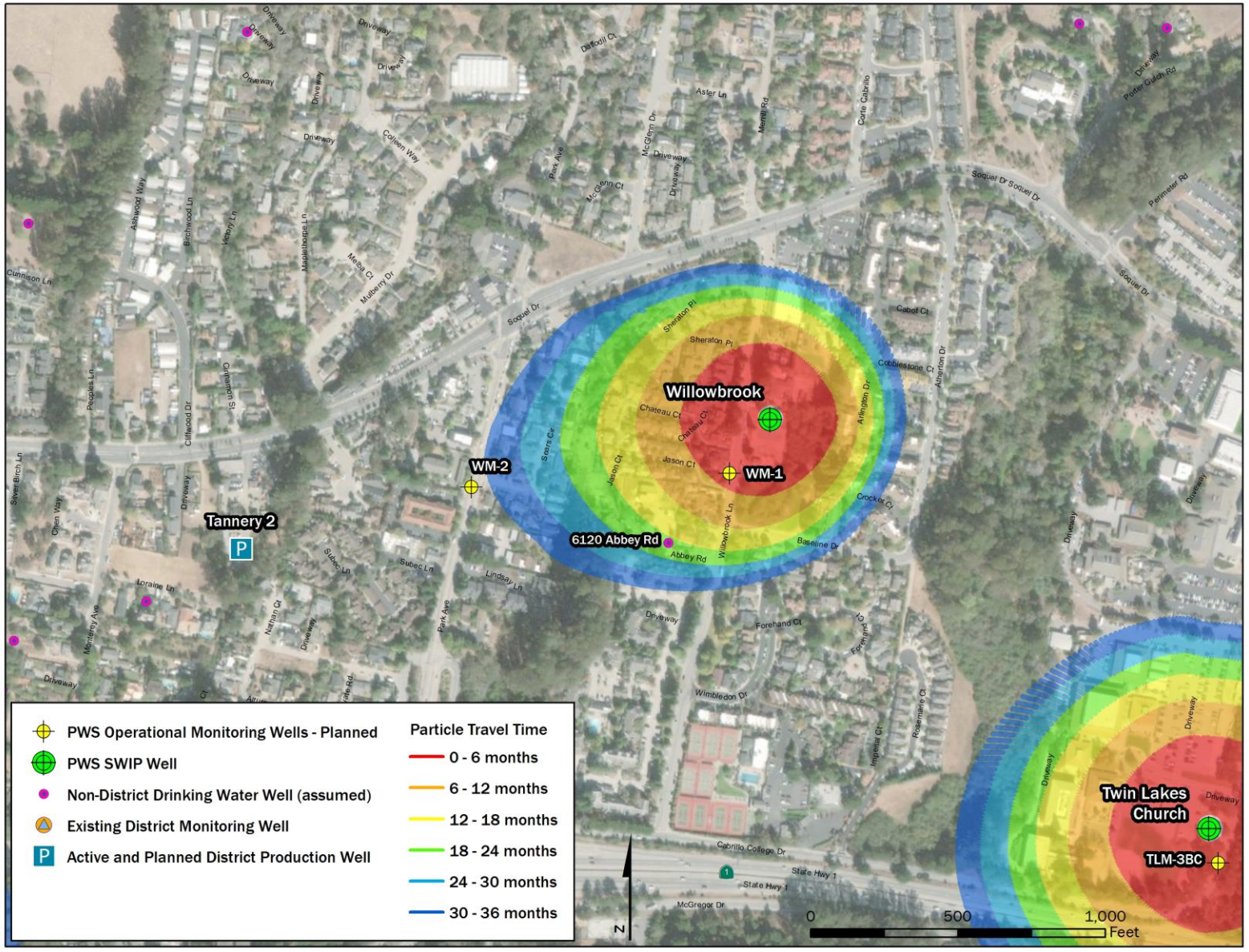

Figure 14-4. Willowbrook SWIP Well travel time contours and potential monitoring well locations

14.5.2.3 TLC SWIP Monitoring Wells

The TLC SWIP well will recharge purified recycled water into both the Purisima A and BC units. At this location, the top of the BC unit is approximately 220 ft below ground surface and 195 ft thick, and the top of the A unit is approximately 565 ft below ground surface and 275 ft thick. As shown in **Figure 14-5** and **Figure 14-6**, there are several private wells near the TLC SWIP well, with the nearest well approximately 1,000 ft to the southwest at 830 Pine Tree Lane, in Aptos, California. There is another private well on the same street on a small parcel between 870 and 880 Pine Tree Lane. Based on particle tracking, these wells are greater than 36 months travel time from the TLC SWIP well in both the Purisima A and BC units.

There are no well completion records for the private well at 830 Pine Tree Lane, nor is its use known. Its presence and location were brought to the SqCWD's attention while meeting with the Pine Tree Lane homeowner's association in July 2019. The well between 870 and 880 Pine Tree Lane belongs to the Pine Tree Lane Mutual Water Company and supplies drinking water to the Pine Tree Lane residents. According to the State's well completion report database (WCR no. 419540), this well was constructed in 1996 as a domestic supply well. The well is intermittently screened between the depths of 190 to 450 ft, indicating it produces from the Purisima BC and underlying B units. It is assumed the well at 830 Pine Tree Lane also produces from the Purisima BC and underlying B units, similar to the Pine Tree Lane Mutual Water Company well.

The closest municipal supply well to the TLC SWIP well is the SqCWD's Estates well, which is approximately 1,600 ft to the east. The Estates well is intermittently screened from 305 to 920 ft and produces groundwater from both the Purisima A and BC units.

Four monitoring wells have been installed to meet Title 22 requirements for monitoring groundwater between the TLC SWIP well and the two nearest drinking water wells: Estates well and Pine Tree Lane well. Wells monitor groundwater in both the Purisima A and BC units between the TLC SWIP well and the Estates well. TLM-1A and TLM-2A monitor the Purisima A unit between these wells (**Figure 14-5**). TLM-1A is located approximately 1.5-2.1 months travel time from the SWIP well and 42-50 months upgradient of the Estates well. TLM-2A is located approximately 27-32 months travel time from the SWIP well and 16-20 months upgradient of the Estates well. TLM-3BC monitors the BC unit between the TLC SWIP well and the Estates well. TLM-3BC is located approximately 4 months travel time and 348-452 months upgradient from the Estates well. TLM-2BC is a well installed by SqCWD to monitor the BC unit co-located with TLM-2A, but is not required to meet Title 22 regulations.

Two wells will be used to monitor groundwater in the Purisima BC unit between the TLC SWIP well and Pine Tree Lane wells: TLCM-3BC and TLM-4BC (**Figure 14-6**). TLM-3BC is located approximately 4 months travel time from the SWIP well and is estimated as 207-276 months upgradient of the nearest drinking water well. TLM-4BC is located at an estimated 71-94 months travel time from the SWIP well and 140-186 months upgradient of the nearest drinking water well.

As described in **Section 11**, the range of travel times is assessed using refined particle tracking and analytical equations for a range of recharge rates (742-1000 afy) at the TLC SWIP well. The estimated range of travel times meet monitoring well requirements for both the A and BC units.

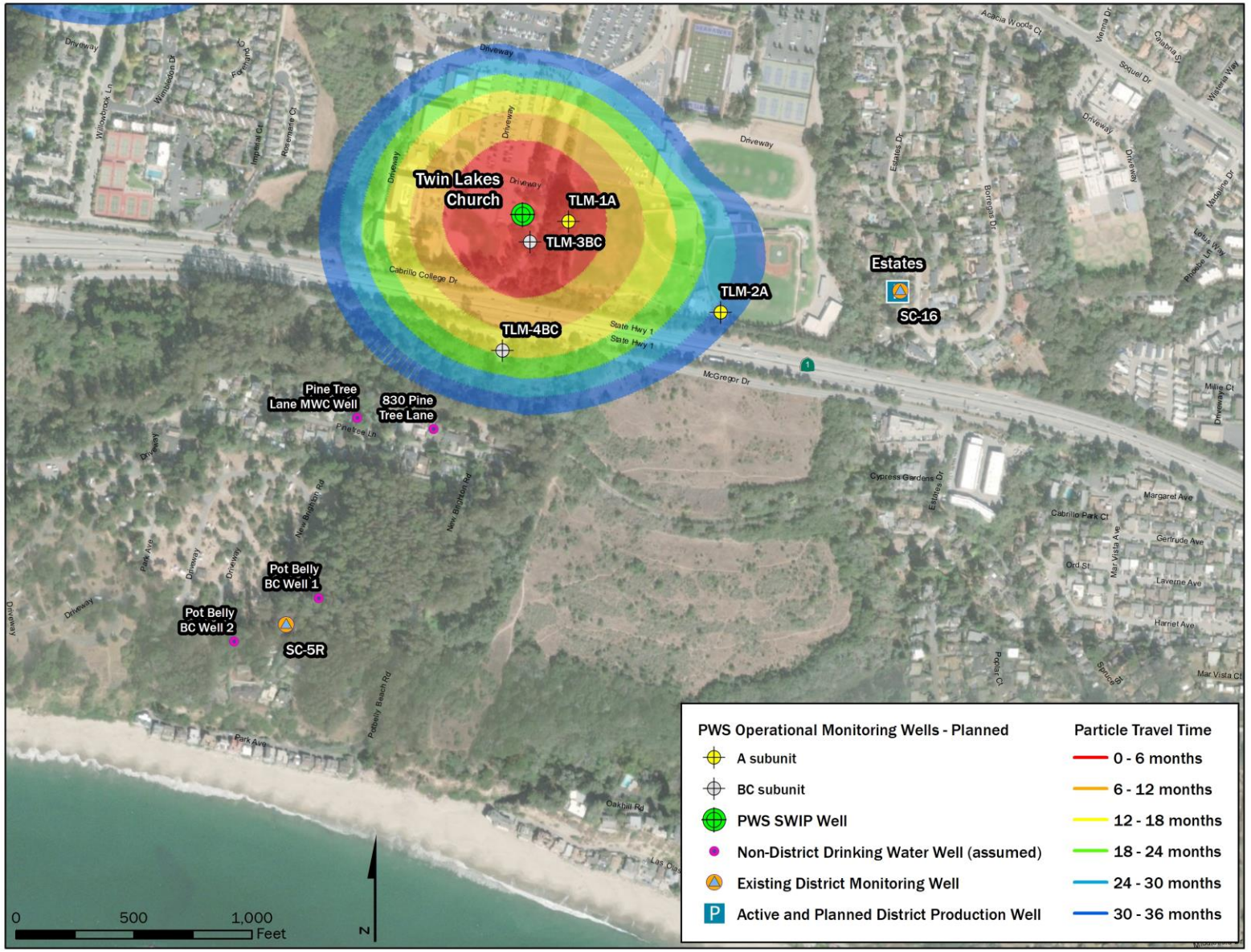

Figure 14-5. TLC SWIP well travel time contours and potential monitoring well locations (Purisima A Unit)



Figure 14-6. TLC SWIP well travel time contours and potential monitoring well locations (Purisima BC Unit)

14.6 Records and Reporting

In accordance with all requirements, SqCWD will provide reports and records of past, current and projected operational information pertaining to the entire PWS Project to DDW and the RWQCB. (Operating records and monitoring reports for the SC WWTF are available from the City.)

14.6.1 Monitoring Reports

The following monitoring records will be retained for a time as directed by DDW and the RWQCB:

- Sampling location, date, and time
- Name(s) of individual(s) performing the sampling
- Analytical results
- Analytical methods/techniques used
- Date of the analyses
- Name of laboratory conducting the analyses with its ELAP certification documentation
- Documentation of quality assurance/quality control, including chain of custody

SqCWD will submit reports to DDW and the RWQCB documenting performance of the MF, RO and UV-AOP processes in compliance with Title 22 Section 60320.201(h) and in order to demonstrate pathogenic microorganism control is achieved per Title 22 Section 60320.208.

Within 60 days of completion of the initial year of operation of the AWPF and PWS Project, SqCWD will submit a report to DDW and the RWQCB documenting the PWS Project's performance and compliance with the requirements of Title 22 Section 60320.201(f) and (g) for the RO and UV-AOP processes.

SqCWD will submit analytical results from the background and operational monitoring to DDW via electronic data transfer to the CLIP database using Primary Station Codes assigned to each monitoring well by DDW and appropriate analyte codes, except for 2-chloroethyl vinyl ether that will be submitted as a PDF copy. As noted in Section 14.5.1. PDF copies of laboratory reports will also be submitted to DDW for a number of constituents analyzed using non-CLIP methods during the first sampling event that occurred in the 4th quarter of 2022,

14.6.2 Annual Report

As required by Title 22 Section 60320.228, SqCWD will prepare and submit an annual report documenting the PWS Project's performance. The report will be provided to DDW and RWQCB within six months after the end of each calendar year. Public water systems and drinking water well owners with water sources within ten years of groundwater travel time downgradient of the PWS Project SWIP recharge well sites will be notified by direct mail or electronic mail of the availability of the report. The report will be prepared by a Professional Engineer licensed in the State of California with experience in wastewater treatment and public water supply. The annual report will cover the following topics:

- Compliance status with Title 22 groundwater recharge and monitoring requirements
- Violations incurred and corrective actions
- Detections and trends of monitored chemicals or contaminants
- Migration of the recharge water plume
- Description of changes and anticipated changes in treatment processes or facilities
- Projected quality and quantity of purified water and diluent water in the next calendar year

- Measures taken to comply with specific Title 22 requirements, particularly those pertaining to wastewater source control
- Increases in the recycled water contribution during the previous calendar year and any increases in the recycled water contribution anticipated for the next calendar year

14.6.3 Engineering Report Update

In accordance with Title 22 Section 60320.228, an updated Engineering Report will be prepared and submitted to DDW and RWQCB every five years from the date of approval of the initial Engineering Report. The Engineering Report update will serve to address any PWS Project changes. At a minimum the report will include:

- Anticipated recycled water contribution increases
- Information showing underground retention time compliance
- Groundwater modelling updates and a comparison between predictions and measured observations
- Geochemistry effects based on groundwater samples

14.7 Preliminary Tracer Study Approach

Tracer studies utilize existing or introduced variation in groundwater chemistry to provide information about underground retention times. Tracer programs can involve introducing a foreign tracer to the recharged water (added tracer), or by utilizing natural or anthropogenic groundwater chemistry variations (intrinsic tracer). An added tracer refers to a substance intentionally added to the recharged water, with measurable characteristics that can be readily identified in the groundwater downgradient of the SWIP well. An intrinsic tracer refers to a substance or attribute already present or absent in the recharged water at levels different from the receiving groundwater, which can be distinctly and sufficiently detected in the groundwater downgradient of the SWIP well.

Under the Title 22 requirements, the proposed tracer study work plan must be submitted to DDW for review and approval. The work plan will be submitted to DDW in time for approval in advance of initiation of recharge of purified water at SWIP wells and implementation of the tracer study.

Recommended Tracer Program

Title 22 requirements specify use of an added tracer but provide for testing using an intrinsic tracer with prior approval. A combination of both added and intrinsic tracers will be utilized for the PWS tracer study and include the following:

- Fluorescent dye (added tracer)
- Conductivity and temperature (intrinsic tracers)
- Major ions and TDS (intrinsic tracers)

This approach is recommended because of the redundancies included and the ability to test both added and intrinsic tracers at the same time. Title 22 requirements apply 1.0 credit to retention times observed with the added tracer, while they apply 0.67 credit to retention times observed with the intrinsic tracer. This will allow for evaluation of estimated retention times based on added tracer results, while evaluating accuracy of intrinsic tracers for future analyses. The results will be evaluated to assess whether log reduction virus and monitoring well location requirements are met. Transducers with dataloggers will also record piezometric water levels in monitoring wells every 6 hours during the tracer study. The overall results may be used to update estimates of RRTs, definitions of primary and secondary control zones, aquifer characteristics, and estimates of any significant transport between aquifer units. The background sampling program described herein will be implemented prior to the start of the tracer study. The tracer

study will begin within the first three months of the onset of recharge at the PWS Project SWIP recharge wells and is anticipated to last 12 months.

Appendix H includes a draft preliminary plan for the tracer study. SqCWD will update this draft preliminary plan as a draft formal workplan to submit to DDW in 2023. The workplan will be finalized based on DDW review for approval in 2023. The workplan will include changes to the approach described in **Appendix H**, including the following:

- As part of the background sampling program and during the tracer study SqCWD will collect water quality samples from private wells in the Project area described in **Section 10.6** if given access by the private well owners.
- SqCWD will conduct the intrinsic tracer study from startup of recharge of purified water at the SWIP wells but will begin the added tracer study up to 3 months after startup of recharge. This will allow time for PWS to achieve operational stability as well as providing information from the intrinsic tracer study for implementation of the added tracer study.

Section 15: General Operations Plan

This Section comprises a preliminary overview of the general operations for the AWPF including brief descriptions of the following:

- Inter-Facility Coordination between the AWPF, TTF at SC WWTF, and the SWIP recharge wells
- OOP
- Automation and Controls
- Planned Reliability and Redundancy
- Treatment Robustness
- CCPs and Off-Spec Diversions
- SWIP Recharge Well Operational Strategies
- Notifications
- Operator Training

The AWPF will be equipped with monitoring and control equipment to facilitate system operations by a highly trained staff of operators to produce a water supply that is reliably protective of public health and complies with the permit requirements. Standby equipment will be included, as needed, to facilitate scheduled and unscheduled maintenance requirements. The OOP will also be developed for the AWPF that details operating procedures for operation and routine maintenance of AWPF process systems. If the product water does not meet water quality permit requirements based on critical control point monitoring, it will be recirculated back to the MF feed tank or sent to the ROC wet well and be sent to the outfall via the RO concentrate line.

Prior to operations, it will be demonstrated that the AWPF's treatment processes have been installed and can be operated to meet their intended function(s). The following protocol describes the actions to be taken to meet this objective:

- Development and execution of a startup and commissioning plan to verify proper system installation, functioning, and performance (i.e., validation testing) of each major process element and the treatment train as a whole. This includes standard operation, startups and shutdowns, and response to critical and major alarms.
- Commissioning, Acceptance Test, and DDW-Related Testing:
  - Verification of Installation Complete
  - Submittal of Amended Draft OOP to DDW
  - Development of Operations and Maintenance (O&M) Manual
  - Submittal of UV-AOP Challenge Test Plan
  - Operator Training
  - Functional Testing
  - Process Commissioning
  - Acceptance Testing
  - Execution of UV-AOP Challenge Test (including submittal and approval of test results)

- DDW Inspection:
  - Demonstration of plant operation
  - Simulation of critical alarms related to pathogens and regulatory compliance, and associated system responses to prevent discharge of off-specification water consistent with the OOP
- Injection and operations
  - Demonstration Test
  - Develop SOPs
  - Finalize OOP
  - Finalize O&M Manuals

Figure 15-1 provides an overview of the phases of startup.

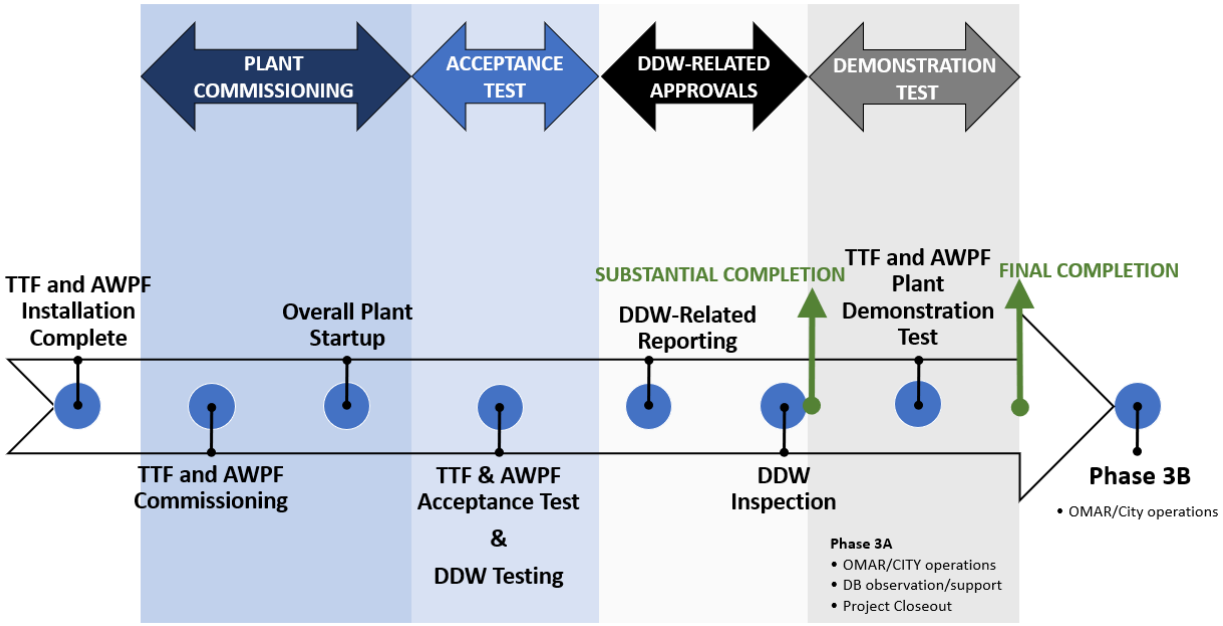

Figure 15-1. AWPF facility startup timeline

15.1 Inter-Facility Coordination

The City and SqCWD are each responsible for certain facilities included as part of the PWS Project:

- Wastewater Collection: City and County of Santa Cruz
- WWTF and ocean outfall: City
- TTF and SWPS: City (Contracted by SqCWD)
- AWPF: PWS Contract Operator
- Source Water Pipeline: County of Santa Cruz and SqCWD
- Purified Water Pipeline: SqCWD and County of Santa Cruz
- ROC Pipeline: City and SqCWD
- SWIP Wells: SqCWD
- Monitoring Wells: SqCWD

To facilitate continuous and effective communication amongst the SqCWD, the City, and the PWS Contract Operator, the operation and maintenance of the new PWS facilities will be coordinated through regular meetings.

The typical objectives expected of these meetings are described below:

- City of SC WWTF Operations and PWS Contract Operator and Maintenance Staff Meetings:
  - Coordinate and plan O&M activities among the wastewater and PWS facilities
  - Discuss and establish PWS policies and procedures
  - Identify and implement system optimization studies
  - Identify and address cross-training needs
  - Review treatment performance at both treatment facilities
  - Attended by both the City and the PWS Contract Operator

On a day-to-day basis, coordination between the SC WWTF and Chanticleer AWPF control rooms will be via telephone and email. Operators will provide notifications via phone, with a follow-up email, to communicate planned operational changes or events that are expected to occur within 24 hours. Additional notification and communication may be necessary depending on the type of event. An example of typical events requiring these notifications may include significant variations in flow rates.

The PWS OOP will include operations plans to instruct operators on communications with other facilities during normal operating conditions, as well as notification procedures in the event of alarm warning, handling off-spec water, emergency/shutdown conditions, and startup/restart. Close operational coordination will be essential between the facilities because the flows, water quality, and permit requirements are interrelated. City Operations Staff, PWS Contract Operator (Chanticleer AWPF), and SqCWD Operations Staff will review their operations plans on a regular basis to make improvements based on "lessons learned." The interface with City Operations Staff, PWS Contract Operator (Chanticleer AWPF), and SqCWD Operations Staff will be described in more detail in operations plans and the PWS OOP that will be submitted for review and approval prior to PWS Project operation.

The Wastewater Lab/Environmental Compliance Division in the Wastewater Systems Branch of the City of Santa Cruz also plays a role in supporting the SC WWTF source control program, with addressing additional constituents relevant to the PWS Project (refer to **Section 4** for these source control enhancements). The City Wastewater Lab/Environmental Compliance Division already provides laboratory support to SC WWTF and will take on the additional monitoring responsibilities for the SWPS, described in **Section 14**. The PWS Contract Operator will take on the additional monitoring responsibilities for the AWPF, described in **Section 14**. The PWS CIP and O&M budgeting will be coordinated among the City Wastewater System and Finance departments as well as SqCWD Operations and Maintenance and Finance and Business departments.

15.2 Operation Optimization Plan

A comprehensive OOP will be prepared and submitted to DDW for review and approval prior to operation of the PWS Project. The OOP will include all the required information specified in Title 22 Section 60320.222 (CCR, 2018) and the WDR/WRR. The purpose of the OOP is to identify and describe the operations, maintenance, analytical methods, monitoring, and reporting necessary to meet the requirements of Article 5.2. The OOP shall describe operation of the treatment process that provides optimal reduction of microbial and chemical contaminants. It is intended to provide operations staff with guidance on regulatory compliance and optimization. The plan shall include a brief description of the wastewater treatment plant, which provides oxidized effluent to the fully advanced treatment facility.

Furthermore, the OOP will complement and be consistent with the O&M Manuals, SOPs, and Computerized Maintenance Management System used by operations staff daily. An initial draft OOP will be submitted to DDW for review prior to completion of construction. An amended draft OOP will be submitted during startup to DDW prior to inspection. A final OOP will be submitted 90 days after approval by DDW to begin injecting purified water. During the life of operations of the PWS and pursuant to 60320.222, SqCWD will update the OOP to include any changes in operational procedures and submit the updated OOP to DDW for review.

A preliminary outline of the OOP is shown in **Table 15-1**.

Table 15-1. OOP Preliminary Table of Contents

OOP Section	Description
1	Introduction
2	Source Waters to WWTF
3	WWTF
4	Ozonation
5	Membrane Filtration
6	RO
7	UV-AOP
8	Post Treatment
9	Purified Water Pump Station
10	SWIP Injection Wells
11	Chemical Storage and Feed Systems
12	ROC Wetwell and Ocean Discharge
13	Sewer Discharge
14	Water Quality Monitoring
15	Plant Utilities
16	Cross Connection Control
17	Process Control System
18	Startup and Shutdown
19	Operations and Maintenance Staffing Plan
20	Maintenance Plan
21	Contingency Plan
22	ERP
23	Key Contact Information

15.3 TTF and AWPF System Communication and Controls

This section describes the communications system between the facilities (the TTF and the AWPF, SWIP wells, monitoring wells) and provides a general description of the CCP monitoring and alarms, and water quality by process, plus any other major operational tools. The AWPF will be equipped with monitoring and control equipment to facilitate system operations by a highly trained staff of operators to produce a water supply that is reliably protective of public health and complies with the permit requirements. Standby equipment will be included, as needed, to facilitate scheduled and unscheduled maintenance requirements. If the product water does not meet water quality permit requirements based on CCPs, it will be recirculated back to the MF feed tank or sent to the ROC wet well and be sent to the outfall via the ROC conveyance pipeline. More details about the planned redundancy and reliability, communication system, controls, alarms, and CCPs will be described in the OOP.

15.3.1 Automation and Controls

The Plant Control System (PCS) consisting of a Supervisory Control and Data Acquisition (SCADA) system and Programmable Logic Controllers (PLC) will monitor and control all process systems, and some auxiliary systems, at the plant. The PCS will utilize a redundant ring fiber optic network to communicate between the Plant PLC and Remote Input/Output (I/O) units (RIO) in each area. Within an area, vendor PLCs will communicate with the local RIO via Ethernet protocol over CAT6 cable. Redundant SCADA historians will be located between two firewalls in a Demilitarized Zone to restrict direct data transfers between the PCS and external networks for Chanticleer AWPF.

The SCADA system will use the Wonderware System Platform version 2017 Update 3 provided by AVEVA for Santa Cruz TTF and Wonderware System Platform version 2020 R2 for Chanticleer AWPF.

Redundant historian will be provided at Chanticleer AWPF. Operators will remotely interact with equipment by interfacing with the SCADA Human Machine Interface (HMI) graphical displays. The graphical displays will represent system processes and will be designed based on design standards listed herein and as shown on the Control Block Diagram in the drawings set. .

At AWPF, 2 operator thin client PC's with running full SCADA HMI run-time licenses will be provided. An engineering workstation with dual monitors with a full SCADA development will be present for an engineer to manage the SCADA system.

Equipment and instrumentation will be controlled and monitored by a Plant PLC communicating with a series of RIO panels located through the plant. LCs will be based on the Allen-Bradley's ControlLogix 5570 platform for any system with more than 100 I/O's and CompactLogix 5370 L3 platform for any systems within less than 100 I/Os. PLCs, RIOs, and vendor panels will communicate using an Ethernet-based communications protocol. Instrumentation will communicate with PLCs and RIOs using hardwired 4-20 mA dc analog and 24V dc discrete wiring. Discrete outputs from the PLC will utilize relay cards to actuate interposing relays.

Radio communication links between Santa Cruz TTF and Chanticleer AWPF, and between Chanticleer AWPF and District Downtown Office Repeater (for Injection Well operation) are provided. Estimated 60'high standalone poles at Santa Cruz TTF and at Chanticleer AWPF are used for both communication links.

The plant control network will be a self-healing fiber optic ring allowing continued communication in the event of a fiber break or a network switch failure. The SCADA system will use physically redundant historian and I/O servers so SCADA functionality is not affected in the event of a server failure. In addition to a redundant historian.

The main plant PLC will have redundant processors, communication modules, and power supplies to reduce the possibility of total PLC failure.

In the event of a power loss UPS will provide backup power to the main plant PLC, SCADA servers, and operations computers to ride through a transition to engine generator power. Additionally, in the event the engine generator is not available; the UPSs are sized to allow for communication to continue during a short power outage of at least 30 minutes for Chanticleer AWPF, or to properly power down SCADA systems if the outage is expected to last longer than what the UPS backup can supply.

The PLCs at the AWPF will control the unit processes to meet operational setpoints, trigger alarms when thresholds are passed that require intervention, and to shut down or divert water from unit processes when system monitors indicate the water is out of specification.

The control strategies will be described in more detail for the OOP. It will include the following:

- Overall PWS flow control strategies
- Unit process-specific control strategies
- Shutdown and startup controls and sequencing
- Online regulatory monitoring and control

15.3.2 Planned Reliability and Redundancy

An eighty percent (80%) online factor was assumed in selecting the AWPF design criteria. The online factor allows for planned and unplanned downtime in the SC WWTF, SWPS, and the AWPF. The design criteria for these process and conveyance areas are summarized in **Section 5**. Redundancy of treatment trains, pumps, and other critical units are also included, where necessary, to minimize the need for shutdown due to planned maintenance and alarm response. Routine and preventative maintenance will be scheduled to maintain system performance up to and including design conditions of flow, water quality, and equipment age to maintain reliability (**Table 15-2**). Conservatism is included in the design, but not explicitly spelled out here. This description will be developed in more detail for the OOP.

Table 15-2. SC WWTF, AWPF and Wellfield Process Equipment Redundancies and Routine Maintenance Activities

Process Area	Location	Redundancy	Routine Maintenance
SWPS	SC WWTF	Standby pump	Routine pump maintenance
Strainers	SC WWTF	Standby unit	Manual cleaning as needed
Ozone system	AWPF	Redundant LOX vaporizers, two duty ozone generators, two duty ozone cooling systems, two duty ozone injection skids, redundant ozone destruct units	Routine pump maintenance, analyzer verification/calibration, check closed loop cooling water quality, destruct catalyst replacement, cooling fan belt replacement
MF system	AWPF	Standby membrane filtration rack, strainer, pumps, blower and air compressor	Routine pump maintenance, backflush & CIPs, maintenance washes, membrane replacement, o-ring replacement, analyzer verification/calibration
RO system	AWPF	Standby transfer pump, cartridge filter	Routine pump maintenance, CIPs, membrane replacement, o-ring replacement, analyzer verification/calibration
UV-AOP system	AWPF	Redundant oxidant feed pump, redundant UV lamp capacity in UV reactor, spare parts (e.g., UV lamps and sensors)	Lamp replacement, sensor checks and calibration, cleaning system maintenance, chemical feed pump calibration and maintenance, analyzer verification/calibration
Decarbonator	AWPF	None	Routine blower maintenance
Post-treatment chemical addition	AWPF	Standby dosing pump	Routine pump maintenance and calibration
Chemical Delivery Systems	AWPF	Standby pumps	Chemical feed pump calibration and maintenance, injection quill cleaning and replacement
Power supply	TTF AWPF	Standby diesel-fueled generator (providing emergency power for flushing pumps and other small loads)	Routine electrical system and generator maintenance
Plant PLC and SCADA	TTF AWPF	Redundant PLC processors Redundant PLC communication modules Redundant PLC power supplies Uninterruptible Power Supplies (UPS) for PLC, SCADA, and Operator Computers	Battery replacement
Purified Water Pump Station	AWPF	Standby pump	Routine pump maintenance
Wellfield pumps	SWIP Wells	N/A	Routine pump maintenance

Anticipated action plans for responses to operational issues (off-specification purified water, WWTF upset (off-specification AWPF feedwater), AWPF upset, source control, power outages, conveyance pipeline discharge/drain, recharge well outages) are described in **Section 5**, Project Facilities, **Section 9**, Pathogenic Microorganism Control, **Section 12**, Response Retention Time, **Section 13**, Contingency Plan, and **Section 14**, Monitoring and Reporting Plan. More detail will be presented in the OOP. The critical operational elements of these plans are summarized below.

- Groundwater protection through provision of Response Retention Time:
  - For RRT compliance, water quality will be monitored in purified water produced by the AWPF and groundwater at monitoring well(s) (defined in **Section 14**)

  - SqCWD will notify DDW and the RWQCB if the RRT Response Protocol is initiated and will keep regulators informed of the findings
- Process train monitoring and diversion:
  - The process train will be continually monitored at a variety of locations to provide early identification of treatment performance issues
  - If final effluent at the SC WWTF is not meeting performance requirements (e.g., upstream SC WWTF process upset), the following actions will be taken:
    - Source water will be diverted to the ROC return line prior to the MF feed tank at the AWPF for ultimate disposal to the SC WWTF ocean outfall
    - The SWPS will be shut down
    - The AWPF will enter into recirculation mode (UV-AOP effluent without hydrogen peroxide will be recirculated back to the MF Feed Tank)
  - If the purified water from the AWPF does not meet potable reuse permit requirements, pathogen reduction performance, or advanced treatment criteria based on on-line monitoring parameters and other critical control points limits, the purified water will be either:
    - Diverted after the UV-AOP system to the MF Feed Tank, or
    - Diverted after the UV-AOP system to SC WWTF ocean outfall via the RO concentrate pipeline
- Contingencies are described in **Section 13**

15.3.3 Treatment Robustness

The AWPF treatment train, plus underground retention time in the aquifer, provide multiple barriers of treatment through a range of different removal, oxidation, and inactivation mechanisms to provide the reduction of a wide range of constituents. **Table 15-3** summarizes the treatment robustness via the various treatment mechanisms achieved through the AWPF and the groundwater aquifer.

Table 15-3. AWPF and Aquifer Treatment Process Robustness through Multiple Treatment Mechanisms

Process	Biological Oxidation	Physical Removal	Microbial Inactivation or Removal	Chemical Oxidation	Sorption
Primary and Secondary Treatment	√	√	√		√
Ozonation			√	√	
MF		√	√		
RO		√	√		
UV-AOP		√ (via photolysis)	√	√	
Aquifer	√	√	√	√	√

Table 15-4 summarizes the constituents of concern targeted by the different treatment processes in the treatment train.

Table 15-4. Constituents of Concern Targeted by the Different Treatment Processes in the Overall Treatment Train

Process	Nitrogen	TOC	DBPs	Inorganic Contaminants	CECs	Bacteria	Viruses	Protozoa
Primary and Secondary Treatment[a] (AWPF and non-potable facility feedwater)	√	√		√	√	√	√	√
Ozonation (AWPF process)	√ [b]				√	√	√	√
MF (AWPF process)		√				√		√
RO (AWPF process)	√	√	√	√	√	√	√	√
UV-AOP (AWPF process)			√		√	√	√	√
Aquifer						√	√	

a. Primary and Secondary Treatment provides some removal of microorganisms, but log reduction value credits are not being sought as part of this project.

b. Ozonation oxidizes nitrite, which is required for the UV-AOP process, but does not remove nitrogen from the system. Ozonation inactivates pathogens, but log reduction value credits are not being sought as part of this project.

15.4 Operational Strategies, Monitoring, and Diversion of Off-Specification Water

Public health protection will be achieved through a combination of source water protection, treatment at the SC WWTF and TTF, and for the potable reuse portion of the treated water, at the AWPF. Confirmation of public health protection will be achieved through a combination of ongoing sampling and online monitoring. All treatment processes will have alarm setpoints that will monitor system performance and alert TTF or AWPF staff to take appropriate actions if a system parameter trends out of specification. Staff will also regularly review instrument readings and verify accuracy, performing calibrations as needed.

An important aspect of operational strategies at the TTF and AWPF is the use of CCPs and critical operational points (COPs). A CCP is a point in the treatment train that is designed specifically to reduce, prevent, or eliminate a human health hazard. A CCP monitor is a measured parameter or calculated value used to assess the performance of the CCP for regulatory compliance and public health protection. A COP is a point in the treatment train that is important to ensure the performance of the facility and, if not maintained, has the potential to adversely impact a CCP. A COP monitor is a measured parameter or calculated value used to assess the performance of the COP. The following subsections provide additional information about the CCPs and COPs at the TTF and AWPF.

Additionally, as described in **Section 14**, flow and water quality monitoring stations will be included for permit compliance and to indicate performance of the treatment processes. The control and monitoring strategies and plans for diversion of off-specification water are summarized below. A refined description of installed monitoring devices will be developed for the OOP.

15.4.1 AWPF Operational Strategies

PWS will employ a CCP approach to manage off-spec water and maintain compliance with pathogen LRVs. If an individual process or monitor fails, the facility will have provisions to appropriately respond and avoid sending off-spec water to the recharge wells. Off-spec water from the AWPF that is sent back to the SC WWTF ocean outfall will be of tertiary quality or better and will not reduce the quality of water at the ocean outfall. The proposed off-spec strategy has been developed in coordination with the City. The off-spec strategy incorporates monitoring data from each of the unit processes plus on-line monitoring of a range of performance indicators at all the CCPs, which will be used to continuously calculate and display the performance of the process in meeting its performance goals. Each surrogate for each CCP will be separately displayed to provide operational staff with a clear picture of the status of PWS facilities as a whole, as well as each CCP. Contingencies are described in **Section 13**. Critical control point monitoring for membrane filtration, RO and UV-AOP are summarized in **Table 15-5**.

If production is suspended, the AWPF will either be placed into recirculation mode while the operators investigate the source of the critical failure and make necessary adjustments or repairs, or the off-specification water will be diverted through the diversion points indicated below. In recirculation mode, AWPF production will be reduced and the UV-AOP effluent will be diverted to the MF feed tank for re-treatment through MF, RO, and UV-AOP. The following subsections describe the operational strategies that will be used at the AWPF. Additional details will be provided in the OOP.

15.4.1.1 AWPF Operating Modes

The AWPF will have the following operational modes or states:

- AWPF startup: automatic startup sequence
- AWPF production: operating mode indicating the AWPF is online and forwarding water to the SWIP injection wells
- AWPF standby: operating mode indicating that AWPF is online but discharging water to ROC wet well or recirculating
- AWPF shutdown: automatic shutdown sequence
- AWPF offline: AWPF is offline

15.4.1.1.1 Startup Sequence

Prior to startup of the AWPF, the Operator should conduct the following steps:

- Confirm manual valves are in proper position
- Confirm auto (remote) at local control panels
- Confirm instruments are operational and calibrated
- Address and clear any alarms at the SCADA
- Confirm lead/lag preferences for pumps
- Confirm individual unit operation setpoints are correct
- Confirm all individual systems are offline
- Confirm AWPF offline status

The automatic AWPF startup sequence is as follows with each step a permissive for the subsequent step:

- PWS SWPS is online
- SWIP injection wells are available
- ROC Wet Well is online
- Sanitary Lift Station is online
- Ensure AWPF Off-Spec Flow Pathway and open off-spec discharge valve (SW-CV210005) to ROC Wet Well. Confirm off-spec discharge valve open, then close influent valve (SW-CV210004) to ozone system. Confirm influent to ozone system is closed.
- Confirm flow and water quality at inlet to Chanticleer via flow meter (FE/FIT-210003), turbidimeter (AE/AIT-220001), TOC analyzer (AI/AIT3006A), and nitrite analyzer (AI/AIT3006B)
- Ensure Ozone System flow pathway by opening influent valve (SW-CV210004) to the ozone system. When confirmed open, close off-spec discharge valve (SW-CV210005) to ROC Wet Well
- Start Ozone System
- Start the MF System
- Ensure AWPF Off-Spec Flow Pathway by opening AWPF off-spec discharge valve (PW-CV260010 and ROC-CV210011) to ROC Wet Well. Close discharge valve (PW-CV260002) to Product Water Post Treatment.
- Start the AOP System UV Reactor
- Start the RO System by opening RO Bypass to ROC Wet Well valve (ROF-CV230001). Start RO low pressure transfer pumps, confirm sulfuric acid and antiscalant feed, then close RO Bypass to ROC Wet Well valve (ROF-CV230001). Start RO high pressure feed pumps and the rest of the RO System
- Start the AOP System
- Confirm AWPF Performance considering MF filtrate combined turbidity, RO permeate TOC, RO permeate conductivity, AOP feed UVT, AOP minimum oxidant dose, and minimum UV dose, and pathogen LRVs
- Ensure purified water pathway by opening discharge valve (PW-CV240002) to Product Water Post Treatment. Confirm discharge valve is open and close AWPF off-spec discharge valve (PW-CV260010).
- Startup Product Water Post Treatment System
- Startup PWPS. Confirm AWPF Performance considering purified water pH and calculated LSI.

15.4.1.1.2 Shutdown Sequence

The AWPF SCADA may initiate an automatic controlled shutdown due to operator decision while in AWPF Production mode or after the AWPF has timed out in AWPF Standby mode (i.e., discharge to off-spec or recirculation). The automatic AWPF Shutdown sequence is as follows with each step a permissive for the subsequent step:

- Open AWPF off-spec discharge valve (PW-CV260010) and the off-spec effluent to ROC Wet Well discharge valve (ROC-CV210011) to ROC Wet Well (if not already open in AWPF Standby mode).
- Close discharge valve (PW-CV260002) to Product Water Post Treatment (if not already closed in AWPF Standby mode)
- Shutdown the PWPS
- Stop the RO System
- Stop the UV-AOP System
- Stop the MF System
- Stop the Ozone System

15.4.1.2 SWPS Operation

The PWS control system will receive a UV effluent channel level signal from a new SC WWTF secondary effluent channel level sensor (LIT-110001). Considering historical flow data, it is anticipated that low flow events will occur less than two percent of the year on average. The low flow periods are expected to last between one to five hours at a time, with an event frequency range of zero to 40 times per year. These low flow periods typically occur during early morning hours when SC WWTF effluent flows reach their daily diurnal minimum. A majority of the time, the UV effluent channel will operate at its maximum level, allowing the SWPS to operate at full flow.

During periods of low SC WWTF effluent flow, the effluent channel level will begin to drop, and the effluent channel volume will be used as influent flow equalization. When the water level in the SC WWTF UV effluent channel drops below the Low-Level setpoint for more than 10 minutes, a signal will be sent to the AWPF to enter low flow recirculation mode and reduce the SWPS flow rate setpoint to supply one RO train at the AWPF and maintain operation of the non-potable reuse system. This approach will maximize the duration before the AWPF has to shut down. When the SC WWTF effluent channel drops below the Low-Low-Low-Level Setpoint for more than 10 minutes, the SWPS, TTF, and NPR Facilities will shut down. When the UV effluent channel begins to refill and the channel level has risen above the Low-Low-Level setpoint for a minimum of 10 minutes, the SWPS and remaining TTF and NPR facilities will be brought back online automatically. The PWS control system will signal when SC WWTF effluent channel level has reached above the High-Level setpoint for a minimum of 1 hour, at which point the entire AWPF facility can initiate startup by the operator.

Table 15-5 provides the various operating levels of the UV effluent channel and associated SWPS operation mode and AWPF feed. The operating levels for High (H), Low (L), Low-Low (LL), and Low-Low-Low (LLL) are operator adjustable setpoints that will be determined during startup and reported in the OOP. Flow to the AWPF will be measured by an online flow meter located downstream of the SWPS (FE/FIT-210003). The SWPS flow demand will be based on the sum of AWPF MF feed flow setpoint and NPR Filter influent flow setpoint. The TTF SCADA will receive an AWPF MF feed flow setpoint and the MF feed tank operating level (LIT-210001) from the AWPF SCADA. The SWPS VFDs (SW-VFD- 101001, -101002, and -101003) will maintain the total MF Feed Flow Setpoint (based on FIT- 115001) and trim the flow setpoint based on the MF feed tank operating level (LIT-2100010).

Table 15-5. SWPS Operating Levels

SC WWTF UV Effluent Channel Level	SWPS Operation Mode	AWPF Feed From SWPS
Between L and H Level Setpoint	SWPS full flow operation	2.37 mgd
≤ L Level Setpoint	SWPS reduced flow operation AWPF in recirculation mode	0.35 mgd
≤ LL Level Setpoint	Maintain SWPS reduced flow operation AWPF in recirculation mode	0.35 mgd
< LLL Level Setpoint	Shutdown TTF and SWPS AWPF in recirculation mode	0 mgd
< LLL Level Setpoint and MF Feed Tank < L Level Setpoint	Shutdown TTF and SWPS Shutdown AWPF	0 mgd

15.4.1.3 Critical Control Points and Monitoring Overview

Total pathogen reduction requirements will adhere to Section 60320.208 of the Water Recycling Criteria. If the total operational pathogen LRVs are less than 12-log for virus, 10-log for Giardia, or 10-log for *Cryptosporidium*, then the AWPF SCADA system will alarm and notify the Operators at Chanticleer to investigate potential causes and take corrective actions within 24 hours of discovery. If PWS fails to meet the pathogen reduction requirements for a period longer than 4 consecutive hours, or more than 8 hours in a 7-day period, then PWS shall notify DDW and the RWQCB immediately. If the failure is a shorter duration (greater than 1 hour), then PWS shall report the failure and duration to the RWQCB in its monthly reports, but not later than 10 days after the month in which the failure occurred.

A critical failure occurs if the total operational pathogen LRVs are less than 10-log for virus, 8-log for Giardia, or 8-log for *Cryptosporidium*. If this occurs, then the AWPF SCADA system will alarm and enter the AWPF into Standby mode via off-spec discharge or recirculation. The AWPF will enter Offline mode via an automatically initiated shutdown sequence if that alarm is not addressed before the off-spec timer times out. PWS must immediately notify the DDW and RWQCB if this critical failure occurs.

The AWPF SCADA system will be able to generate monthly reports to DDW summarizing PWS's ability to achieve the required 12/10/10 LRV require that only "Yes" or "No" be reported for each daily 24-hour period. Although not required, the monthly reports will also include the daily calculated overall LRV. Templates for these monthly reports will be provided with the OOP.

A range of control and monitoring features will be in place at the Chanticleer AWPF. A summary of the preliminary monitoring framework for each CCP is summarized in **Table 15-6**. The following subsections provide further detail regarding the CCP monitoring for the MF, RO, and UV-AOP Systems.

Table 15-6. Critical control point monitoring for the AWPF

Monitored Parameters and Locations	Control Limits	Pathogen/Contaminant LRV Strategy
Membrane Filtration		
Continuous on-line MF filtrate turbidity for each MF train Daily PDT of each MF train	Indirect integrity measure: continuous turbidity ≤ 0.2 NTU 95% of the time within 24-hr period and ≤ 0.5 NTU for each train at all times Direct integrity measure: daily LRV based on PDT for each train	*Cryptosporidium* oocyst and *Giardia* cyst LRV calculated based on daily PDT
RO		
Continuous TOC, combined RO feed and combined RO permeate Continuous EC, measured at the RO feed and RO permeate of each individual train	LRV based on the removal of TOC or EC	LRV calculated as highest of the following: • Continuous calculated TOC reduction of overall RO system • Continuous calculated EC reduction for each train; lowest train reduction selected
UV-AOP		
Continuous on-line monitoring of UV dose	UV Dose ≥ 276 mJ/cm^2	Credit received on a pass/fail basis if control limit is met
Continuous on-line monitoring of UV dose and oxidant dose	TBD during commissioning testing	Credit received on a pass/fail basis if control limit is met

15.4.1.4 MF System Operational Strategies

To receive pathogen reduction credit for the MF system, both direct integrity monitoring and indirect integrity monitoring of the membrane fibers are required. The MF system will not receive virus reduction credit. A single MF LRV will be provided by MF vendor PLC to SCADA as a function of their daily direct integrity testing of individual skids.

For direct integrity monitoring, a PDT will be conducted a minimum of once every 24 hours to check for breaches in the hollow membrane fibers and quantify the LRVs for *Giardia* and *Cryptosporidium*. The pressure decay rate from the PDT and other membrane-specific parameters are used to calculate the LRV per the methodology of the Membrane Filtration Guidance Manual (EPA 2005). Detailed information regarding the calculations to determine the LRV based on PDT results can be found in **Section 9.1.1.** The calculated value cannot exceed 6.0 LRVs. The same LRV will apply for each *Giardia* and *Cryptosporidium*. The SCADA system will determine the MF system LRV by using the lowest calculated LRV of any MF unit that was online during the 24-hour period as the operational value for the MF system in the overall pathogen LRV monitoring. If an MF unit LRV falls below the target value of 4.0, then a low alarm will be triggered. No automatic response will occur due the MF LRV low alarm, but the Operator should investigate and repeat the PDT, as necessary, for that MF unit. If the MF system LRV falls below 1.0, then a low-low alarm will be triggered and the AWPF enter Standby mode via off-spec discharge or recirculation. The AWPF will enter Offline mode via an automatically initiated shutdown sequence if that alarm is not addressed before the off-spec timer times out.

For indirect integrity monitoring, the MF filtrate turbidity for each unit will be monitored continuously using a 15-minute rolling average to determine compliance. If the turbidity exceeds 0.2 NTU more than 5 percent of the time within a 24-hour period, then a high-high (HH) alarm will initiate a shutdown of that MF unit. If the turbidity exceeds 0.5 NTU at any time, then an HH alarm will initiate a shutdown of that MF unit.

Table 15-7 provides the target setpoints and associated alarms and responses for each CCP monitor of the MF system. Note that this information will be updated during startup and documented in the OOP.

Table 15-7. MF CCP monitoring for the AWPF						
Parameter	**Related Instrumentation**	**Units**	**Target Setpoint**	**Alarm**	**Automatic Response**	**Operator Response**
Filtrate Turbidity (Individual Unit)	AE/AIT-220001 AE/AIT-220002 AE/AIT-220003	NTU	--	0.4 (H) 0.5 (HH)	• Unit shuts down on HH alarm	H: • Confirm meter reading with handheld meter or grab sample • Review last PDT result HH: • Stop operation of unit • Initiate PDT for unit • Repair and verify PDT passes
Filtrate Turbidity Running 24-hr 95th Percentile (Individual Unit)	AE/AIT-220001 AE/AIT-220002 AE/AIT-220003	NTU	--	0.17 (H) 0.2 (HH)	• Unit shuts down on high-high alarm	H: • Review turbidity trend and last PDT result HH: • Stop operation of unit • Initiate PDT for suspected unit • Repair and verify PDT passes
Calculated LRV (Individual Unit)	TIT210001 Unit 1 : • FE220001 • PIT220001 PIT220002 Unit 2 : • FE220002 • PIT220003, PIT220004 Unit 3 : • FE220003 • PIT220005, PIT220006	log	--	4 (L) 1 (LL)	• MF PLC automatically initiates PDT on each MF unit daily. If the PDT is acceptable, the MF unit will automatically return to service L: • Action dependent on total AWPF LRV. If AWPF still meets overall 12/10/10 requirement, MF unit remains online. If AWPF does not meet 12/10/10, initiate LL responses. LL: • Repeat PDT. If second PDT acceptable, MF unit automatically returned to service. • If second PDT is failed, an alarm will generate and MF unit will automatically shut down. AWPF enters Standby Mode via off-spec diversion or recirculation. • AWPF enters Offline mode via automatically initiating shutdown sequence if delay timer times out	• If L is triggered, operations staff will investigate the MF unit. Repeat PDT as necessary • If MF unit is automatically shut down, the membranes will be inspected and repaired. A manual PDT will be initiated and confirmed acceptable prior to the unit being brought on-line

15.4.1.5 RO System Operational Strategies

To receive pathogen reduction credit for the RO system, LRVs must be demonstrated through the real-time measurement of log removal of an approved surrogate. LRV for virus, Giardia, and Cryptosporidium will be determined in real-time using a tiered surrogate approach using rejection of a primary (TOC) and secondary (EC) surrogate. **Section 9.1.2** provides additional details about approach. The SCADA system will display in real-time the largest LRV from the two surrogates (TOC and EC) as the operational LRV value for the RO system. The calculated value cannot exceed 6.0 LRV for any pathogen.

For TOC, a real-time rejection will be calculated using continuous online monitoring by TOC analyzers of the combined RO feed and combined RO permeate. LRV for virus, *Giardia* cysts, and *Cryptosporidium* oocysts shall all be equal to log10(permeate TOC/feed TOC).

For EC, real-time rejection will be calculated for each train using continuous online monitoring by conductivity meters on the combined RO feed and the RO permeate of each train. LRV based on EC rejection shall be equal to log10(permeate EC/feed EC), and the lowest LRV value from all RO trains will be used for determining compliance. The SCADA system will provide the ability for an operator to hold EC or TOC values while calibrating instrumentation.

If the RO system LRV falls below the target value of 1.5, then a low alarm will be triggered. No automatic response will occur, but the Operator should investigate. If the RO system LRV falls below 1.0, then a low-low alarm will be triggered and the AWPF will enter Standby mode via off- spec discharge or recirculation. The AWPF will enter Offline mode via an automatically initiated shutdown sequence if that alarm is not addressed before the off-spec timer times out.

In addition to pathogen LRV monitoring, the RO system will also be monitored for combined permeate TOC and EC. **Table 15-8** provides the target setpoints and associated alarms and responses for each CCP monitor of the RO system. Note that this information will be updated during startup and documented in the OOP.

Table 15-8. RO CCP monitoring for the AWPF						
Parameter	**Related Instrumentation**	**Units**	**Target Setpoint**	**Alarm**	**Automatic Response**	**Operator Response**
Calculated LRV (from conductivity, train)	AE-230004 AE-230011 AE-230011	log	1.0	1.0 (L)	• If the high permeate EC LRV alarm is not resolved after the delay time, the train will shutdown	• Check train permeate conductivity reading • Take RO unit out of service if necessary
Calculated LRV (from TOC)	AE-230008 AE-230020	log	1.5	1.5 (L)	• If the low LRV permeate TOC alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Verify the RO feed and permeate TOC reading • Check the LRV calculated from the conductivity rejection • Take RO unit out of service if necessary
Pathogen LRV credit for RO	Calculate from: • AE-230004 • AE-230011 • AE-230011 • AE-230008 • AE-230020	log	1.5	1.5 (L) 1.0 (LL)	L: • Action dependent on total AWPF LRV. If AWPF still meets overall 12/10/10 requirement, RO train remains online. If AWPF does not meet 12/10/10, initiate LL responses. LL: • AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Check the LRV calculated from the conductivity rejection and TOC rejection • Take RO unit out of service if necessary
Instantaneous Permeate TOC	AE-230020	mg/L	0.25	0.25 (H) for first 20 weeks 0.5 (H) thereafter	• If the high permeate TOC alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Check RO feed TOC reading • Verify the permeate TOC reading • Check individual conductivity readings • Reduce ozone dose as needed • Take RO unit out of service if necessary

Table 15-8. RO CCP monitoring for the AWPF						
Parameter	**Related Instrumentation**	**Units**	**Target Setpoint**	**Alarm**	**Automatic Response**	**Operator Response**
Permeate TOC (24-hr running avg.)	AE-230020	mg/L	0.25	0.25 (H) for first 20 weeks 0.5 (H) thereafter	• If the high permeate TOC alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Same response as for instantaneous permeate TOC
Permeate TOC (8-hr running avg.)	AE-230020	mg/L	0.25	0.25 (H) for first 20 weeks 0.5 (H) thereafter	• If the high permeate TOC alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Same response as for instantaneous permeate TOC
Train Permeate conductivity	AE-230022	µS/cm	60[a]	145 (H)[b]	• If the high permeate EC LRV alarm is not resolved after the delay time, the train will shutdown	• Confirm meter reading with handheld probe • Take RO unit out of service if necessary

a. Anticipated RO permeate based on 50% percentile influent water quality conductivity of 1,447 µS/cm

b. Maximum acceptable permeate conductivity to reach 1.0 log LRV based on 50% percentile influent water quality conductivity of 1,447 µS/cm

15.4.1.6 UV-AOP System Operational Strategies

To receive pathogen reduction credit for the AOP system, the UV reactor must provide a minimum validated UV dose of 276 mJ/cm^2, the validated dose required to achieve a 6 LRV of virus, *Cryptosporidium* and *Giardia* per the required dose tables of the EPA ORD report, Innovative Approaches for Validation of Ultraviolet Disinfection Reactors for Drinking Water Systems (April 2020).

UV reactors shall have been validated per the US EPA's UV Disinfection Guidance Manual, with testing, data analysis and development of the UV reactor control/monitoring algorithms conducted by an independent third-party with expertise in UV system validation. In addition to the validation report, a Pathogen Inactivation Report must also be approved by DDW, demonstrating how the UV Dose Compliance Setpoint used for UV AOP System operation will ensure that the required microbial pathogen LRVs are provided.

The Pathogen Inactivation Report shall be based on data derived from the UV reactor validation. If the design conditions for the UV AOP System are outside of the validated range of the UV reactor, the report shall provide rationale as to how the validation data can be extrapolated to demonstrate an accurate or conservative measurement of the disinfection performance that can be achieved with the UV AOP System. The Pathogen Inactivation Report shall be developed by an independent third-party with expertise in UV reactor validation.

If the UV dose drops below the UV Dose Compliance Setpoint, a Low-Low UV Dose Alarm shall be generated, 0.0 LRVs assigned as the operational LRV for the AOP System, and the UV reactor will be taken offline with off-specification AOP effluent diverted to the ROC Wet Well. **Table 15-9** provides the target setpoints and associated alarms and responses for each CCP monitor of the UV-AOP system. Note that this information will be updated during startup and documented in the OOP.

Table 15-9. UV-AOP CCP monitoring for the AWPF

Parameter	Related Instrumentation	Units	Target Setpoint	Alarm	Automatic Response	Operator Response
UV Reactor Flow Rate	FE-240001	MGD	1.67	0.67 (LL) 1.67[a] (HH)	• If the low-low alarm is not resolved after the delay time, the train will shutdown • If the high-high alarm is triggered the train will shut down	• Verify flow meter • Check AWPF production rate setpoint • Inspect flow control valves and flow isolation valves
Influent UVT	AE-240001 AE-240002	%	95[c]	95[c] (LL)	• AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Check UVT panel and calibration of UVT meter • Verify the UVT analyzer • Verify RO permeate turbidity • Verify UV reactor has automatically increased to 100% power
UV Dose	FE-240001 AE-240001 AE-240002 UVI Sensors (2 per train, tag TBD)	mJ/cm^2	2702[b]	2702[b] (LL)	• The system will modulate the power to the lamp • If the low-low alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Check UVT and UV intensity meter calibrations and verify flow meter • Confirm that the ballasts and lamps are operating properly
UV/Peroxide Dose Product	FE-240001 AE-240001 AE-240002 UVI Sensors (2 per train, tag TBD)	mJ/cm^2-mg/L	12,429[b]	12,429[b] (LL)	• Not a control setpoint for selected system	• Investigate the situation and resolve • If the issue is the H_2O_2 dose, adjust setpoint or resolve H_2O_2 metering pump issue
H_2O_2 Dose		mg/L	4.6[b]	4.6[b] (LL)	• If the low-low alarm is not resolved after the delay time, AWPF enters Standby mode via off-spec discharge or recirculation • AWPF enter Offline mode via automatic initiated shutdown sequence if off-spec timer times out	• Verify flow meter • Inspect metering pumps • Verify hydrogen peroxide residual at the inlet to the UV reactor using Titanium Oxalate method or other reliable field test kit • Check specific gravity of H_2O_2 in the storage tank and enter correct values into the SCADA system

a. UV-AOP Design setpoint. Final control setpoints for max flow conditions to be confirmed during AOP Challenge testing

b. UV-AOP design point to meet 0.6 LRV removal of 1,4 Dioxane. Final control setpoints and alarm conditions to be confirmed during AOP Challenge testing

c. UV-AOP assumed influent water quality design setpoint to meet 0.6 LRV removal of 1,4 Dioxane.

15.4.2 SWIP Well Operational Strategies

It is anticipated that three SWIP wells will operate concurrently except during backflush and maintenance. Each well will receive purified water delivered to the site via the purified water conveyance system described herein. Water will typically be delivered at approximately 15 psi and gravity-fed into the well(s). Flow to the well(s) will be controlled by a control valve and will be measured at the ground surface by meter. Periodic chlorination for well maintenance may be practiced. The water delivered to the well(s) may have a low peroxide residual, the concentration of which will depend on finalized hydrogen peroxide dose for the UV/AOP (determined during Challenge Testing), target chloramine residual dose, and other complex physico-chemical dynamics in the purified water pipeline. Further purified water quality details can be seen in **Section 8** of this report. There are no specific requirements surrounding dechlorination for recharge water; however, consideration will be given to dechlorinate at each well head. Backwashing operations will occur at each well, as needed, to re-establish the well(s) injectivity. The recharge wells are assumed to have peak recharge capacities of approximately 200-900 gpm and the three recharge wells will typically operate concurrently to recharge approximately 1,200 gpm, the total flow from the AWPF unless they are backwashing or down for maintenance. The total recharge rate may need to be decreased if a well is backwashing or down for maintenance. For example, two operating wells may recharge 950-1,100 gpm during the time that the third well is down for maintenance. The SWIP well backwash will be directed to the sewer.

15.4.3 Purified Water for Non-Potable Uses – Operational Strategies

As part of the PWS Project, SqCWD may provide purified water for non-potable use (e.g., irrigation) at the TLC athletics fields near the TLC SWIP well site. SqCWD Ordinance No. 22-02 (SqCWD, 2022a) establishes rules, requirements, and responsibilities for water conservation in landscaping for new development and certain existing development undergoing land use review and includes the following language: "Irrigating with alternative water sources such as recycled water, rainwater and graywater is strongly encouraged where available onsite and permitted. All recycled water, rainwater and graywater irrigation systems shall be designed and operated in accordance with all applicable local and State laws." SqCWD will develop rules and requirements for purified water service supplied to TLC or any other future customers for non-potable recycled water uses approved under CCR Title 22 and amend SqCWD Ordinance 22-03 (SqCWD, 2022b), which establishes rules and regulations for water service, to reflect this new water supply source. Customers like TLC applying for purified (recycled) water service must agree to comply with the terms of their purified (recycled) water use permit as well as applicable Federal, State and Local statues, to protect public health. The on-site operational controls must be appropriate for the beneficial use approved in the recycled water use permit for the safe and reliable delivery of purified (recycled) water. Examples of requirements for non-potable use of purified (recycled) water, which may be added to Ordinance 22-03, include cross-connection prevention measures, such as backflow preventers or reduced pressure principal devices, installed and maintained to comply with requirements of DDW and the County of Santa Cruz. Hose bibs are not allowed in the recycled water system; rather, quick couplers or comparable connection devices shall be used. All recycled water valves, outlets, quick couplers, and sprinkler heads shall be of a type or secured in a manner that only permits operation by personnel authorized by the customer. The customer must designate an on-site supervisor trained in recycled water use. Recycled water piping, valves, and outlets shall be colored (purple) or marked to differentiate it from potable facilities. Signage in conformance with Title 22 regulations must be installed at use sites to notify the public, employees, and others that recycled water is being used.

15.5 Notification Procedures

As detailed in **Section 15.2.1**, SC WWTF operations staff will operate the SWPS and TTF to provide a consistent flow, operating within the planned flow range identified in **Section 5**, to the AWPF. In turn, the Chanticleer AWPF operations staff will maintain the ability to receive flow at the AWPF. The notification procedures are summarized in **Table 15-10**.

Table 15-10. SC WWTF, AWPF and Wellfield Process Equipment Redundancies and Routine Maintenance Activities

Location	Action	Planned Response	Notification Protocol
SC WWTF	Planned flow reduction or operational challenge that would prevent the SWPS/TTF from operating within planned flow range	SC WWTF senior operator/shift superintendent will notify via phone and e-mail the AWPF senior operator/shift superintendent and then AWPF senior operator/shift superintendent will respond via e-mail confirming receipt	As soon as possible
	Planned AWPF shutdown requiring SWPS/TTF flow reduction	AWPF senior operator/shift superintendent will notify via phone and e-mail the TTF senior operator/shift superintendent and then TTF senior operator/shift superintendent will respond via email confirming receipt	Three working days prior to the change
	Unplanned flow reduction or SWPS/TTF planned flow range exceedance	SC WWTF senior operator/shift superintendent will notify via phone and e-mail the AWPF senior operator/shift superintendent	As soon as possible
AWPF	Unplanned AWPF shutdown requiring SWPS/TTF flow reduction	AWPF senior operator/shift superintendent will notify via phone and e-mail TTF operator and then TTF operator will respond via email confirming receipt	As soon as possible
SC WWTF or AWPF	Emergency notification	Senior operator/shift superintendent at the plant with the emergency will also notify via e-mail other parties on the Recycled Water Delivery Notification List	As soon as possible

The City shall follow the notification requirements included in WDRs Order No. R3-2017-0030, NPDES Permit No. CA0048194 for SC WWTF. SqCWD shall follow the notification requirements included in the WDR/WRR permit specific to the project AWPF, upon its issuance. SqCWD will follow the notification requirements in Title 22 as well, which are expected to be incorporated into the Project's WDR/WRR permit.

15.6 Training

Operations at the SC WWTF will be handled by SC WWTF operators; they will operate the TTF and the SWPS.

As stated above, the AWPF will be operated by third party contract operators; they will operate the AWPF to produce purified water for groundwater recharge. The recharge wells will be operated by SqCWD.

For all groups, startup will include classroom and hands-on operator training for all new facility components. On-going hands-on training will also be provided at each facility. Training and O&M manuals for each major system component (from the respective equipment manufacturers) and for the facilities as a whole will also be provided. Electronic copies of the SC WWTF O&M manual for operation of the TTF and SWPS will include descriptions of:

- Contact information for all operations staff, supervisors, SC WWTF management, SqCWD staff, and state agency liaisons (e.g., RWQCB and DDW), and other agencies as appropriate

- All processes
- Links to equipment specifications and manufacturer O&M manuals
- Control systems
- Design criteria
- Routine maintenance and operations, including start-up and shut-down protocols and critical control points operations
- Alarms
- Compliance monitoring and data recording
- Handling of off-specification water, including notification protocols

All operators at the SC WWTF will be hired by the City and meet permit certification requirements for the SC WWTF. All contract operators for the AWPF will be hired by the Facility Operator and meet permit certification requirements as specified in the AWPF operating permit. Continuing education will be maintained by all operations staff as a requirement by the Office of Operator Certification and operations permits.

15.7 AWPF Preliminary Staffing Plan

The AWPF will be staffed Monday through Friday, 7am-4pm by certified operators as listed below. Operators will be on call outside of normal working hours, weekends, and holidays. Remote operation capability is not anticipated. Response to alarms during off hours will be by the appropriate on-call personnel on the Operations staff. Alarm response time will be based on the alarm level (e.g., critical will be as soon as possible, low level alarms will be cleared during normal business hours). Notifications will be as described in **Section 15.5**.

A statewide certification program has yet to be formally adopted for the operation of advanced treatment facilities, however, the City anticipates that wastewater-certified operators with supplemental experience with membrane and advanced treatment processes and appropriate advanced water treatment certifications will be responsible for operation of the AWPF. Alternatively, water treatment operators with cross-certificates in wastewater processes and advanced water treatment will be considered for positions at the AWPF. The preliminary staffing estimated for the AWPF includes:

- Three operators:
  - The Chief Plant Operator will have at least an (Advanced Water Treatment) AWT3™ certification at the start-up of the facilities; within 36-months of AWPF operation, the Chief Plant Operator will obtain an AWT5™ certification.
  - At least one lead operator per shift or on-call will have AWT3™ certification at AWPF start-up.
- One maintenance staff member
- One instrumentation and control maintenance staff member
- One project manager

Details of the proposed staffing plan will be developed during final design of the Project and included in the OOP.

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Section 16: Technical Managerial and Financial Capacity

SqCWD has the necessary TMF capacity to support the PWS Project. Title 22 Section 60320.200 requires that the sponsor of a project for groundwater replenishment using recycled water via subsurface application demonstrate that it possesses adequate technical and managerial capacity for the proposed GRRP. Although DDW has yet to develop specific TMF requirements for potable reuse system operations, elements of the DDW TMF Assessment for Public Water Systems can be used as the basis for SqCWD to demonstrate its TMF capacity for the PWS Project.

16.1 Background

The 1996 federal Safe Drinking Water Act required states to incorporate TMF capacity into public water system operations. This requirement helps ensure that public water systems have long-term sustainability and are able to maintain compliance with all applicable drinking water laws and regulations.

The California Safe Drinking Water Act goes beyond the federal requirements by applying the TMF instructions and requiring assessments for not only community water systems but also transient noncommunity water systems, water systems changing ownership, and water systems seeking financing from the State.

SqCWD has submitted the TMF assessment as a public water system to the SWRCB as part of the information needed to receive state funding for the PWS Project (SqCWD, 2020).

16.2 Technical Capacity

SqCWD has demonstrated its technical ability to implement and operate the PWS Project by:

- Operating and maintaining a water infrastructure and distribution system to deliver a reliable, high quality, safe supply of drinking water to its customers
- Monitoring groundwater levels (overdraft) and water quality (seawater intrusion) using strategically-placed coastal monitoring wells
- Implementing sustainable and environmentally protective water resource management solutions to meet the water supply needs of the service area
- Completed planning reports and pre-design documents in preparation for implementing the PWS Project
- Prepared and certified the Final EIR for the PWS Project (ESA, 2018), an Addendum to the EIR (ESA, 2020), and an additional Addendum to the Final EIR (ESA, 2021) and conducting further environmental analysis, as needed, with furthering design of the PWS Project.
- Completed technical planning and reports to secure grant funding and low-interest loans for the PWS Project
- Managing final design and construction phases of the PWS Project.

16.2.1 Consolidation Feasibility

SqCWD was founded in 1961 as Soquel Creek County Water District after a local ballot measure was passed to establish the agency and elect five directors to carry out the purpose of providing flood control and water conservation services. SqCWD was formed according to the provisions of County Water District Law under Division XII of the California Water Code (Section 30000 et seq.).

SqCWD acquired the Monterey Bay Water Company in 1964 and discontinued flood control services. In 1983, "County" was dropped from the name and Soquel Creek County Water District became known as Soquel Creek Water District. The name is something of a misnomer, however, because SqCWD's sole source of water supply is groundwater; literally no water is provided by Soquel Creek.

SqCWD manages the groundwater basin and provides drinking water to residents and businesses within the unincorporated communities of Aptos, La Selva Beach, Rio Del Mar, Seacliff Beach, Seaside, and Soquel, as well as the City of Capitola. Groundwater is the sole source of supply.

SqCWD is an active participant in the local joint powers agency, the Santa Cruz MGA, which was formed to provide oversight and take responsibility for bringing the groundwater basin into sustainability by 2040. The MGA is a partnership among the City and County of Santa Cruz, Central Water District, SqCWD, and three private well representatives. Enabling the agencies to work together, the MGA focuses on regional groundwater management in the Mid-Santa Cruz County area. The MGA has effectively addressed the issue of consolidation for groundwater management in the area when it was formed in 2016. Since then, SqCWD has actively participated in the MGA with elected Board of Directors from SqCWD serving as Chair or Vice-Chair. The MGA developed and adopted a GSP on November 19, 2019 (Santa Cruz MGA, 2019) and submitted to the State on January 30, 2020. The State announced approval of the GSP on June 3, 2021. As required by the CCR for GSPs, the MGA has submitted its two Annual Reports to DWR for 2020 and 2021.

As part of the solution to achieve water sustainability by 2040, a list of projects and programs were identified in the GSP, with the PWS Project as a key element. The PWS Project, at its currently designed capacity of producing up to 1,500 afy of purified water, has been included as a primary Group 2 project in the GSP. PWS is also identified as a Group 3 project in the GSP whereby an expansion of up to 3,000 afy of purified water could be developed should the region need to meet water shortage drought needs or the Basin needs additional supplies to meet sustainability goals based on project performance and monitoring of the GSP's implementation measures.

16.2.2 System Description

SqCWD is located in Santa Cruz County and encompasses seven miles of shoreline along the Monterey Bay, and extends from one to three miles inland into the foothills of the Santa Cruz Mountains. The City of Capitola is the only incorporated area within SqCWD. Unincorporated communities include Aptos, La Selva Beach, Rio Del Mar, Seascape, Seacliff Beach, and Soquel. SqCWD is responsible for supplying potable water to a population of approximately 40,677 people with approximately 14,518 active service connections (SqCWD, 2021). Approximately 94 percent of the water connections are single-family and multifamily residential properties. The remaining 6 percent are primarily comprised of commercial connections (approximately 4 percent), followed by dedicated landscape/outdoor water use connections (approximately 2 percent). Institutional connections, and connections used by SqCWD for facility operations and maintenance, each comprise less than 1 percent of the total number of connections. There are currently no agricultural or industrial connections to SqCWD's distribution systems.

SqCWD currently receives 100 percent of its water supply from local groundwater sources and pumps groundwater from the Basin. While SqCWD is generally 100 percent reliant on its groundwater supply, its distribution system includes interties with CWD, the SCWD, Pure Source Water Inc., Trout Gulch Mutual Water Company, and Cabrillo College for emergency aid.

SqCWD's water supply system consists of 16 active groundwater production wells, approximately 166 miles of main pipeline, and 18 water storage tanks. SqCWD currently receives 100 percent of its water from groundwater aquifers in the Basin. The aquifers are located within two geologic formations that underlie SqCWD service area. The Purisima Formation provides approximately two-thirds of SqCWD's annual production and serves the communities of Capitola, Soquel, Seacliff Beach, and Aptos. The Aromas Red Sands aquifer provides the remaining one-third of SqCWD's annual production and mainly serves the communities of Seascape, Rio Del Mar, and La Selva Beach.

SqCWD monitors groundwater levels and water quality using 80 strategically placed monitoring wells.

The total water production capacity of the existing system is estimated at approximately 7 mgd. The total existing water storage capacity is approximately 7.5 MG. On average between 2007 and 2016, SqCWD produced an average of approximately 4,020 AFY of water; recent water production has been lower, about 3,000 AFY, due to conservation (SqCWD, 2020).

The PWS Project components will include water recycling and advanced treatment facilities, pump stations and pipelines, SWIP/recharge wells and monitoring wells. A new SWPS and pipeline will convey secondary-treated wastewater from the SC WWTF to the new AWPF that will be located at the Chanticleer site. Purified water will be pumped to three SWIP/recharge wells at the TLC, Monterey Avenue, and Willowbrook Lane sites. Monitoring wells will be installed downgradient of the recharge wells. Stored groundwater will address the State's mandate under SGMA, help prevent seawater intrusion, recharge the aquifer, and improve water quality.

16.2.3 Certified Operators

SqCWD currently has State-certified Water Treatment Plant Operators and Distribution System Operators that oversee and manage the daily operations of pumping, treating, and conveying groundwater. This information is submitted to the SWRCB DDW.

When the PWS Project is operational, it will also be staffed with certified and trained operators. The proposed staffing plan is currently being developed for the OOP. A statewide certification program was adopted in spring 2019 for the operation of advanced water treatment (AWT) facilities. While not required at the present time, AWT operator certification helps address specialized expertise and prepares for anticipated future requirements. Operators currently holding either a Grade 3 or higher drinking water or wastewater certification are eligible to take the AWT operator certification exams. Certification levels advance from 3 to 5, with AWT5 as the highest level, similar to those for drinking water or wastewater treatment plant operators.

With the AWT certification program in its infancy, operators at water recycling facilities may hold either wastewater treatment or drinking water treatment certificates. At Class IV and V water recycling plants, at least 50 percent of the operators on staff must hold at least a wastewater Grade II certificate. SqCWD anticipates that wastewater-certified operators with supplemental experience with membrane and advanced treatment processes will be responsible for operation of the tertiary treatment facilities and AWPF. Alternatively, water treatment operators with cross-certificates in wastewater processes will be considered for positions at the AWPF.

SqCWD anticipates the operations and maintenance staffing for the Pure Water Soquel Program to be:

- Utilizing existing City of Santa Cruz Public Works staff for the SWPS at the SC WWTF
- Engaging an outside entity for operation and maintenance of the PWS Project AWPF at the Chanticleer Site
- Utilizing existing and new SqCWD staff for the operations and maintenance of the conveyance pipelines, SWIP recharge wells, and monitoring wells.

16.2.4 Source Capacity Assessment

As stated previously, SqCWD's sole source of water is groundwater. In 2014, the SGMA was passed and mandated that all groundwater basins be sustainable by 2040. The Basin is one of 21 basins that the State of California has identified as critically overdrafted and unsustainable. Based on groundwater modeling and SqCWD's Board of Directors desire to pump within the safe yield of the Basin to reduce further overdraft conditions, a goal of pumping no more than 2,300 afy of groundwater was established to maintain protective water levels at the Coast. A groundwater emergency and stage 3 water shortage were declared in 2014 with aggressive conservation measures put in place to reduce water demands. While water demands were peaking in 2013 at 4,288 afy, conservation efforts reduced water demands to 3,246 afy in 2019. With the statewide housing crisis and conservation hardening, water use is projected to increase in the future.

A new water supply (purified recycled water) is being developed through the PWS Project. This water source will be used to replenish the groundwater basin, create a seawater intrusion barrier, and aid in diversifying SqCWD's water portfolio and resiliency. The source water for the PWS Project will come from the treated municipal wastewater produced at the SC WWTF. With a permitted capacity of 17 mgd (dry weather average monthly discharge rate), the SC WWTF has more than enough treated wastewater to supply the PWS Project. The average wastewater flow rates in 2014 were approximately 8.1 mgd. Approximately 25 percent of this average flow of secondary effluent will be required for the PWS Project and will receive subsequent advanced water treatment to produce up to 1.7 mgd of purified water for recharging the groundwater basin. On July 21, 2017, the City and SqCWD entered into a Memorandum of Understanding memorializing preliminary terms related to the PWS Project, and followed with a formal Agreement on July 19, 2019, regarding the source water, design, construction, start-up, and ownership of the tertiary facility component of the PWS Project. Furthermore, on November 24, 2020, the City at their council meeting, and on December 1, 2020, the SqCWD at their board meeting, both unanimously voted to enter into a land lease agreement for the construction and operation of the SWPS at SC WWTF (SqCWD and City, 2020).

16.2.5 Operations Plan

SqCWD currently maintains an operations plan for its groundwater system that is included in its annual report to the Drinking Water Program for Large Water Systems. This report includes its water quality and sampling program, cross connection control, water system improvements, handling of complaints, dead end flushing program, valve exercise program, storage tank inspections and cleanings, water loss, and catalog of infrastructure and systems pressures.

For the PWS Project, as discussed in **Section 15** a comprehensive OOP will be prepared and submitted to DDW for review and approval prior to beginning operation of the PWS Project. The OOP will include all the required information specified in Section 60320.222 (CCR, 2018). **Section 15** presents the general operations plan for the PWS Project.

16.2.6 Training

One of SqCWD's organizational goals is expanding employee development, maintaining workforce excellence, and supporting strong Board governance. Ongoing training sessions on treatment and conveyance regulations, BMPs, and safety are routinely offered and scheduled for SqCWD staff.

For the PWS Project, training will include instructional sessions conducted by equipment manufacturers with hands-on demonstrations at the facilities as discussed in **Section 15**. Internal SOPs will be developed to facilitate routine tasks, as needed, and transfer information between staff. It is anticipated that operators of the SC WWTF and AWPF will collaborate to share information and support the upstream and downstream treatment processes and better understand the interrelationships that will ensure the PWS Project's success.

SqCWD proposes to conduct training sessions for SqCWD staff (including SqCWD contract operators at both the Chanticleer AWPF and the SC WWTF for PWS Project components) to expand the PWS Project operations staff's understanding of treatment processes, operating procedures, troubleshooting, and emergency response protocols. Safety "tailgate" meetings will be conducted for operations and maintenance staffs at the PWS Project's facilities to maintain safe workplaces and superior safety records.

16.3 Managerial Capacity

SqCWD is a nonprofit, local government agency that provides water resource management within its service area to deliver a safe and reliable supply of high-quality water to meet present and future needs in an environmentally sensitive and economically responsible way.

16.3.1 Ownership

As presented earlier, SqCWD was founded in 1961 after a local ballot measure was passed to establish Soquel Creek County Water District and elect five directors to carry out the purpose of providing flood control and water conservation services. SqCWD was formed according to the provisions of County Water District Law under Division XII of the California Water Code (Section 30000 et seq.).

SqCWD acquired the Monterey Bay Water Company in 1964 and discontinued flood control services. In 1983, "County" was dropped from the name and SqCWD became known as SqCWD.

SqCWD's values and culture address the question "What do we stand for?" Core questions accompany the core values and help drive day-to-day business actions by staff as well as decision making by the Board as shown in **Table 16-1**.

Table 16-1. SqCWD's values and culture

Value	Core Value Question
Fairness, Honesty, and Ethics	Does the decision/action treat all concerned fairly, honestly, and ethically?
Customer Service	Does the decision/action reflect high-quality customer service?
Environmental Stewardship	Does the decision/action consider the impact to the environment and ways to protect it?
Collaboration	Does the decision/action promote collaboration with others?
Commitment and Dedication	Does the decision/action show commitment and dedication to support the mission of SqCWD?

SqCWD has demonstrated its ability to proficiently manage its public water system and has received numerous awards for community outreach, public process and transparency, and budgeting excellence. In 2019, SqCWD's General Manager received the "Special SqCWD Administrator Certification."

A core management team has been put together to design and implement the PWS Project. SqCWD intends to utilize the experience of its leaders and established procedures to manage all aspects of the PWS Project.

16.3.2 Water Rights

In California, water rights involve the right to use water, not the right to own water. From a water law standpoint, SqCWD possesses appropriative water rights as a public agency and has the right to store, recharge and to recapture water in the Basin:

- SqCWD has the right to recapture water that has been added to the groundwater supply as a result of recharge
- SqCWD has the right to further prevent other groundwater producers from extracting the replenished supply, although this could require litigation, and in some cases adjudication of all rights to the groundwater basin may be necessary to determine rights to the total supply
- The underground storage and recovery of the groundwater basin cannot substantially interfere with the Basin's native or natural groundwater supply

The Basin is not adjudicated; it is a shared groundwater basin used by the City of Santa Cruz, Central Water District, and SqCWD, plus private well owners. In 2016, following the regulations of the SGMA, the Santa Cruz MGA, a joint powers agency, was formed to develop the GSP and bring the groundwater basin into sustainability by 2040 (Santa Cruz MGA, 2016). For the PWS Project, the City and SqCWD entered into an Agreement in 2019 for the source water for the PWS Project (treated wastewater, secondary effluent) (City and SqCWD, 2019). This Agreement followed previous documents between the City and SqCWD. The agencies' collaboration represents the multiple benefits recognized would come from the PWS Project including reducing ocean discharge of treated wastewater and increasing water recycling and beneficial reuse.

16.3.3 Governance and Organizational Structure

SqCWD is a special district in California. SqCWD is governed by a five-member Board of Directors elected to staggered four-year terms by voters who reside in SqCWD's service area. The Board oversees three committees: (1) Water Resource Management and Infrastructure, (2) Public Outreach, and (3) Finance and Administration Services. Two directors are selected by the Board to serve on the Santa Cruz MGA Board, which is a Joint Powers Agency formed to ensure regional groundwater sustainability.

As of 2020, SqCWD has a total of 47.8 full time equivalent staff working under the direction of the General Manager and Board of Directors. To accommodate the PWS Project's operational needs, it is envisioned that new staff may be hired and assigned to the Engineering Departments and Operations and Maintenance Division. SqCWD is also planning to contract with the City to operate and maintain the SWPS and with a third-party operations firm for the AWPF.

A more detailed staffing plan will be prepared as part of the PWS Project final design phase.

16.3.4 Emergency Response

Since 2012, SqCWD has maintained an Emergency Response Plan (ERP). The purpose of the ERP is to provide a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin. The ERP also describes how to respond to potential threats of actual terrorist scenarios identified in the vulnerability assessment,

as well as additional emergency response situations. Included in the ERP are specific action plans that will be used to respond to events and incidents.

The goals of the ERP are to: (1) rapidly restore water service after an emergency, (2) ensure adequate water supply for fire suppression, (3) minimize water system damage, (4) minimize impact and loss to customers, (5) minimize negative impacts on public health and employee safety, and (6) provide emergency public information concerning customer service.

Just as SqCWD has emergency response procedures in place for its facilities, it is anticipated that similar emergency response procedures would be extended to the PWS Project facilities. The existing emergency procedures involve immediately calling emergency responders in the case of personnel injury or illness, notifying Operations and Maintenance Division supervisors and manager, and reporting to the RWQCB, DDW, and other appropriate regulatory agencies.

The PWS Project includes provisions for reliability, including both failure prevention (redundancy and robustness), and failure response (resilience) elements. Critical control points and limits for pathogenic microorganism control and treatment process performance optimization are described in this Title 22 Engineering Report, as well as response retention time compliance, which focuses on protecting public health and the environment in the event of a water quality or process performance issue. This Title 22 Engineering Report presents the PWS Project contingency plan, including response and notification communication plans.

The OOP will include detailed emergency operating procedures, action plans, and emergency response procedures for the PWS Project.

SqCWD will follow procedures outlined in the OOP, which will parallel many aspects of ERP to address short- and long-term adverse impacts of the PWS.

In accordance with Section 1433(b) of the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, California Health and Safety Code (Section 116460, 116555, and 116750), and California Waterworks Standards (Section 64560), SqCWD has prepared an ERP to provide a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of natural or man-made origin. The SqCWD ERP includes specific action plans that serve as a guide for responding to the following types of emergencies: power outages, winter storms, earthquakes, structural failures, contamination, bomb threats, and other water supply emergencies. The ERP also describes how to respond to potential threats or actual terrorist scenarios identified in SqCWD's vulnerability assessment, as well as additional emergency response situations. A Risk and Resilience Assessment and updated ERP has been prepared to comply with Section 2013 of the America's Water Infrastructure Act of 2018.

Specific actions associated with short- and long-term impacts of the PWS are described in this Engineering Report in **Section 12.1.3 "Time Necessary to Provide an Alternative Safe Source of Drinking Water" and Section 13.5 "Alternative Water Source"**. These actions demonstrate PWS compliance with CCR Title 22 Section 60320.200(b) and SqCWD's commitment to provide safe drinking water to owners of a producing drinking water well (SqCWD-owned or non-SqCWD-owned (private) that becomes adversely impacted by PWS.

Many aspects of SqCWD's commitment to the PWS overlap with its ERP. For example, action plans for:

- Changes to the SqCWD water distribution system:
  - Remove adversely impacted well(s) from service and rely on other wells
  - Blending from multiple unaffected SqCWD wells

  - Utilize existing interagency connections to obtain supplemental water from a neighboring agency should there be a water supply shortage
  - Install well-head treatment
- Short-term responses:
  - Supply bottled water to the affected party(ies)
  - Provide trucked water to replace groundwater from non-SqCWD-owned (small private wells
  - Install a temporary connection to SqCWD's distribution system
- Long-term responses:
  - Construct well-head treatment
  - Monitor groundwater quality to track contaminants originating from the PWS
  - Install a permanent connection from the SqCWD distribution system to the impacted non-SqCWD (private) well owner

In summary, SqCWD will manage the PWS and address any adverse impacts caused by the PWS by providing alternative water source(s) using the methodology outlined in its OOP, ERP, and latest Urban Water Management Plan.

16.3.5 Policies

SqCWD has a number of policies related to the operation of its water systems. Human Resources-related policies are included in SqCWD's Employee Handbook and Memorandum of Understanding, and the Family and Medical Leave Act/California Family Rights Act guidelines. Financial policies are included in **Section 16.4**. Many of those policies will be applicable to the management, operation, and maintenance of the PWS Project. During the design and implementation phase of the PWS Project, the need for development of additional policies or revisions to existing policies will be assessed.

16.4 Financial Capacity

SqCWD has received numerous awards demonstrating it financial capacity.

In November 2016, SqCWD received its first "Distinguished Budget Presentation Award" from the GFOA for its annual budget for the fiscal year 2016-17. In order to receive this award, SqCWD's budget needed to meet necessary criteria set forth by GFOA, which included designating the budget as a policy document, an operations guide, a financial plan, and communication device.

In February 2017, SqCWD received the highest honor from the California Society of Municipal Finance Officers: the "Operating Budget Excellence Award" for its fiscal year 2016-17 budget.

More recently, SqCWD was awarded the "Distinguished Budget Presentation Award" by the GFOA for its 2018-19 budget and its 2019-20 budget. This award represents a commitment by SqCWD's governing body and staff to meet the highest principles of governmental budgeting and to develop a budget document that serves as a policy document, a financial plan, an operations guide, and a tool for effective communications.

Over the last three years, SqCWD has accomplished these financial milestones:

- Adopted five years of Proposition 218 Rates in 2019 with rate increases that included 100 percent debt financing of the PWS Project (estimated at Class IV, $90M)
- Awarded $50M Proposition 1 Groundwater Grant from SWRCB
- Secured a $25 M Low-Interest Loan through Seawater Intrusion Control Loan Program from SWRCB
- Secured a low-interest loan through the WIFIA from USEPA for up to $88.9M
- Secured short-term bridge financing through CoBANK. (Revolving credit agreement with CoBANK to finance short-term cash flow needs prior to receiving draws from the long-term funding sources (e.g., grants and low interest loans).
- Selected for $30M in grant funding by the Bureau of Reclamation through its Title XVI program
- Received and completed requirements for $2M Proposition 1 Groundwater Replenishment and SWIP Planning Grant from SWRCB

16.4.1 Budget Projections/Capital Improvement Plan

Each year, SqCWD Board of Directors approves a budget that lays out how SqCWD plans to maintain and improve the water system on behalf of its customers. This budget provides a framework for combining SqCWD goals, operating plans, and infrastructure projects into one comprehensive document. Once approved by the Board, SqCWD continues to closely monitor projects, expenditures, and revenues throughout the year to ensure the integrity and quality of the operation.

SqCWD's annual budget consists of two major components: Operations Budget and Capital Improvement Program (CIP) Budget. The Operations Budget includes revenue and expenditures SqCWD produces in the course of daily operations as well as Non-Operating revenues and expenditures created through investment or debt service. The CIP Budget encompasses the acquisition or construction of major capital facilities, infrastructure improvements, specific projects, or equipment.

SqCWD, as a special district of the State of California, is a not-for-profit agency. SqCWD does not receive any tax revenues. Primary operating revenue is generated through billing SqCWD customers for water sales and service charges and is supported by annual rate increases.

SqCWD's fiscal year runs from July 1 through June 30 of the following year.

For long-term financial forecasts, SqCWD utilizes various planning strategies:

- Strategic Plan, which includes goals to support SqCWD's mission statement, e.g., groundwater sustainability.
- Community Water Plan, which informs customers about local water challenges and actions underway to protect the groundwater basin, ensure water supply reliability and resiliency, and prepare for climate change and future water supply concerns. The PWS Project is a key element in the Community Water Plan.
- Capital Improvement Plan, which includes project schedules and projected costs for production and water supply facilities identified in the Community Water Plan and through SqCWD's infrastructure program. The Capital Improvement Plan is a ten-year forecast and includes the PWS Project.
- 10-Year Finance Plan, which includes short and long-range projections of SqCWD's revenues, operating and maintenance expenses, capital expenditures, and reserves over the next decade. The PWS Project is a factor in the financial plan. The finance plan forms the basis for any potential rate changes.
- Annual Budget, which is adopted by the Board of Directors each year and provides forecasts for revenues, operating expenditures, and capital expenditures.

The SqCWD Fiscal Year 2022-23 Budget was adopted on June 21, 2022.

16.4.2 Budget Controls and Audits

SqCWD is required to adopt a balanced budget by July 1 of each fiscal year (July 1 – June 30). The balanced budget allows for revenues to be equal to or exceed current expenditures; reserves may be used to augment current revenues. The annual budget may only be amended with Board approval.

Financial policies and practices are used by SqCWD for operational and strategic decision making. The financial policies include:

1. Investment Policy, which provides a guideline for prudent investment of surplus cash, reserves, trust funds, and restricted monies as well as maximizes the efficiency of SqCWD's cash management system.
2. Reserve Policy, which covers the Operating Reserve Fund and Capital Facilities Reserve Fund. The Operating Reserve serves to ensure that SqCWD will always have sufficient funds to meet annual operating costs. The Capital Facilities Reserve serves to ensure that SqCWD will be able to deliver a sufficient supply of water to its customers by providing for maintenance, repair, replacement, or improvement of water system infrastructure.
3. Purchasing Policy, which defines the authority of SqCWD staff to procure consultants, supplies and materials.
4. Debt Management Policy, which allows for the use of debt for acquisition, refurbishment, replacement, or expansion of capital assets with a minimum useful life to the term of debt service (minimum debt coverage ratio of 1.7).

A financial audit is conducted annually by an independent auditor.

Section 17: References

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Appendix A: Public Hearing Documentation

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Public Hearing Outreach for Pure Water Soquel Engineering Report- Summary

The Pure Water Soquel (PWS) Project (Project) is a new groundwater replenishment project using recycled water that is being implemented by Soquel Creek Water District (SqCWD), for the purpose of replenishing and sustaining the overdrawn Santa Cruz Mid-County Groundwater Basin and providing a seawater intrusion barrier. As the Project intends to inject the recycled water to sub surface basin(s) for beneficially reusing the recycled water, the project is classified as a Groundwater Replenishment Reuse Project (GRRP) by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) and the Central Coast Regional Water Quality Control Board (RWQCB).

The Title 22 Engineering Report was completed by SqCWD in October 2022 and approved by DDW to move forward with a public hearing in compliance with the Water Recycling Criteria specified in the California Code of Regulations (CCR), Title 22, Division 4, Chapter 3 (CCR, 2014).

SqCWD completed the following public and stakeholder outreach associated with the Title 22 Engineering Report and public hearing:

1. Title 22 Engineering Report and public notice posted on the PWS website
   - Link : https://www.soquelcreekwater.org/647/Pure-Water-Soquel-Groundwater-Replenishm

2. Public hearing notice (English and Spanish) was posted at Soquel Creek Water District main office location, 5180 Soquel Drive, Soquel, CA 95073.

3. Public notice mailed to all potential well owners within 10-year modeled travel time zone and entities SqCWD has interties with

4. Announcement of the Public Meeting in the Manager's Update at 11/22/2022 Soquel Creek Water District Board meeting

5. Newspaper Notice in the Santa Cruz Sentinel (on November 1 and November 15, 2022)

6. Hosted Public Hearing via ZOOM on December 1, 2022
   - Powerpoint Presentation, recording, and responses to public comment posted on PWS website
   - Link : https://www.soquelcreekwater.org/647/Pure-Water-Soquel-Groundwater-Replenishm

Documentation Provided in the Engineering Report with this Summary

- Public Notice (English and Spanish)
- Copy of Newspaper Notice
- 12/1/2022 – Powerpoint Presentation
- Responses to Public Comments

SOQUEL CREEK WATER DISTRICT

Mail: P.O. Box 1550 • Capitola, CA 95010 • Office: 5180 Soquel Drive, Soquel, CA 95073

Tel.831.475.8500 • Fax.831.475.4291 • www.soquelcreekwater.org

Board of Directors
Dr. Thomas R. LaHue, President
Carla Christensen, Vice-President
Dr. Bruce Daniels
Dr. Bruce Jaffe
Rachél Lather

Ron Duncan, *General Manager*

NOTICE OF PUBLIC HEARING
PURE WATER SOQUEL GROUNDWATER REPLENISHMENT REUSE PROJECT

The public is invited to attend a public hearing on the Pure Water Soquel (PWS) Project. The hearing is being held in accordance with Title 22, Division 4, Chapter 3, Article 5.2, §60320.202 of the California Code of Regulations (Title 22).

Background: Soquel Creek Water District (SqCWD) is a public water agency that relies solely on groundwater for its water supply. The Santa Cruz Mid County Groundwater Basin (Basin), the primary source of water for SqCWD, is in a state of critical overdraft; groundwater has been extracted at a rate that has caused seawater intrusion. Seawater intrusion has been detected as high chloride concentrations in some of the coastal monitoring wells in the Basin, which has been confirmed by geophysical mapping. Despite significant conservation efforts in the region, the groundwater basin remains critically overdrafted and an additional water supply is required to supplement the natural recharge of the Basin and combat the seawater intrusion. Planning for a reliable, high-quality and affordable water supply that protects groundwater resources is a top priority for SqCWD. To that end, SqCWD is implementing the PWS Project.

Project: The PWS Project is a new groundwater replenishment reuse project (GRRP) using highly purified recycled water proposed by SqCWD. The primary goal of the PWS Project is to produce up to 1,500-acre feet per year (afy) of purified water for groundwater replenishment intended to prevent further seawater intrusion and improve the Basin's reliability as a water supply. The sustainable water supply will allow for a reliable, drought-resistant supplemental water source for SqCWD's customers and others who rely on the basin.

The Santa Cruz Wastewater Treatment Facility (SC WWTF) will provide secondary effluent (referred to as source water) that will undergo water purification treatment to produce purified water for the PWS Seawater Intrusion Prevention (SWIP) wells. The source water conveyed to the advanced water purification facility (AWPF) at Chanticleer Avenue will be treated via ozonation, membrane filtration (MF), reverse osmosis (RO), ultraviolet disinfection with hydrogen peroxide, and conditioning via post treatment stabilization prior to being pumped to the SWIP wells for groundwater recharge. The PWS Project will produce purified water that will comply with the California Code of Regulations Title 22, Article 5.2 for a Groundwater Replenishment Reuse Project and meet all federal and state drinking water regulations.

Available Information: A copy of the Pure Water Soquel Engineering Report is available for public review at www.soquelcreekwater.org/GRRP. Any questions regarding this project may be directed to PureWaterSoquel@soquelcreekwater.org.

Public Hearing: The State Water Resources Control Board, Division of Drinking Water and Soquel Creek Water District will conduct an on-line public hearing as part of the Title 22 approval process. The public hearing will begin with a brief presentation about the project, followed by an opportunity for public comments and questions.

Title 22 Pure Water Soquel Engineering Report Public Hearing
Thursday, December 1, 2022 at 5:30 pm, PST
Online Zoom Meeting: https://bit.ly/3CBSvYh
Meeting ID: 878 6849 8787
Passcode: 676862
Phone only: 1-669-900-6833

Public Comments: All public comments on the Pure Water Soquel Engineering Report can be made as written or as an oral comment at the public hearing. Written comments must be submitted and received no later than 5:00 pm on December 8, 2022 via mail or email:

Email to:
PureWaterSoquel@soquelcreekwater.org
Subject Line: PWS Title 22 Engineering Report

Mail to:
Soquel Creek Water District
ATTN: Pure Water Soquel Project Title 22 Engineering Report
PO BOX 1550
Capitola CA 95010

##

31 de octubre de 2022

Estimado/a:

Soquel Creek Water District (SqCWD) está implementando el proyecto Pure Water Soquel (PWS), que es un proyecto de reutilización de reposición de agua subterránea que incluirá la instalación de tres pozos de prevención de intrusión de agua de mar (SWIP). Los pozos SWIP repondrán y sostendrán la cuenca de agua subterránea críticamente sobreexplotada de Santa Cruz Mid-County con agua reciclada purificada para crear una barrera hidráulica y evitar que ocurra una mayor intrusión de agua de mar en la cuenca de agua subterránea. Estos pozos de reposición son una parte integral de PWS para garantizar un suministro de agua confiable para las generaciones actuales y futuras.

La División de Agua Potable de la Junta Estatal de Control de Recursos Hídricos y el Soquel Creek Water District llevarán a cabo una audiencia pública en línea como parte del proceso de permisos para el proyecto Pure Water Soquel. La audiencia pública comenzará con una breve presentación sobre el proyecto, seguida de una oportunidad para comentarios públicos. Se ha preparado un Informe de Ingeniería que describe la información sobre el Proyecto y el plan general para el cumplimiento del Código de Regulaciones de California (CCR) Title 22 para la reposición de agua subterránea con agua reciclada.

Su propiedad en ---------- ha sido identificada como en posesión o potencialmente en posesión de un pozo de agua potable dentro del "tiempo de viaje" de 10 años del proyecto PWS, y, como tal, una notificación sobre la próxima audiencia pública se le está enviando directamente a usted.

La audiencia pública en línea sobre el Informe de Ingeniería de PWS se llevará a cabo de conformidad con el Código de Regulaciones de California, Title 22, Sección 60320.202:

Fecha: Jueves, 1 de diciembre de 2022

Hora: 5:30 p. m. PST

Enlace de ZOOM: https://bit.ly/3CBSvYh
Código de acceso: 676862

Solo por teléfono: Marque 1-669-900-6833
ID del Seminario web: 878 6849 8787
Código de acceso: 676862

Para obtener más información sobre el proyecto, consulte el **aviso adjunto**. Además, para acceder a una copia electrónica del Informe de Ingeniería de PWS, visite el sitio web de SqCWD en www.soquelcreekwater.org/GRRP.

El comentario público sobre el Informe de ingeniería de PWS se puede hacer por escrito o como un comentario oral en la audiencia pública. **Los comentarios escritos deben enviarse y recibirse a más tardar a las 5:00 p. m. del 8 de diciembre de 2022 por correo o correo electrónico:**

Correo electrónico a:
PureWaterSoquel@soquelcreekwater.org
Asunto: Informe de Ingeniería de PWS Title 22

Correo a:
Soquel Creek Water District
Atención: Pure Water Soquel Project Title 22 Engineering Report
PO BOX 1550
Capitola CA 95010

Si tiene alguna pregunta, no dude en enviar un correo electrónico a PureWaterSoquel@soquelcreekwater.org o llame a la oficina de SqCWD al 831-475-8500 int.153.

Atentamente,

Melanie Mow Schumacher, PE
Proyectos Especiales-Gerente de Comunicaciones
Director del Programa
de Pure Water Soquel
Anexo: Aviso de Audiencia Pública

****

AVISO DE AUDIENCIA PÚBLICA
PROYECTO DE REUTILIZACIÓN DE REPOSICIÓN DE AGUAS SUBTERRÁNEAS PURE WATER SOQUEL

Se invita al público a asistir a una audiencia pública sobre el Proyecto Pure Water Soquel (PWS). La audiencia se celebra de acuerdo con el Título 22, División 4, Capítulo 3, Artículo 5.2, §60320.202 del Código de Regulaciones de California (Title 22).

Antecedentes: Soquel Creek Water District (SqCWD) es una agencia pública de agua que depende únicamente de las aguas subterráneas para su suministro de agua. La Cuenca de Agua Subterránea de Santa Cruz Mid County (Cuenca), la principal fuente de agua para SqCWD, se encuentra en un estado de sobreexplotación crítica; el agua subterránea ha sido extraída a un ritmo que ha generado la intrusión de agua de mar. La intrusión de agua de mar se ha detectado como concentraciones elevadas de cloruro en algunos de los pozos costeros de vigilancia de la cuenca, lo que ha sido confirmado por la cartografía geofísica. A pesar de los importantes esfuerzos de conservación realizados en la región, la cuenca de aguas subterráneas sigue estando sobreexplotada y se necesita un suministro de agua adicional para complementar la recarga natural de la cuenca y combatir la intrusión de agua de mar. La planificación de un suministro de agua confiable, asequible y de alta calidad que proteja los recursos de aguas subterráneas es una de las principales prioridades para SqCWD. Con ese fin, SqCWD está implementando el Proyecto PWS.

Proyecto: El proyecto PWS es un nuevo proyecto de reutilización de reposición de agua subterránea (GRRP) mediante el uso de agua reciclada altamente purificada propuesto por SqCWD. El objetivo principal del proyecto PWS es producir hasta 1500 acres pie por año (afy) de agua purificada para la reposición de agua subterránea destinada a evitar una mayor intrusión de agua de mar y mejorar la confiabilidad de la cuenca

como suministro de agua. El suministro de agua sostenible permitirá una fuente de agua suplementaria confiable y resistente a la sequía para los clientes de SqCWD y otros que dependen de la cuenca.

La Instalación de Tratamiento de Aguas Residuales de Santa Cruz (SCWWTF) proporcionará efluentes secundarios (denominados agua de origen) que se someterán a tratamiento de purificación de agua para producir agua purificada para los pozos de Prevención de Intrusión de Agua de Mar (SWIP) de PWS. El agua de origen transportada a la instalación de purificación de agua avanzada (AWPF) en Chanticleer Avenue se tratará mediante ozonización, filtración de membrana (MF), ósmosis inversa (RO), desinfección ultravioleta con peróxido de hidrógeno y acondicionamiento mediante estabilización posterior al tratamiento antes de ser bombeada a los pozos SWIP para la recarga de agua subterránea. El Proyecto PWS producirá agua purificada que cumplirá con el Código de Regulaciones de California Título 22, Artículo 5.2 para un Proyecto de Reposición de Reposición de Agua Subterránea y cumplirá con todas las regulaciones federales y estatales de agua potable.

Información disponible: Una copia del Informe de Ingeniería de Pure Water Soquel está disponible para su revisión pública en www.soquelcreekwater.org/GRRP. Cualquier pregunta relacionada con este proyecto puede dirigirse a PureWaterSoquel@soquelcreekwater.org.

Audiencia Pública: La Junta Estatal de Control de Recursos Hídricos, la División de Agua Potable y el Distrito de Agua de Soquel Creek llevarán a cabo una audiencia pública en línea como parte del proceso de aprobación del Título 22. La audiencia pública comenzará con una breve presentación sobre el proyecto, seguida de una oportunidad para comentarios y preguntas del público.

Audiencia Pública del Informe de Ingeniería de Pure Water Soquel Título 22
Jueves, 1 de diciembre de 2022 a las 5:30 p.m., PST
Reunión de Zoom en línea: https://bit.ly/3CBSvYh
ID de la reunión: 878 6849 8787
Código de acceso: 676862
Solo por teléfono: 1-669-900-6833

Comentarios del público: Todos los comentarios del público sobre el Informe de Ingeniería de Pure Water Soquel se pueden hacer por escrito o como un comentario oral en la audiencia pública. Los comentarios escritos deben enviarse y recibirse a más tardar a las 5:00 p. m. del 8 de diciembre de 2022 por correo o correo electrónico:

Correo electrónico a:
PureWaterSoquel@soquelcreekwater.org
Asunto: Informe de Ingeniería de PWS Title 22

Correo a:
Soquel Creek Water District
A LA ATENCIÓN DE: Pure Water Soquel Project Title 22 Engineering Report
PO BOX 1550
Capitola CA 95010

From: [redacted] on behalf of Santa Cruz Legals <scslegals@santacruzsentinel.com>
Sent: Thursday, October 27, 2022 3:39 PM
To: Emma Western
Subject: Re: Notice of Public Hearing - PWS GRRP
Attachments: Ad #6709358.pdf

Please find your Ad #6709358 Text.
This is being published 11.01, 11.15.2022.

Thank you
Gloria Mutch
[redacted]
Santa Cruz Sentinel
Legal Clerk
scslegals@santacruzsentinel.com

SOQUEL CREEK WATER DISTRICT

NOTICE OF PUBLIC HEARING
PURE WATER SOQUEL GROUNDWATER REPLENISHMENT REUSE PROJECT

The public is invited to attend a public hearing on the Pure Water Soquel (PWS) Project. The hearing is being held in accordance with Title 22, Division 4, Chapter 3, Article 5.2, §60320.202 of the California Code of Regulations (Title 22).

Background: Soquel Creek Water District (SqCWD) is a public water agency that relies solely on groundwater for its water supply. The Santa Cruz Mid County Groundwater Basin (Basin), the primary source of water for SqCWD, is in a state of critical overdraft; groundwater has been extracted at a rate that has caused seawater intrusion. Seawater intrusion has been detected as high chloride concentrations in some of the coastal monitoring wells in the Basin, which has been confirmed by geophysical mapping. Despite significant conservation efforts in the region, the groundwater basin remains critically overdrafted and an additional water supply is required to supplement the natural recharge of the Basin and combat the seawater intrusion. Planning for a reliable, high-quality and affordable water supply that protects groundwater resources is a top priority for SqCWD. To that end, SqCWD is implementing the PWS Project.

Project: The PWS Project is a new groundwater replenishment reuse project (GRRP) using highly purified recycled water proposed by SqCWD. The primary goal of the PWS Project is to produce up to 1,500-acre feet per year (afy) of purified water for groundwater replenishment intended to prevent further seawater intrusion and improve the Basin's reliability as a water supply. The sustainable water supply will allow for a reliable, drought-resistant supplemental water source for SqCWD's customers and others who rely on the basin.

The Santa Cruz Wastewater Treatment Facility (SC WWTF) will provide secondary effluent (referred to as source water) that will undergo water purification treatment to produce purified water for the PWS Seawater Intrusion Prevention (SWIP) wells. The source water conveyed to the advanced water purification facility (AWPF) at Chanticleer Avenue will be treated via ozonation, membrane filtration (MF), reverse osmosis (RO), ultraviolet disinfection with hydrogen peroxide, and conditioning via post treatment stabilization prior to being pumped to the SWIP wells for groundwater recharge. The PWS Project will produce purified water that will comply with the California Code of Regulations Title 22, Article 5.2 for a Groundwater Replenishment Reuse Project and meet all federal and state drinking water regulations.

Available Information: A copy of the Pure Water Soquel Engineering Report is available for public review at www.soquelcreekwater.org/GRRP. Any questions regarding this project may be directed to PureWaterSoquel@soquelcreekwater.org.

Public Hearing: The State Water Resources Control Board, Division of Drinking Water and Soquel Creek Water District will conduct an on-line public hearing as part of the Title 22 approval process. The public hearing will begin with a brief presentation about the project, followed by an opportunity for public comments and questions.

Title 22 Pure Water Soquel Engineering Report Public Hearing
Thursday, December 1, 2022 at 5:30 pm, PST
Online Zoom Meeting: https://bit.ly/3CBSvYh
Meeting ID: 878 6849 8787
Passcode: 676862
Phone only: 1-669-900-6833

Public Comments: All public comments on the Pure Water Soquel Engineering Report can be made as written or as an oral comment at the

public hearing. Written comments must be submitted and received no later than 5:00 pm on December 8, 2022 via mail or email:

Email to:
PureWaterSoquel@soquelcreekwater.org
Subject Line: PWS Title 22 Engineering Report

Mail to:
Soquel Creek Water District
ATTN: Pure Water Soquel Project Title 22 Engineering Report
PO BOX 1550
Capitola CA 95010

AVISO DE AUDIENCIA PÚBLICA
PROYECTO DE REUTILIZACIÓN DE REPOSICIÓN DE AGUAS SUBTERRÁNEAS PURE WATER SOQUEL

Se invita al público a asistir a una audiencia pública sobre el Proyecto Pure Water Soquel (PWS). La Junta Estatal de Control de Recursos Hídricos, la División de Agua Potable y el Distrito de Agua de Soquel Creek llevarán a cabo una audiencia pública en línea como parte del proceso de aprobación del Título 22. La audiencia pública comenzará con una breve presentación sobre el proyecto, seguida de una oportunidad para comentarios y preguntas del público.

Audiencia Pública del Informe de Ingeniería de Pure Water Soquel Título 22
Jueves, 1 de diciembre de 2022 a las 5:30 p.m., PST
Reunión de Zoom en línea: https://bit.ly/3CBSvYh
ID de la reunión: 878 6849 8787
Código de acceso: 676862
Solo por teléfono: 1-669-900-6833

Información disponible: Una copia del Informe de Ingeniería de Pure Water Soquel está disponible para su revisión pública en www.soquelcreekwater.org/GRRP. Cualquier pregunta relacionada con este proyecto puede dirigirse a PureWaterSoquel@soquelcreekwater.org.
11/01, 11/15/2022



SOQUEL CREEK WATER DISTRICT

Pure Water Soquel Groundwater Replenishment Reuse Project (GRRP)- Public Hearing

Thursday, December 1, 2022 • 5:30 pm

Presenters:

Mir Ali, ***State Water Resources Control Board***

Melanie Mow Schumacher, ***Soquel Creek Water District***

Debbie Burris, ***DDB Engineering, Inc.***

Cameron Tana, ***Montgomery and Associates***

Rob Beggs, ***Brown and Caldwell***

THIS MEETING WILL BE RECORDED

SoquelCreekWater.org

Transforming Your Water For the Future

Agenda

- Introductions
- Purpose of the Public Hearing
- Overview of the Title 22 Regulations by Division of Drinking Water (DDW)
- Overview of the Pure Water Soquel Groundwater Replenishment Reuse Project (GRRP) Project
- Open for comments
- Instructions on written comments



Purpose of the Public Hearing

- Compliance with Title 22 CA Code of Regulations 60320.202
- Inform the public about the Title 22 approval process and the Pure Water Soquel project
- Provide the public with an opportunity to ask questions and submit comments on the Title 22 Engineering Report, which can be viewed online at: www.soquelcreekwater.org/GRRP



Introductions



Mir Ali

Water Resources Control Engineer, Recycled Water Unit

State Water Resources Control Board



Melanie Mow Schumacher

Pure Water Soquel Program Director
Special Projects-Communications Manager

Soquel Creek Water District



Debbie Burris

Principal

DDB Engineering



Cameron Tana

Principal Hydrologist

Montgomery and Associates



Rob Beggs

Chief Engineer

Brown and Caldwell

Groundwater Replenishment Title 22 Regulations

Mir Ali
Recycled Water Unit
Division of Drinking Water (DDW)



CALIFORNIA
Water Boards

Pure Water Soquel GRRP Public Hearing | December 1, 2022

Why is DDW here?



Per CCR T22 § 60320.202, the Pure Water Soquel Creek is required to hold a Public Hearing on the proposed Groundwater Replenishment Reuse recycled water project.

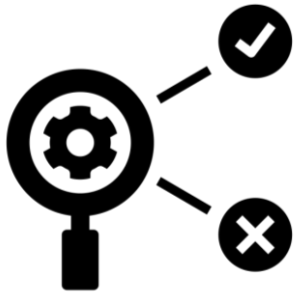


Regional Boards consult with DDW on the **protection of public health** for recycled water projects.

DDW
Recycled Water Unit



Develop <u>water recycling criteria and regulations</u> protective of public health



Evaluate water recycling projects



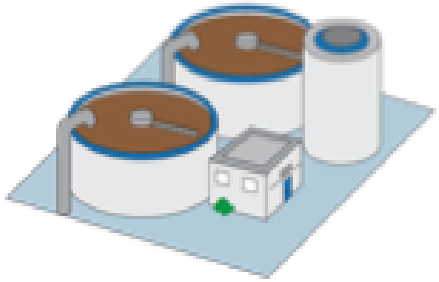
(For **Groundwater Replenishment**): Make recommendations for inclusion in permit to Regional Water Boards

GRRP Overview

"GRRP"

Groundwater **R**eplenishment **R**euse **P**roject

CCR, Title 22, Articles 5.1 and 5.2



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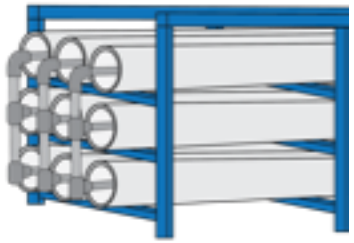
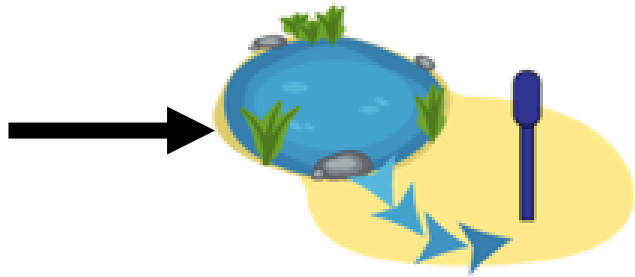
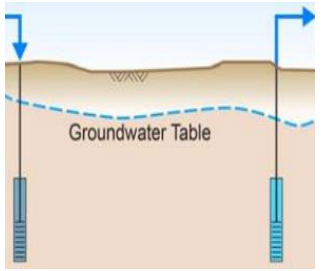




OR



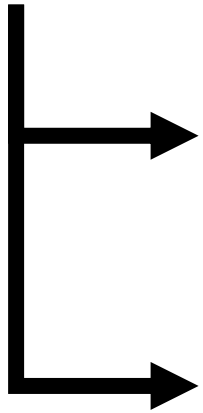
Wastewater + Advanced Water Treatment

Recharge Groundwater for Potable Water Supply

GRRP Regulations

California Code of Regulations

Title 22, Div. 4, Ch. 3 Water Recycling Criteria



Article 5.1 (§ 60320.100 – 60320.130)
Surface Application

Article 5.2 (§ 60320.200 – 60320.230)
Subsurface Application

GRRP Regulations

GOAL: Provide an alternative drinking water source as safe as conventional drinking water sources



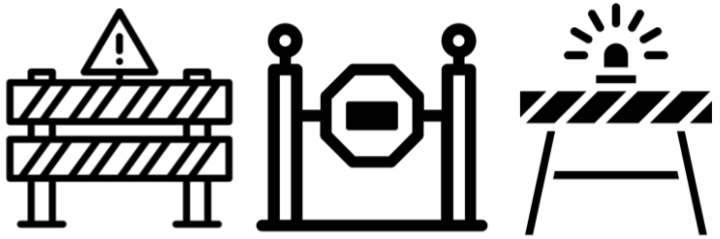
GRRP Regulations

APPROACH: require systems to have…

Reliability



Robustness



Resilience



Title 22 CCR
Subsurface GRRP Regulations

- 60320.200 General Requirements
- 60320.201. Advanced Treatment Criteria
- 60320.202. Public Hearing
- 60320.204 Lab Analysis
- 60320.206 Wastewater Source Control
- 60320.208. Pathogenic Microorganism Control
- 60320.210. Nitrogen Compounds Control
- 60320.212. Regulated Contaminants and Physical Characteristics Control
- 60320.214 Diluent Water Requirements
- 60320.216. Recycled Municipal Wastewater Contribution (RWC) Requirements
- 60320.218. Total Organic Carbon (TOC)
- 60320.220. Additional Chemical and Contaminant Monitoring
- 60320.222 Operation Optimization Plan
- 60320.224 Response Retention Time
- 60320.226 Monitoring Well Requirements
- 60320.228 Reporting
- 60320.230 Alternatives

Components of Subsurface GRRP Regulations

CCR T22 § 60320.200
General Requirements

- **Sample** groundwater before GRRP operation
- **Assess** hydrogeology
- **Establish** boundaries of controlled drinking water well construction
- **Demonstrate** technical and managerial capabilities
- **Plan** for alternative sources of drinking water

Components of Subsurface GRRP Regulations

CCR T22 § 60320.206

Wastewater Source Control

INTENT – protect public health “at the source” by reducing the amount of chemicals that enter the sewer shed.

APPROACH – Wastewater agency participating in GRRP must implement an industrial pretreatment and pollutant source control program, including:

- Outreach to community
- Maintenance of an inventory of chemicals discharged to sewer shed
- Chemical source investigations

Components of Subsurface GRRP Regulations

CCR T22 § 60320.208
Pathogenic Microorganism Control

INTENT – reduce concentration of pathogens to levels below the US EPA tolerable risk of infection for drinking water (1 in 10,000 per year per person)

APPROACH – minimum log reduction value (LRV) for pathogens across all of treatment

- 12-log Virus (99.9999999999% reduction)
- 10-log Giardia cysts (99.9999999% reduction)
- 10-log Cryptosporidium oocysts (99.9999999% reduction)

Components of Subsurface GRRP Regulations

CCR T22 § 60320.210, .212, .220, .226

Chemical Monitoring

INTENT – ensure and verify treatment performance and protection of the drinking water source (i.e., groundwater)

APPROACH – comprehensive sampling and analysis plans

- Maximum Contaminant Levels (MCLs)
- Notification Levels (NLs)
- Action Levels (lead and copper)
- Priority Toxic Pollutants (40 CFR 131.38)

Components of Subsurface GRRP Regulations

CCR T22 § 60320.224
Response Retention Time

INTENT – retain recycled water underground for a minimum time to allow an effective response to protect health in the event of a treatment failure

APPROACH – comprehensive sampling and analyses of treated water

- Retention time underground is verified by a tracer study
- Minimum of two months

GRRP Permitting Process



GRRP permits are issued by Regional Water Quality Control Board (RWQCB)



Project sponsors must submit a Title 22 Engineering Report to DDW for review.



Before permit adoption, the RWQCB consults with and receives recommendations from DDW regarding protection of public health.

DDW's GRRP Permitting Process

- Pure Water Soquel submits Draft Title 22 Engineering Report (ER) to DDW
- Pure Water Soquel conducts Public Hearing
- Pure Water Soquel reviews public comments, may update ER for DDW
- DDW conditionally accepts ER and provides recommendations to RWQCB
- RWQCB prepares, circulates Draft Order for public comment (30 days)
- RWQCB prepares Order and adopts Order at Board Meeting
- Pure Water Soquel submits Operations & Optimization Plan to DDW
- DDW conducts final site inspection prior to project operations
- DDW will provide continued oversight throughout project's lifespan

DDW
Recycled Water Unit
Contact Information

Dr. Ginachi Amah – Supervisor
ginachi.amah@waterboards.ca.gov

Mir Ali – Project Staff Engineer
mir.ali@waterboards.ca.gov

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

Pure Water Soquel Project Overview



Melanie Mow Schumacher

Pure Water Soquel Program Director
Special Projects-Communications Manager

Soquel Creek Water District

Soquel Creek Water District

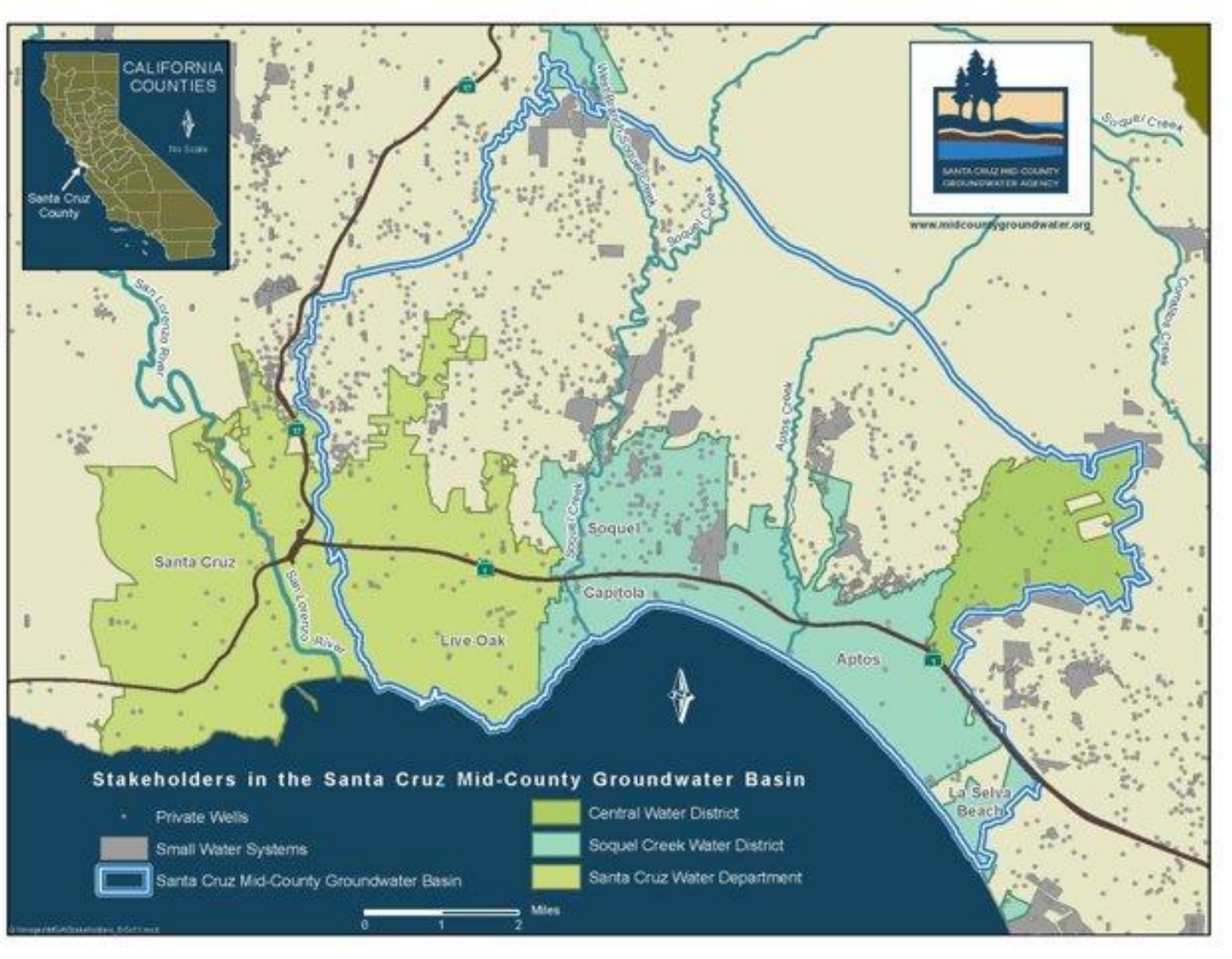
- California Special District, which is a local government agency that provides essential services
- Serve the areas of Aptos, La Selva Beach, Opal Cliffs, Rio Del Mar, Seascape, Soquel, and portions of Capitola
- 100% groundwater conveyed through 165+ miles of pipeline
- 16 active groundwater wells, approximately 3,300 acre-feet per year
- 80 Monitoring Wells
- 18 Tanks



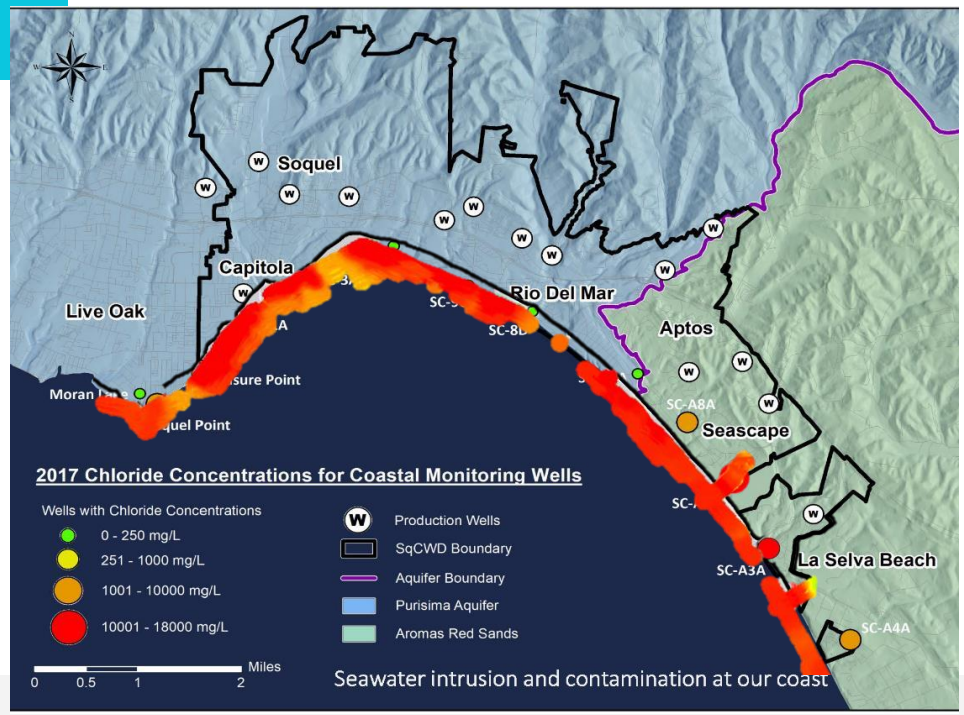


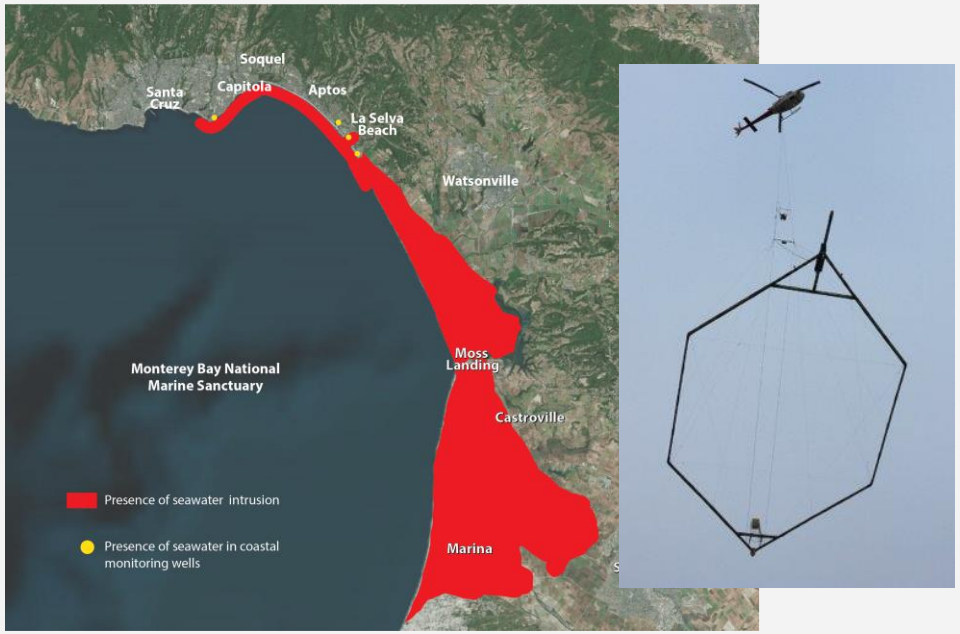
Santa Cruz Mid-County Groundwater Basin

- Sole source of water is groundwater
- Area does not receive any state or federal imported water
- Shared by many others



Mid-County Groundwater Challenges





Critically Overdrafted as identified by the State of California with a mandate to be sustainable by 2040

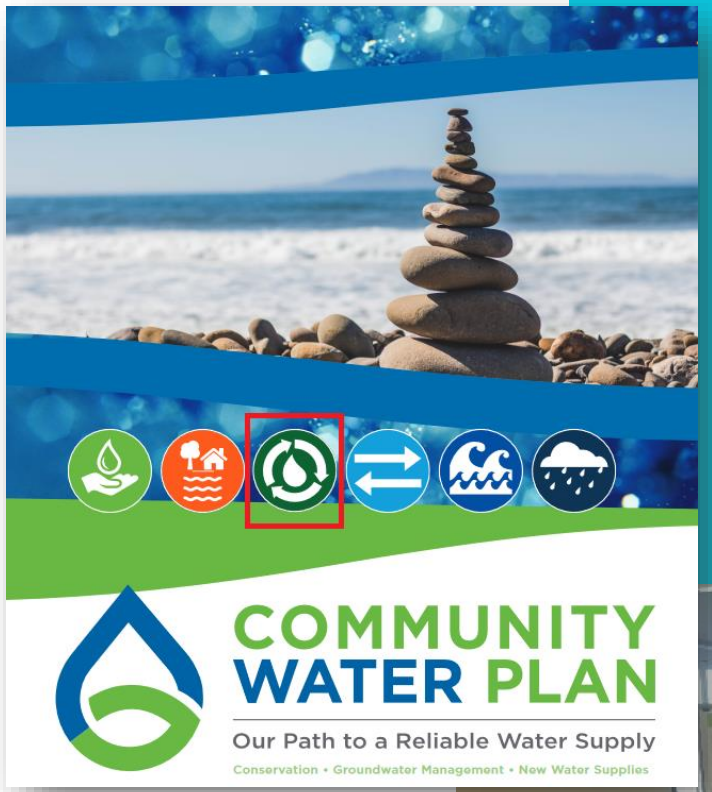
Groundwater is the ONLY source of water for Soquel Creek Water District and much of the SC Mid-County Region

Contaminated with seawater intrusion along the coast

Our Primary Solutions

Conservation + Groundwater Management + New Supplies

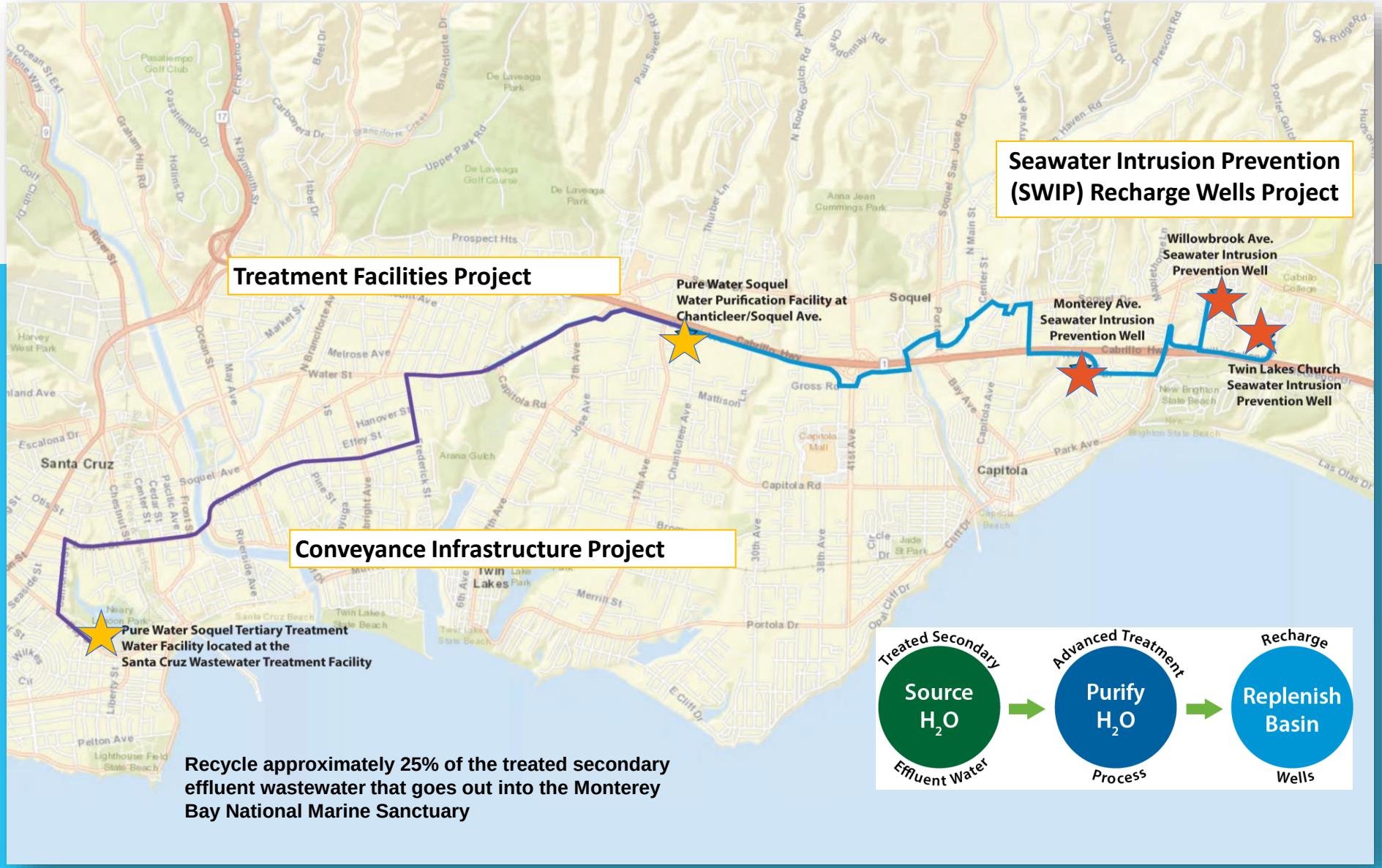
- Use Water Efficiently
- Be Adaptive with Groundwater Management
- Develop New Supplies
- Water Purification with Pure Water Soquel
- Excess River Water Purchases, when available
- Storm Water Capture





Pure Water Soquel Project Overview

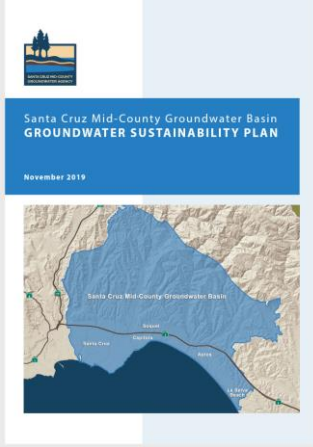
PUREWater Soquel
Water Transformed

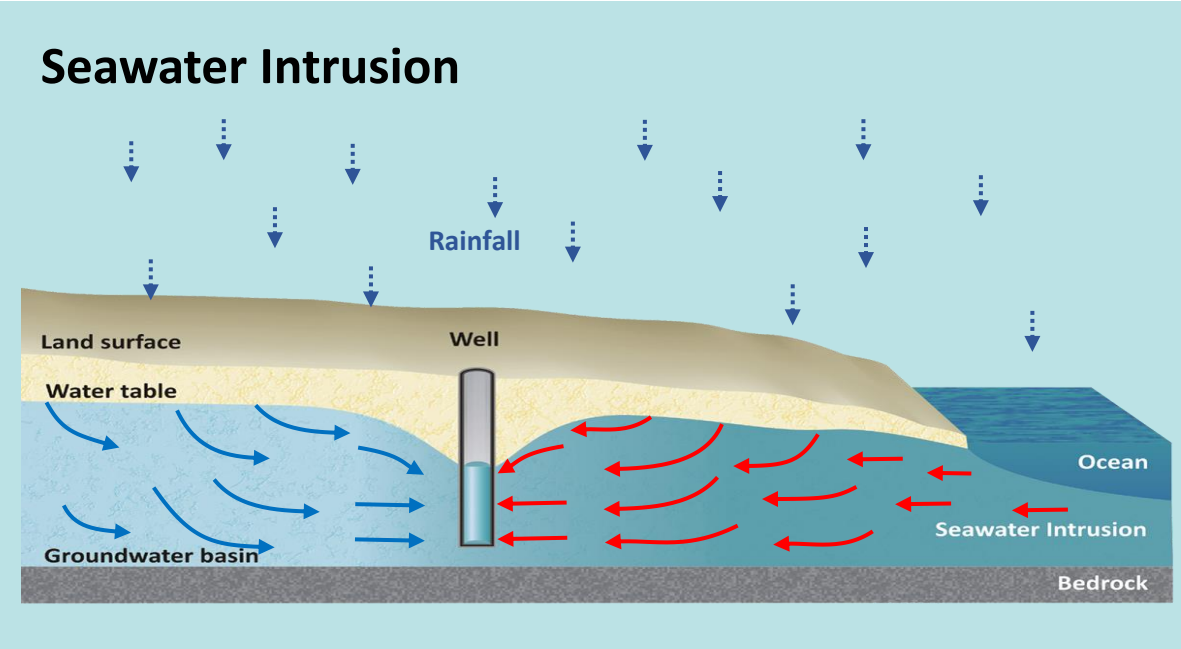


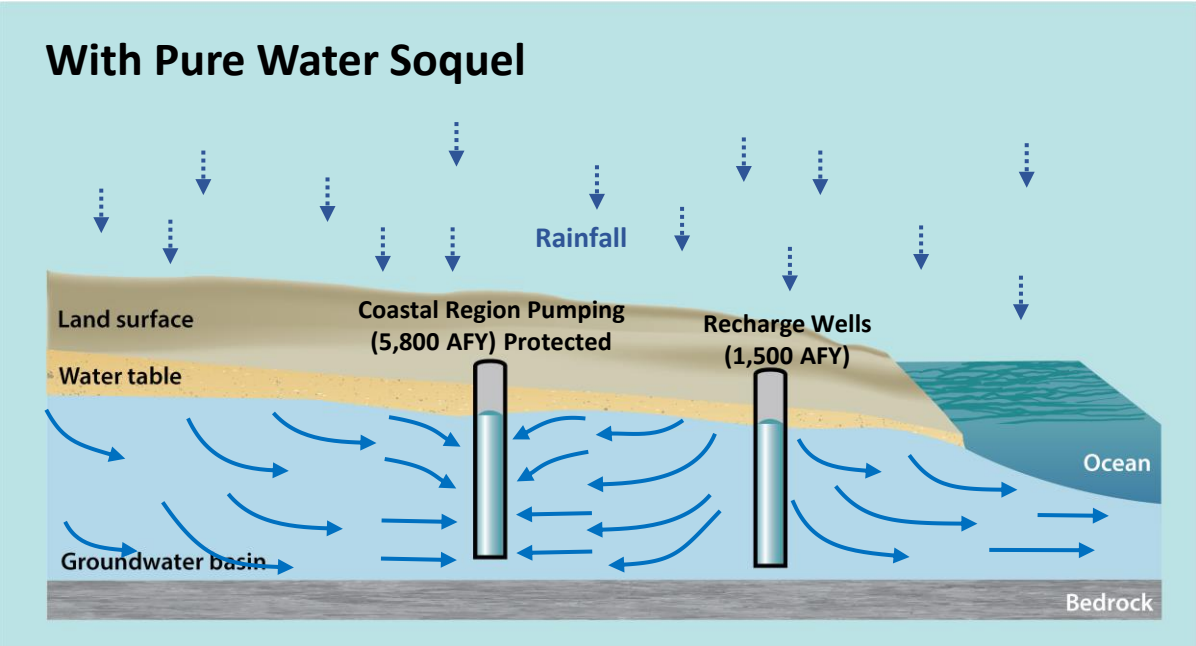
- 0.3 million gallons per day of tertiary non-potable recycled water
- 1.3 million gallons per day of advanced water
- 2-16” pipelines
- 14” pipeline
- 3 seawater intrusion prevention wells
- 9 monitoring wells
- Expandable in the future to meet additional groundwater basin needs, drought needs, and climate change

How the Project will Prevent Further Seawater Intrusion

When purified water is stored in the basin through recharge wells, it creates a barrier to prevent seawater contamination from reaching our production wells.

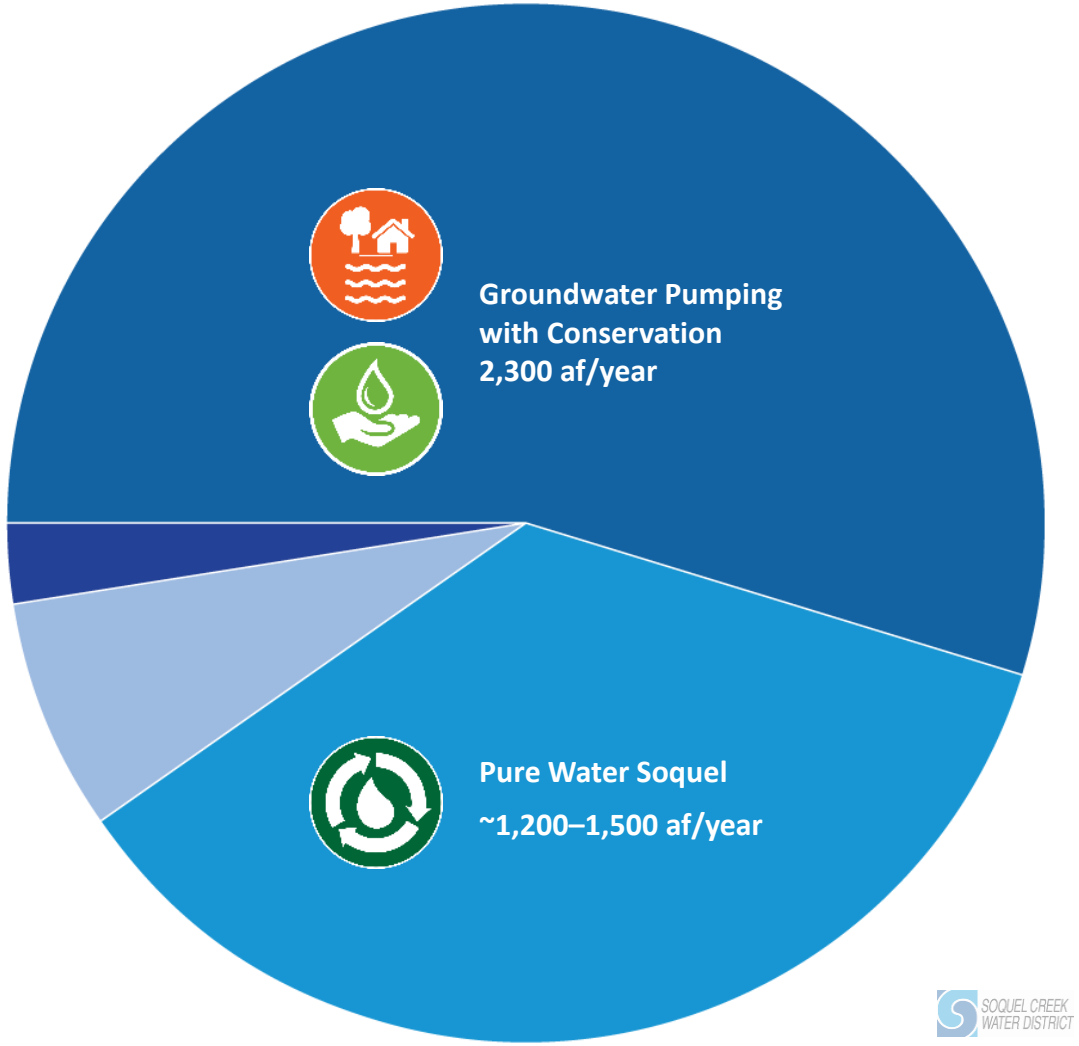






Diverse Water Supply portfolio:

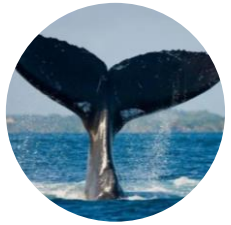
Reduces pressure on our groundwater basins and provides security during times of drought and climate resiliency



Storm Water Capture
~10–100 af/year

Water Transfer/Purchase
~300–500 af/year

Project Benefits



Reduces Discharge into the Ocean by 25%



Uses Clean Energy



Provides a Seawater Intrusion Barrier



Promotes Economic Vitality



Reliable, Drought- and Climate-Proof Water Supply



Produces High Quality Water



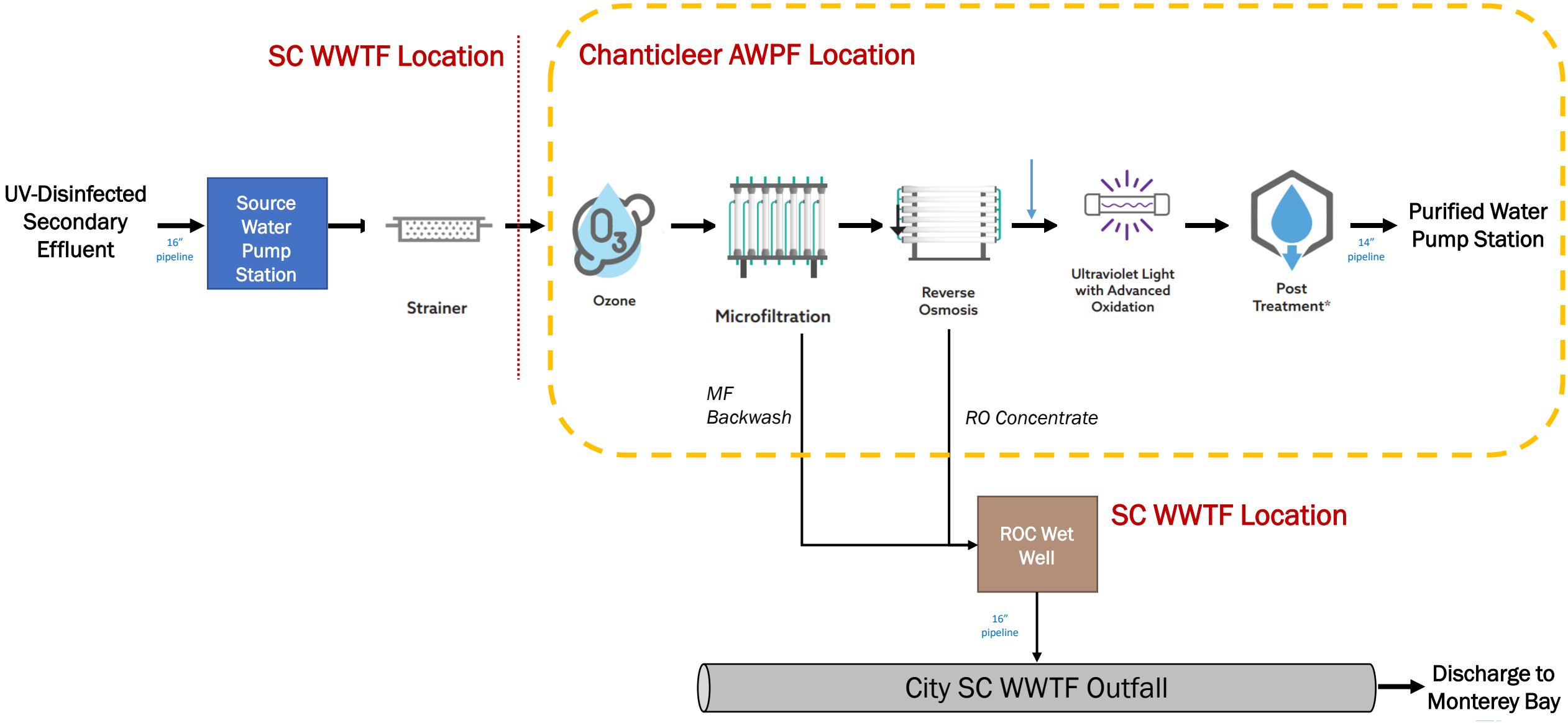
Timely



Can be Scaled-Up

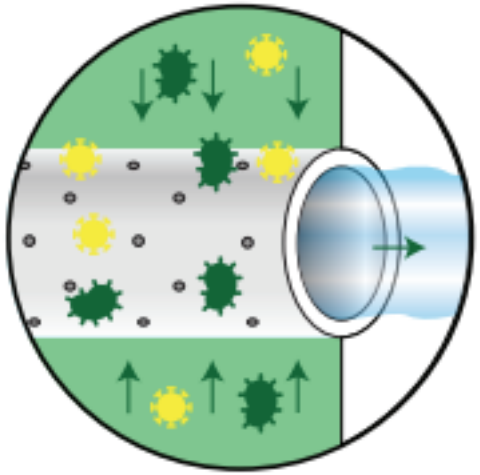
SOQUEL CREEK WATER DISTRICT

Pure Water Soquel – At a Glance



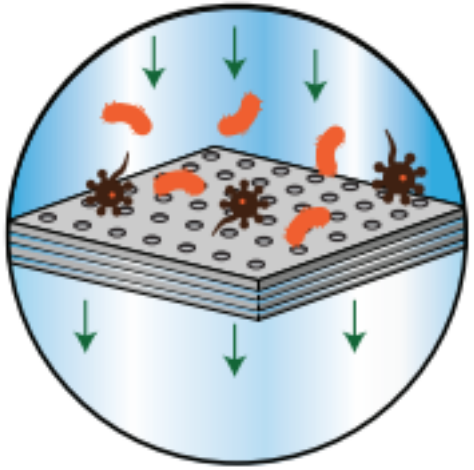
Purification Creates Clean Safe Water

3-Step Process



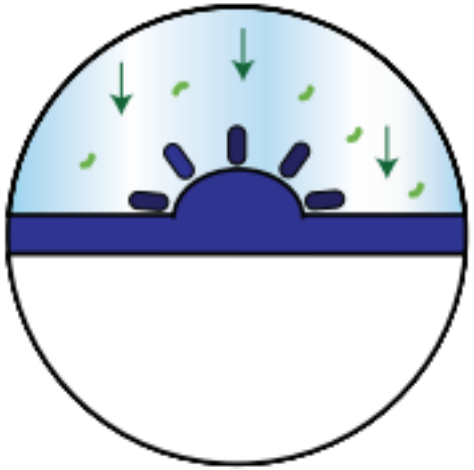
MICROFILTRATION

Water moves through a bundle of straw-like filters. Each filter is perforated with small holes 1/300th the width of human hair. These holes allow water to pass through while removing solids, bacteria, protozoa, and many viruses.



REVERSE OSMOSIS

Contaminants 100x smaller than a virus, as well as chemicals, are stopped by this barrier, resulting in water that's near distilled quality. This same process is used by bottled water companies, baby food manufacturers, and for kidney dialysis



ULTRAVIOLET LIGHT (UV) & ADVANCED OXIDATION PROCESS

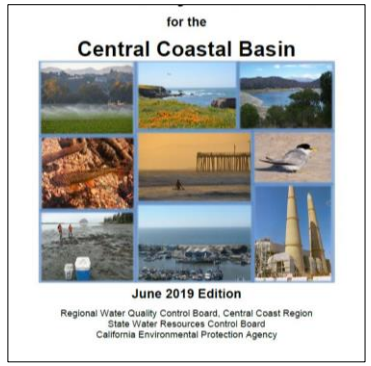
Concentrated UV light, similar to the sun's rays, and an oxidant such as bleach, together destroy remaining trace level chemicals and pharmaceuticals.

Water Quality Requirements

The PWS Project's purified water is subject to water quality requirements from the following:



Title 22 Water Recycling Criteria



Water Quality Control Plan for the Central Coastal Basin (Basin Plan)



State Water Quality Control Board (SWRCB) Water Quality Control Policy for Recycled Water (Recycled Water Policy)

Proven Approach and Water Quality

- The purified water will meet or exceed all Federal and State regulations (e.g., primary, secondary MCLs, and notification levels) for drinking water to ensure it is safe for groundwater recharge
- The District worked with State regulators to establish a robust and reliable treatment system
- California has several decades of experience with Groundwater Replenishment Reuse Projects



Permitted/Operational Groundwater Replenishment Reuse Projects in California



Pure Water Monterey
3,500 AFY

Cambria Community Services District
385 AFY



West Basin Municipal Water District, West Coast Basin Barrier Project
17,000 AFY

Water Replenishment District of Southern California, Vander Lans AWPF for Alamitos Barrier
6,000 AFY





City of Los Angeles Terminal Island AWPF for Dominguez Gap Barrier
8,000 AFY

Los Angeles County Sanitation Districts, Montebello Forebay
50,000 AFY

Inland Empire Utilities Agency, Chino Basin Groundwater Replenishment Program
21,000 AFY

Orange County Water District, Groundwater Replenishment System
103,000 AFY



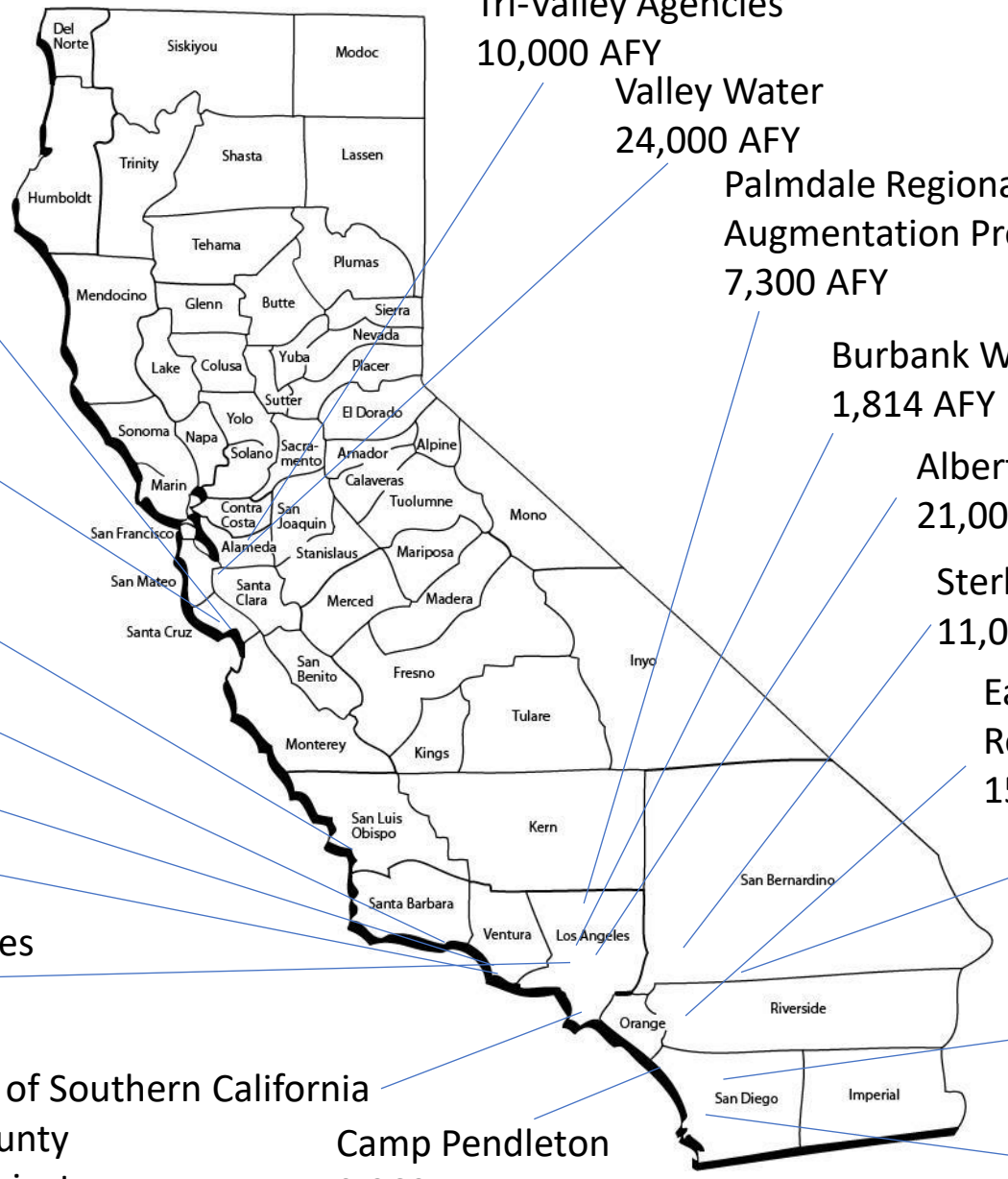
City of Oceanside, Pure Water Oceanside
5,060 AFY



Source: WateReuse California

SOQUEL CREEK WATER DISTRICT

Planned Groundwater Replenishment Reuse Projects in California



Pure Water Soquel
3,000 AFY

Scotts Valley WD
2600 AFY

Central Coast Blue
930 AFY

Carpinteria Advanced
Purification Project
1,100 AFY

Ventura WaterPure
4,000 AFY

City of Oxnard
7,000 AFY

City of Los Angeles
84,000 AFY

Metropolitan Water District of Southern California
Sanitation Districts of LA County
Regional Recycled Water Project
101,000 AFY

Camp Pendleton
2,060 AFY

Tri-Valley Agencies
10,000 AFY

Valley Water
24,000 AFY

Palmdale Regional Water
Augmentation Program
7,300 AFY

Burbank Water and Power
1,814 AFY

Albert Robles Center Project
21,000 AFY

Sterling Natural Resource Center Project
11,000 AFY

Eastern MWD Groundwater
Reliability Plus
15,000 AFY

Yucaipa Valley WD Aquifer Storage
and Recovery Project
3,000 AFY

City of Escondido
8,968 AFY

Olivenhain MWD
560 AFY

Source: WateReuse California

SOQUEL CREEK WATER DISTRICT

Artist Rendering of a Willowbrook Seawater Intrusion Prevention Well Site



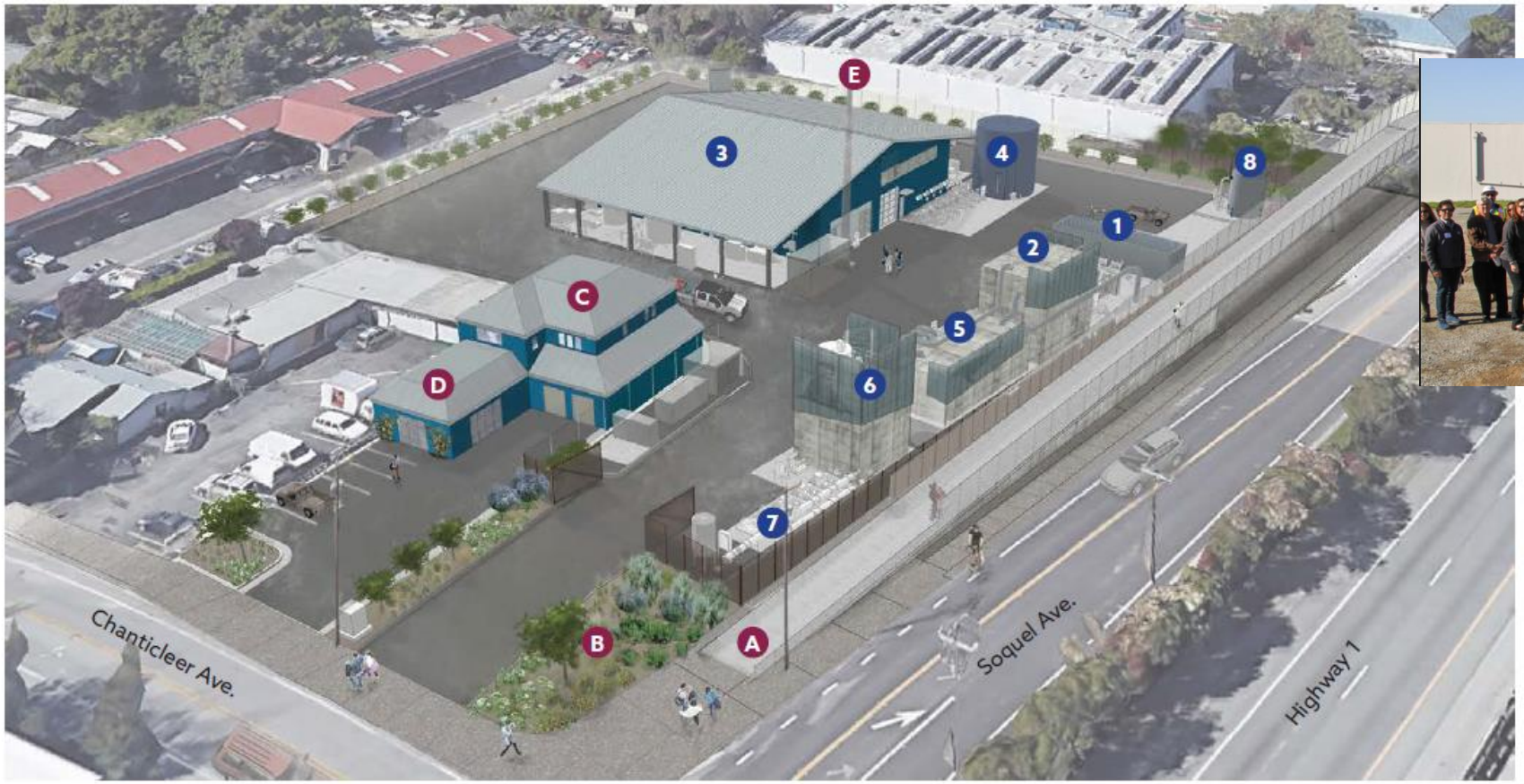
Prior to Construction



Artist's rendering of completed SWIP well.

SOQUEL CREEK WATER DISTRICT

Pure Water Soquel's Water Purification Center





Groundbreaking, December 2021



Purification Building, November 2022

Process Flow

1. Ozone System
2. Ozone Contact/Membrane Filtration (MF) Feed Tank
3. MF, Reverse Osmosis (RO), Ultraviolet Light with Advanced Oxidation Process (UV/AOP) Building
4. RO Feed Tank
5. Reverse Osmosis Concentrate (ROC) Wet Well
6. Purified Water Tank and Decarbonation Unit
7. Purified Water Pump Station
8. Neutralization Tank

Other Components

A. Bike/Pedestrian Bridge (by RTC)
B. Demonstration Garden
C. Operations Offices
D. Education Center
E. Communications Pole

Groundwater Modeling and Underground Retention Times



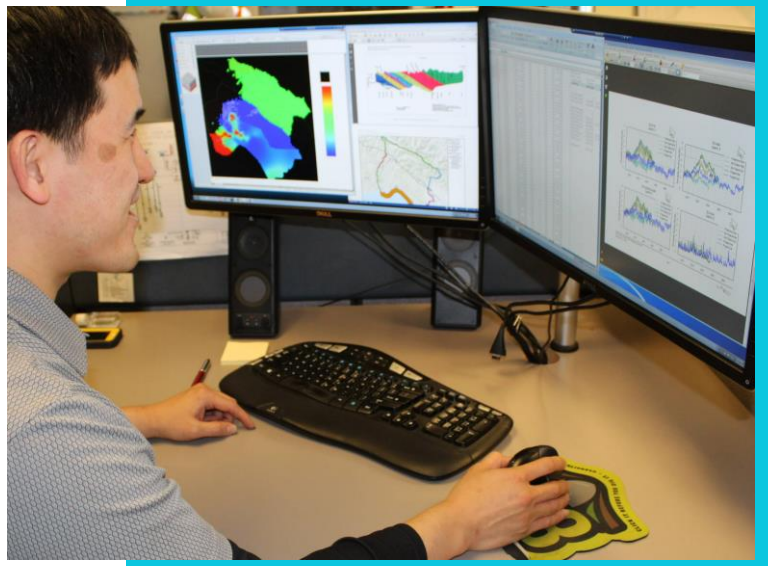
Cameron Tana

Principal Hydrologist

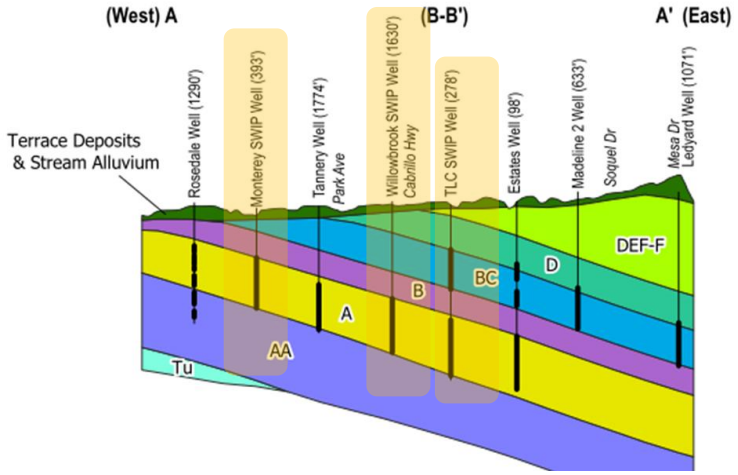
Montgomery and Associates

Groundwater Modeling Uses

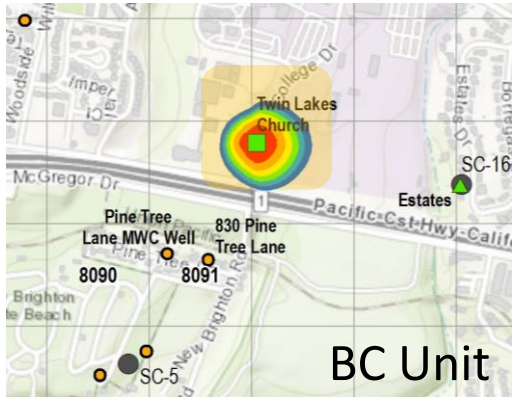
1. Estimate travel times between groundwater recharge wells and groundwater production wells
    a. To quantify virus log reduction underground (Title 22 Section 60320.208).
    b. To ensure sufficient response retention time is provided between recharge wells and production wells (Title 22 Section 60320.224).
2. Establish monitoring well network to monitor groundwater recharge operations (Title 22 Section 60320.226)



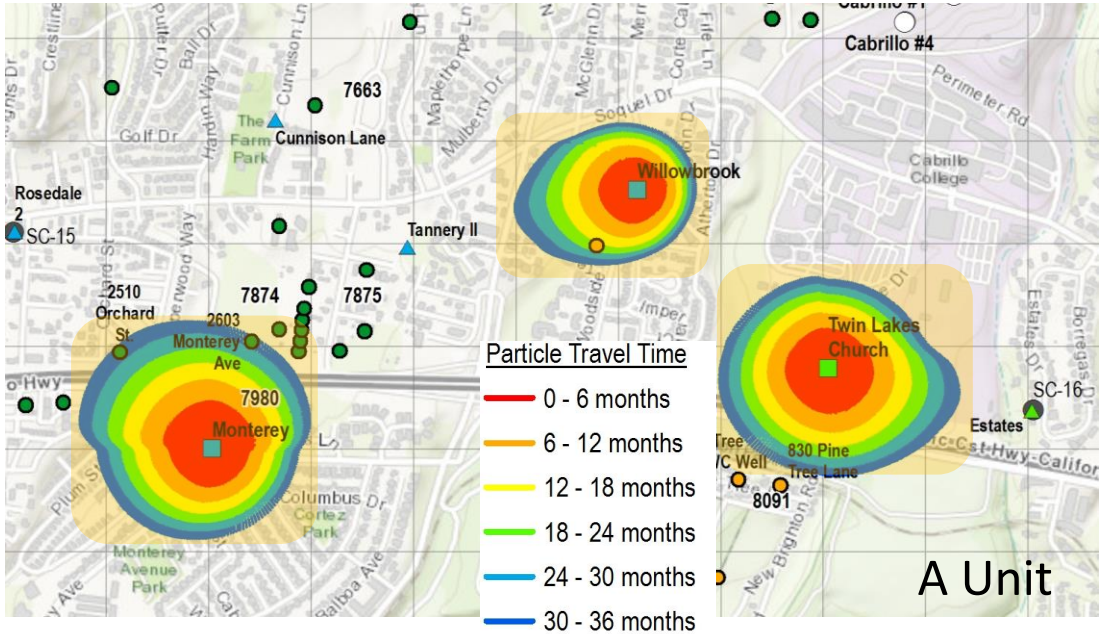
Underground Retention Times (URT)
Estimated Based on Basin Model and Analytical Equations



Twin Lakes Church SWIP Well recharges Purisima BC and A Units



Monterey and Willowbrook SWIP Wells recharge Purisima A Unit Only



SWIP Well (Aquifer Unit)	URT to Nearest Drinking Water Well (months)
Twin Lakes Church (BC unit)	211-280
Twin Lakes Church (A unit)	43-52
Willowbrook (A unit)	56-72
Monterey (A unit)	33-39

SOQUEL CREEK WATER DISTRICT

The Pure Water Soquel Project meets the Log Reduction Value (LRV) Compliance for potable reuse for groundwater replenishment

Log Reduction Value (LRV) Compliance: 12-10-10

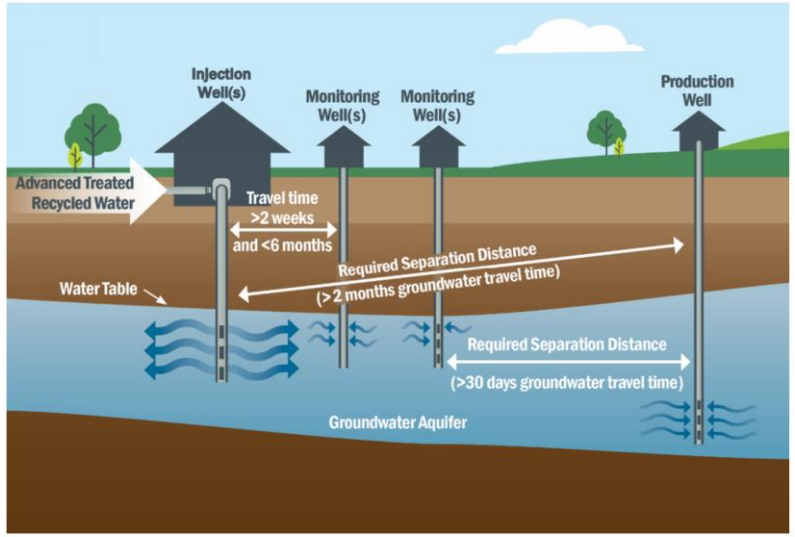
Treatment Process	Virus	Giardia	Cryptosporidium
MF	0.0	4.0	4.0
RO	1.5	1.5	1.5
UV-AOP	6.0	6.0	6.0
Underground Retention Time	6.0	0.0	0.0
PWS Project Provided	**13.5** ☑	**11.5** ☑	**11.5** ☑
Required	**12.0**	**10.0**	**10.0**

1 log = 90% removal
2 log = 99% removal
…
10 log = 99.99999999% removal
12 log = 99.9999999999% removal

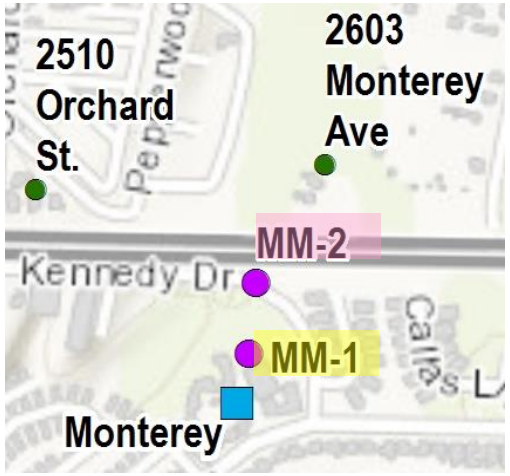
Modeling Informs Background and Operational Monitoring Network

2 monitoring wells for each SWIP well and in each aquifer unit receiving water:

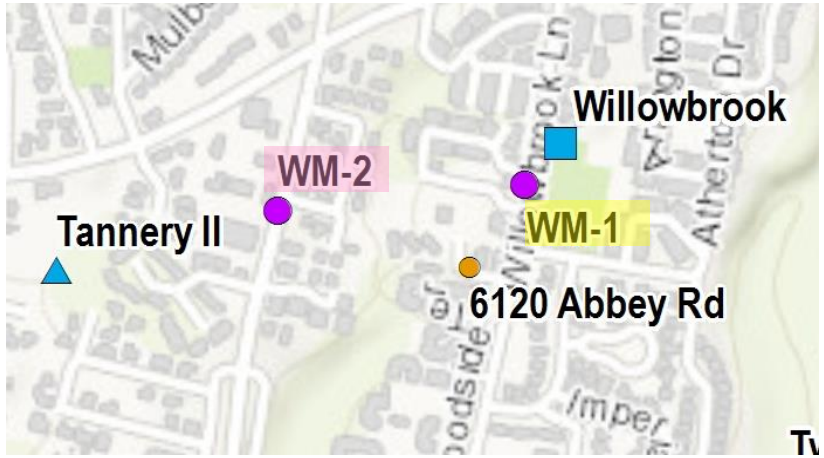
- **One well is located >2 weeks and <6 months travel time AND >30 days upgradient of nearest drinking water well**
- **One well is between the SWIP well and the nearest drinking water well in the aquifer unit**



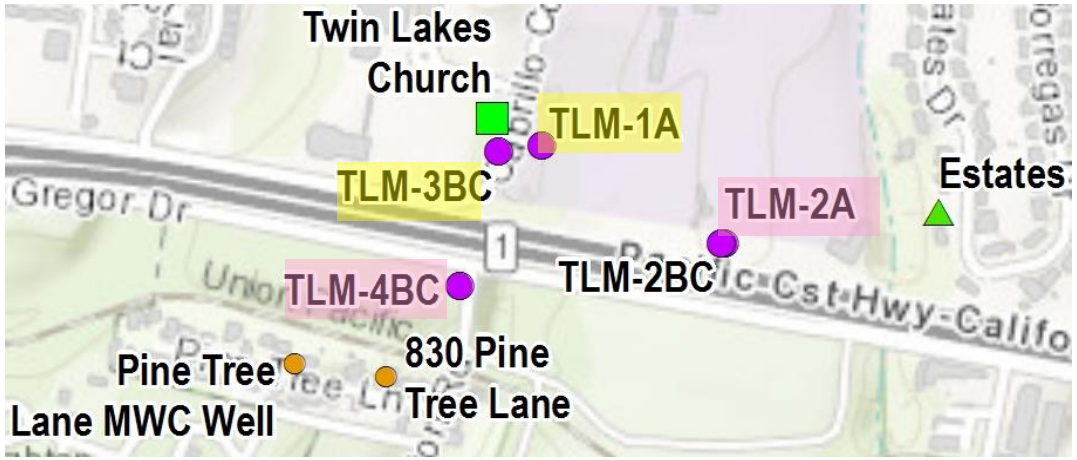
Purisima A Unit Only



Purisima A Unit Only



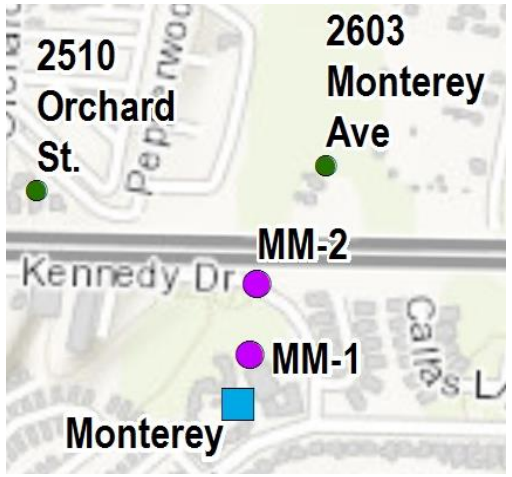
Purisima BC and A Units



4 quarters of background sampling prior to operation, then quarterly sampling during operation

Response Retention Time (RRT) is Minimum Underground Retention Time

RRT is time to Identify Treatment System Failures and Implement Corrective Actions



Shortest Time to Monitoring Well = 1.1-1.6 months based on range of recharge rates. Conservatively multiply by 4.

4.5-6 months

\+



Sampling Results, Confirmation and Compliance Monitoring.

2.5 months

\+



Decide on Response and Procure Alternate Supplies

0.5 months

=



Response Retention Time (RRT)

7.5 - 9.2 months

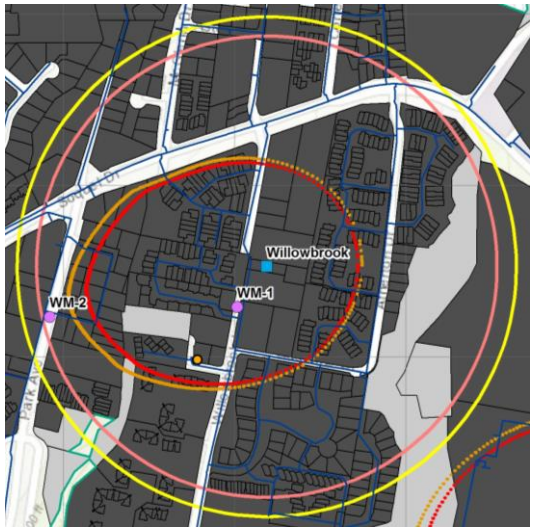
Well Construction Control Zones Established Based on RRT Multiplied by 4



Monterey SWIP Well

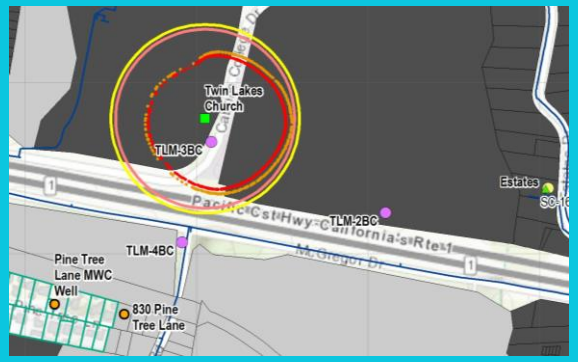
No drinking water wells in primary control zone (A unit).

Secondary control zone to be evaluated with tracer study.



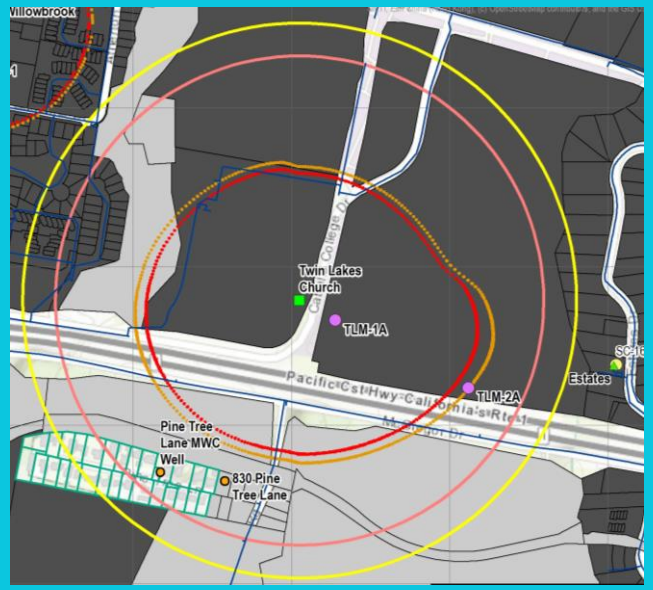
Willowbrook SWIP Well

No drinking water wells in control zones (A unit).



Twin Lakes Church SWIP Well

No drinking water wells in control zones (BC unit).



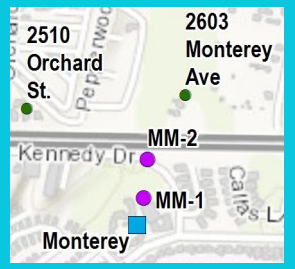
Twin Lakes Church SWIP Well

No drinking water wells in control zones (A unit).

Tracer Study during PWS Operation (2024) will update Underground Retention Time (URT) Estimates, RRT, and Control Zones

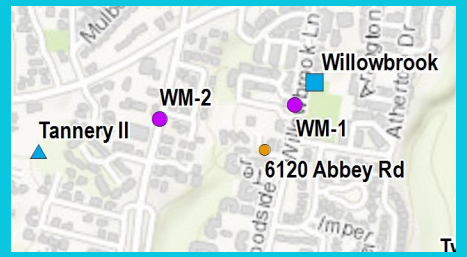
1. Intrinsic Tracers = Sample Wells for Lower Conductivity, Ions, and Total Dissolved Solids of Purified Water
2. Added Tracer = Sample Wells for Drinking Water Safe Dye Added to Recharge Water

District will sample monitoring wells and will seek access to monitor nearest private wells



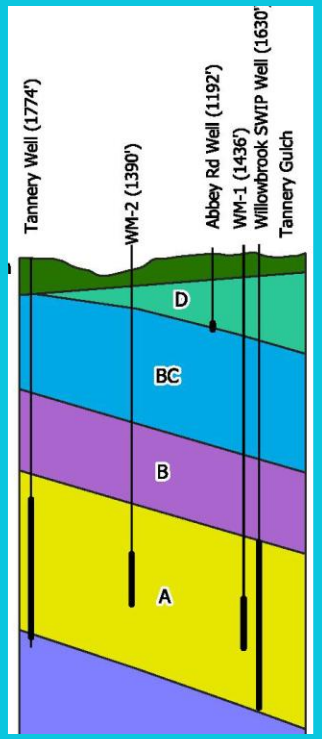
Monterey SWIP Well

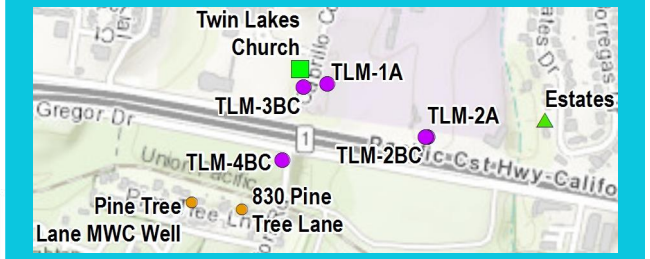
Verify secondary control zone



Willowbrook SWIP Well

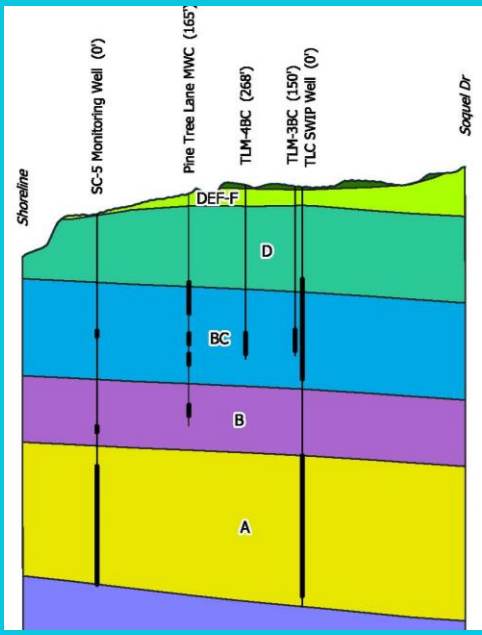
Verify no transport from A to shallower units





Twin Lakes Church SWIP Well

Verify URT in A and BC Units



Antidegradation Analysis



Rob Beggs

Chief Engineer

Brown and Caldwell

Antidegradation Analysis

1. Support permitting for recycled water operations
2. Take the place of a Salt and Nutrient Management Plan
3. Assess impact on the Santa Cruz Mid-County Groundwater Basin by using purified water for groundwater recharge
4. Determine if recharge operations would be protective of beneficial uses (drinking water and irrigation)
5. Evaluate criteria for showing maximum benefit to the people of the State

Basin Plan Water Quality Objectives

Constituent	Units	Groundwater Basin Water Quality Objective	PWS Purified Water (Finished Injectate for SWIP Wells)	Does This Meet Basin WQ Objective?
Chloride	mg/L	250/500[a]	3.1	Yes
Nitrate (as N)	mg/L	10	3.5	Yes
TDS	mg/L	500/1000[a]	92	Yes
Boron	mg/L	0.75	0.12	Yes

a. *Where applicable for secondary objectives, values shown are recommended/upper limits*

Assimilative Capacity Usage Projection (2023–32)

Constituent	Recharge Water (mg/L)	Difference from Background (mg/L)	Assimilative Capacity			
			Usage (tons)	Usage (mg/L)	% of Total	Less than +10% assimilative capacity by mass?
Chloride	10.1	-31.6	-634	-0.5	-0.25%	Yes
Nitrate (as N)	1.7	1.6	32	0.03	0.27%	Yes
TDS	101	-339	-6,790	-5.7	-9.44%	Yes

Estimated Effects on Production Well Salinity After Beginning of Capture

Well	Production (AF)	Purified Water for Recharge			Chloride		TDS	
		Captured (% of total particles released)	Captured (AF)	Captured (% of production)	Current (mg/L)	With PWS Project (mg/L)	Current (mg/L)	With PWS Project (mg/L)
Estates	10,277	11.4	4,155	40	49	30	472	318
Tannery II	14,710	16.1	5,966	41	61	38	561	371
Rosedale	13,635	7.1	2,626	19	44	36	496	418
Cunnison	9,580	2.5	917	10	53	48	529	487

Antidegradation Study Findings

1. The Project is consistent with the State of California's Antidegradation Policy
2. Advanced treated recycled water meets the groundwater basin's water quality objectives
3. Geochemistry effects are likely to be temporary and not cause exceedances of water quality objectives
4. Implementation of the groundwater recharge project is in line with the beneficial uses of the Santa Cruz Mid-County Groundwater Basin and for the maximum benefit of the people (e.g., drinking water)

Summary

Pure Water Soquel uses a proven approach to provide a drought resilient water supply and creates 1,500 AFY of local water supply.

Pure Water Soquel will comply with State of California regulations for a Title 22 Groundwater Replenishment Reuse Project.

Advanced treated recycled water from Pure Water Soquel meets all federal and state drinking water quality requirements to recharge local groundwater aquifers.



SOQUEL CREEK WATER DISTRICT

Collaborative Partners

Funding Partners

Project Team Support and Implementation

Public Comments

- At tonight's hearing, the District is accepting public comments via oral comments
- If you provide an oral comment, it is recommended that you follow with a written comment via mail or email (PureWaterSoquel@soquelcreekwater.org) to ensure we have properly captured your comment.
- As appropriate, the Engineering Report will be revised to address the comments
- **Response to comments will be posted on the District's website**

For Oral Comments: Public Hearing Ground Rules

- Attendees will be muted when not called upon to comment
- Speakers will be called on and unmuted to provide comments.
- State your name for the record
- Limit oral comments to 3 minutes per speaker
- Comment only on Engineering Report for Title 22
- Instructions for providing written comments will be provided at the close of the hearing
- **Response to comments will not be made tonight, but will be posted on the District's website**

For Written Comments: How to Submit Comments

All public comments on the Pure Water Soquel Groundwater Replenishment Reuse Project Title 22 Engineering Report must be submitted in writing and received no later than 5:00 pm on December 8, 2022 via mail or email:

Email:
PureWaterSoquel@soquelcreekwater.org
Subject Line: PWS Title 22 Engineering Report

U.S. Mail:
Soquel Creek Water District
ATTN: Pure Water Soquel Project Title 22 Engineering Report
PO BOX 1550
Capitola CA 95010

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
1	Steve Seliskar	How deep is aquifer AA at Monterey well injection site?	During drilling of the Monterey SWIP recharge well, the top of the Purisima AA unit was encountered at 470 feet below ground surface.
2	Steve Seliskar	With the increase of cancer and other strong drug treatments, radiation, chemotherapy, and associated chemicals,will the filtering and other treatments to the water reduce contaminants to a safe level?	The system has been designed to be compliant with all regulations as described in Section 8 Product Water Quality and other sections of the Engineering Report. The regulations were developed to protect public health.
3	Steve Seliskar	The presentation, I think by R. Beggs, has a table comparing minerals and chemicals listing Cunnison Lane and its makeup of water, but as far as I know there is no well there to get samples to show what a sample of water there would show.	The slide titled "Estimated Effects on Production Well Salinity After Beginning of Capture" shows results based on a model simulation of Pure Water Soquel (PWS). As the commenter states, the planned well at Cunnison Lane has not been constructed. To estimate the effects at this well, the anti-degradation study assumes the Purisima Formation at the Cunnison Lane location has chloride and TDS concentrations calculated from the average concentrations at the nearby Rosedale and Tannery 2 wells. Although the actual concentration at Cunnison Lane is unknown, the estimated effect of PWS on lowering chloride and TDS concentrations at that location is representative and consistent with salinity concentrations throughout the Purisima Formation being higher than what will be in purified water.
4	Steve Seliskar	It also seems logical that pumping at Maplethorpe well and the potential Cunnison Lane site that the flow from Monterey injection well will move faster than projected to the private wells shown in the time of influence as well as wells not shown to be inside the influence zone, wells that are closer to Soquel Drive and on Monterey Ave. north of the freeway.	The Maplethorpe well was destroyed in 2017. Engineering Report Table 11-2 includes the current operating wells and a footnote has been added for clarity. The refined particle tracking results shown on Figure 11-13 are based on conditions prior to the Cunnison Lane well coming online because this period will have higher pumping at the Tannery II production well nearest to the Monterey SWIP well and therefore the gradients near the Monterey SWIP well are expected to be greatest prior to Cunnison Lane well coming online and reducing pumping at the Tannery II well. The tracer study conducted after operation begins will provide more accurate data on travel and underground retention times. The refined particle tracking model can be calibrated to the data and then used to evaluate underground retention times with Cunnison Lane well pumping.
5	Steve Seliskar	If water that does not pass quality testing manages to be injected into the ground, will there be pumps to remove that water or will it be assumed that by the time it travels in the ground that it will meet safe standards. It seems that this would eventually build up issues of a toxic basin.	The PWS Project will suspend recharge of purified water in the event of non-compliance with its permit and only resume recharge once corrective actions have been taken such that it complies with Title 22 water recycling regulations. The PWS Project will use several procedures to protect public health and the groundwater basin: (1) enhanced source control of wastewater (Section 4.3.5), (2) advanced water treatment process performance monitoring (Section 14.3), (3) purified water quality monitoring (Section 14.4), (4) groundwater quality monitoring (Section 14.5), and (5) drinking water well construction control zones (Section 11.4). In the event that inadequately treated purified water is inadvertently recharged at the SWIP wells, the steps outlined in Section 12 (Response Retention Time) and Section 13 (Contingency Plan) of the Engineering Report will be implemented. SqCWD has contingency plans in place to protect public health and ensure a safe drinking water supply is delivered to the public. Elements of the contingency plans include water quality monitoring, management of sources, including interties and blending, providing alternative drinking water sources, and installing well-head treatment for adversely impacted drinking water wells. These actions would be implemented as soon as SqCWD has evidence of a problem caused by the PWS Project.
6	Becky Steinbruner	Will the NPDES permit by the Santa Cruz Wastewater Treatment Plant take into account this increase in concentrated disinfectant and also temperature changes and what studies are there being done to monitor the impacts on the marine habitats at the outflow? That is table 4.18.	The City of Santa Cruz's amended NPDES permit for the discharge flows to the outfall at the SC WWTF will include the flows coming from the AWPF, including the reverse osmosis concentrate (ROC) blend flows. The discharge and receiving water temperatures were modeled to determine the mixing and dilution at the outfall. The PWS project will comply with the Ocean Plan, which has been developed to reduce impacts to marine habitats.
7	Becky Steinbruner	I note that there is still no final antidegradation report. If you can please provide a timeline when that will be done and available to the public. At this point everything is based on conjecture and modeling, but I note that the AEM studies were not done on real Earth sites, they were done on a grid that was put on a screen somewhere so I'm very very concerned about this.	An updated antidegradation report is planned to be submitted to the RWQCB in Q1 2023. The AEM data was only used to supplement the groundwater model, which was based on drilling logs, pumping tests, and prior detailed studies.

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
8	Becky Steinbruner	I note that there is a preponderance of geochemical, geophysical analysis included for the Twin Lakes Church injection well, but nothing for the other two. So I want that level of geophysical analysis done as well for Willowbrook and Monterey, noting that there are extreme differences within five feet of the depth of the 600 foot area.	The Phase III Geochemistry Investigation included the Willowbrook Well. It also included the high transmissivity zones for both the Willowbrook and Twin Lakes Church Wells. The investigative work was planned to address comments from the Regional Water Board in early 2021. The differences in geochemistry results between the wells were not substantial. The Phase III Geochemistry Investigation report will be added as an appendix to the revised Engineering Report.
9	Becky Steinbruner	That there be a study of the radio impacts and how effective they will be, it makes me very nervous that the time is 4 to 6 months before there could be a problem noted. I would like real time sampling at the point of injection rather than modeling and a long time before we find out if there are problems.	The estimated underground travel time to the nearest monitoring well is 1.1-1.6 months. To ensure there is enough time to respond before drinking water wells are impacted, this estimate is multiplied by a conservative factor of 4 in calculating response retention time (RRT). The RRT is the minimum time that purified water must be retained underground prior to withdrawal for use as a drinking water supply. The RRT for the PWS Project is 7.5-9.2 months, which allows treatment system failures to be identified and corrected, supplemental monitoring, and providing (if necessary) an alternative source of drinking water. The tracer study will provide data to more accurately quantify travel time to the nearest monitoring well to confirm response retention time is sufficient. As described in Section 14.4, purified water will be sampled prior to recharge to meet TItle 22 requirements to protect public health.
10	Becky Steinbruner	It looks like primarily Unit A is going to be where the pressure injection will be. Please clarify what unit your AEM studies, which are all hypothetical, are showing the saltwater/freshwater interface, is this effectively going to hold back or push back the saltwater intrusion interface.	The Purisima A Unit will receive the majority of the PWS recharge though there will be some recharge into the Purisima BC Unit. Figure 10-5 provides a summary of the AEM data that shows salty water in the A Unit just offshore of SC-5A where low groundwater levels indicate a high risk of seawater intrusion. Model results show how PWS (Figures 11-7 and Figure 11-9) raise groundwater levels above minimum thresholds (MT) defined in the Basin's Groundwater Sustainability Plan as necessary to prevent seawater intrusion in the A Unit while model results of conditions without PWS show groundwater levels below MT. Note also that PWS is designed to prevent seawater intrusion throughout SqCWD, not just in the A Unit, as PWS recharge facilitates reduction of pumping in other areas of SqCWD, as described in Section 11.1.1. Appendix D Section 4.3 describes expected benefits throughout SqCWD.
11	Patty Pickett	I appreciate the work that the Soquel Water District is doing in implementing the Pure Water Soquel Project. I am a long time resident of Santa Cruz County and I rely on the groundwater basin, which I understand is overdrawn and getting contaminated by the seawater. I appreciate the technical evaluation and the studies that have been underway and understand that they will continue when Pure Water Soquel comes online. I feel that it is good to hear that other projects in California that are operating and producing purified water to replenish their groundwater basins. It is good planning in our region to recycle water and not have it wasted and just sent out to the ocean. I thank you for implementing this project and working with the state to make sure that we have reliable water for our community and for the future.	Thank you for your comment.
12	Becky Steinbruner	1) The Engineering Report lacks a FINAL Anti-Degradation Analysis, required by State Water Resources Board Resolution 68-16. A DRAFT version only is included in the Report, which is not to be relied upon or cited, as it is not complete or conclusive. Section 11.5 should include a FINAL Anti-Degradation Analysis to protect the high-quality waters of the groundwater basin and the marine waters of the Monterey Bay National Marine Sanctuary and Pacific Ocean. "SWRCB Resolution No. 68·16 ("Statement of Policy With Respect to Maintaining High Quality of Waters in California") Resolution No. 68-16 establishes essentially a two-step process to comply with the policy. The first step is if a discharge will degrade high quality water, the discharge may be allowed if any change in water quality (1) will be consistent with maximum benefit to the people of the State, (2) will not unreasonably affect present an anticipated beneficial use of such water, and (3) will not result in water quality less than that prescribed in state policies (e.g. water quality objectives in Water Quality Control Plans). The second step is that any activities that result in discharges to such high-quality waters are required to use the best practicable treatment or control of the discharge necessary to avoid pollution or nuisance and to maintain the highest water quality consistent with the maximum benefit to the people of the State."	See response to comment #7.
13	Becky Steinbruner	2) Because there is no FINAL Anti-Degradation Analysis of the Project impacts on high-quality groundwater, as defined in California Water Code 13050(g), or any of the Project's marine receiving waters in the Monterey Bay National Marine Sanctuary, there must be further analysis of the chemical, temperature and nuisance impacts per State Water Resources Control Board WO 86-8 and WO86-13 to avoid violation of Water Code 13050(l) 13241 and 13050(m).	See response to comment #7.

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
14	Becky Steinbruner	3) Page 4-18 Section 4.4) fails to include known leak in the Santa Cruz City Wastewater Treatment effluent outfall pipe that has been subject to recent Regional Water Quality Control Board (RWQCB) letters requiring Enforcement Action. "The City discharges under an NPDES permit issued by the RWQCB On June 1, 2020, the RWQCB(Order No. R3-2017-0030, NPDES No. CA 0048194)" Santa Cruz City Enforcement Order R3-2019-0005 Therefore, please include description and analysis of how the marine areas near this known leak will be monitored for potential increased contaminants associated with disinfection by-products inherent in the PureWater Soquel Project brine and also temperature fluctuations and any and all potential biological and nuisance impacts.	See response to comment #6.
15	Becky Steinbruner	4) Section 4.4.1 Wastewater Collection System fails to include discussion regarding the impacts of the increased load impacts and potential system failures on the Rodeo Gulch Basin system that is currently over-burdened and for which there is a service connection moratorium. Please include discussion of how the collection system capacity will be affected and what best practices will be employed to prevent system failures and public health risk.	The additional flows that will be going to the collection system from the PWS project have been evaluated and approved by the County.
16	Becky Steinbruner	5) 4.4.3.1 Ocean Discharge Limitations "The 2018 NPDES permit (No. CA0048194) for the SC WWTF sets effluent discharge specifications for conventional pollutants, toxic pollutants, percent removals and bacteria. Table 4-15 summarizes the specific conventional pollutants." This section fails to include discussion, description or analysis of potential Project brine components or temperature fluctuations. Please include such information in the final document.	The Regional Board is in the process of writing an amended NPDES permit that will include description of the ROC discharge and analysis of the ROC discharge on effluent quality.
17	Becky Steinbruner	6) Section 5 Overview. Please include explanation of how the City of Santa Cruz will obtain and convey the "sidestream" waters to the NPR Project Facility. This is a component of the PureWater Soquel Project and must be included in description and impacts.	This information is provided in a separate SC Nonpotable Reuse Engineering Report and this report has been conditionally approved by DDW.
18	Becky Steinbruner	7) Section 5.2.2.2 (page 5-9) footnote reads: "a. SC NPR Facilities are detailed separately in the SC Nonpotable Reuse Engineering Report" Please provide embedded link to that document.	See link to the SC Nonpotable Reuse Engineering Report: https://www.soquelcreekwater.org/261/Reports-Studies
19	Becky Steinbruner	8) Page 5-10 Please include embedded link to the SC NPR Facilities documents referenced again in Section 5.2.5: 5.2.5 Non-Potable Reuse Facilities "The majority of the source water will be pumped by the SWPS to the AWPF at Chanticleer. The remaining approximately 0.3 mgd will be further treated to meet the Title 22 requirements for disinfected tertiary recycled water. The Santa Cruz TTF Project facilities include cloth filtration and UV disinfection. These non-potable reuse facilities will replace the current SC WWTF 2W treatment facilities system, which produces 0.2 mgd for in-plant reuse using media filtration and chloramine disinfection. Design details for the Santa Cruz TTF Project facilities can be found in the City of Santa Cruz Non-Potable Reuse Engineering Report" Please include a direct link to that document.	See response to comment #18.
20	Becky Steinbruner	9) page 5-0 Chanticleer AWTF description fails to define or identify the location of the "ROC wet well". Reverse Osmosis. RO removes dissolved organic compounds and minerals from water. RO produces a residual concentrate stream (ROC). The RO system is designed to operate at 80-percent recovery. The concentrate stream will be sent to the ROC wet well for discharge through the ocean outfall. Chemical solutions used to clean the membranes will be neutralized and sent to the sewer via the Sanitary Lift Station.	Page 5-1 identifies the ROC wetwell as being at the AWPF and it is also shown in Figure 5-7.
21	Becky Steinbruner	10) Figure 5-7 on page 5-13 is unreadable and provides the public with no reasonable level of information regarding the actual layout of the disinfection process or elements thereof.	Comment Noted. The intent for Figure 5-7 is to show the overall site layout.
22	Becky Steinbruner	11) Figure 5-8 shows two different layout scenarios, but there is no explanation regarding water process operational flow and not readable due to small and confusing text.	The purpose of Figure 5-8 is to show the process equipment, from two different perspectives (these are not different layout scenarios). The water process operational flow is shown on Figure 5-2.

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
23	Becky Steinbruner	12) Page 5-16 Neither the 2018 Project EIR nor 2021 Project Addendum included the LOX production element, process components or the truck deliveries of LOX. This requires further CEQA evaluation and public noticing. Please conduct environmental analysis of this new component of the Chanticleer AWTF treatment process with attention to fire safety hazards adjacent to Highway One and nearby County Law Enforcement and Emergency Services buildings and Communication Center and provide the document publicly as an updated Project Addendum or Subsequent EIR. 5.3.3.2 Liquid Oxygen Storage and Feed System "Ozone will be produced on-site using high purity oxygen stored on-site as LOX. LOX will be delivered via chemical delivery trucks and stored and maintained in a liquid form in an on-site storage tank. LOX from the storage tank will be conveyed to ambient vaporizers and converted to gaseous oxygen (GOX). Heat gain at the vaporizers will be provided from ambient air as the LOX flows through the vaporizing units. The pressure of the storage tank will provide the motive force for the flow of oxygen out of the tank, through the vaporizers and ozone generator, and to the ozone dissolution system. The LOX storage tank will consist of an inner pressure vessel and an outer jacket. The space between the pressure vessel and outer jacket will be filled with Perlite or another similar insulating material and placed under vacuum to insulate the tank. The LOX storage tank will be located adjacent to the AWPF Building, south of the western chemical storage area canopy. Design criteria for the LOX storage tank are listed in Table 5-9."	The 2021 Addendum to the EIR evaluated the addition of ozone and found no additional impacts as the previously approved project. The LOX area, which is part of the ozone system, is shown on Figure 3 of the 2021 Addendum to the EIR. From page 19 of the 2021 Addendum to the EIR: "As discussed in Certified EIR Section 4.9, Hazards and Hazardous Material, required compliance with the numerous laws and regulations that govern the transportation, use, handling, and disposal of hazardous materials, would limit the potential to create hazardous conditions due to the use or accidental release of hazardous materials. Further, it is noted that the water treatment chemicals are consistent with chemicals used at water and wastewater facilities throughout California, as well as other public and municipal facilities such as swimming pools. As detailed in the Certified EIR, the District will be required, under the California Hazardous Materials Release Response Plan and Inventory Law of 1985, to prepare and implement a Hazardous Materials Business Plan (HMBP) that will identify the hazardous materials to be used in the treatment process, procedures for the safe transportation, storage, use and disposal of chemicals, and spill response procedures in the event of a spill. The plan is implemented at the local level and the agency responsible for implementation of the Unified Program is called the Certified Unified Program Agency (CUPA), which for the Project area, is the Santa Cruz County Environmental Health Services (EHS). The requirements of the HMBP, which would be developed based on final details of Project design, will require primary and secondary containment of all hazardous materials, training for the use of hazardous materials, routine facility inspections, and the establishment of spill prevention and response procedures in the event of a spill. Further, transportation regulations concerning hazardous materials are enforced by the California Highway Patrol and Caltrans and include the periodic inspections of vehicles and containers used to transport hazardous materials to ensure compliance with container requirements. Collectively, the HMBP and transportation requirements will ensure compliance with the numerous applicable regulations. The required implementation and compliance with these existing regulations will limit the potential for creation of hazardous conditions associated with the Project due to the use or accidental release of hazardous materials and would render this impact less than significant."

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
24	Becky Steinbruner	13) Page 5-18 further describes the Ozone generation facility that was never described or evaluated in the Project 2021 Addendum CEQA document. Please provide an updated CEQA document for this element of the Chanticleer AWTF that is only summarized on page 5-18 in Section 5.3.3.3. 5.3.3.3 Ozone Generation "The ozone generation system converts GOX into ozone by passing GOX through two electrodes powered by high voltage alternating current (AC). The high voltage AC for each ozone generator will be supplied by a dedicated power supply unit. Excess heat from the generators will be removed by a cooling system, described further in Section 5.3.3.5. Design criteria for the ozone generators are summarized in Table 5-12." 14) Page 5-18 5.3.3.5 Ozone Generation Cooling System None of this was included in the Project 2021 Addendum CEQA document or analysis. Please provide an updated Project Subsequent EIR or Addendum to satisfy CEQA requirements because of the increased energy and hazardous chemical transport, storage and use at the Project site. 15) Page 5-19 5.3.3.6 Ozone Dissolution System was not included in the Project 2021 Addendum CEQA document. Please include a comprehensive Subsequent EIR updated Addendum for this system to comply with CEQA requirements. 16) Page 5-205.3.3.7 Off-Gas Destruct System was not included in the Project 2018 EIR or the 2021 Project Addendum for impacts to air quality or hazards to nearby County Offices, Highway One traffic, the Chanticleer Pedestrian Overcrossing or the neighboring homes and businesses, or the potential impacts to the ambient air quality, or mitigations regarding the on-site generator. Please conduct and provide to the public an updated CEQA Subsequent EIR or updated Addendum document regarding this new treatment element and all potential impacts. 5.3.3.7 Off-Gas Destruct System The ozone off-gas destruct system will reduce the ozone concentration in the off-gas produced from the ozone system to levels suitable for discharge to the atmosphere. Ozone off-gas will be pulled from the top of the Ozone Contact Tank. Each ozone destruct unit consists of a skid-mounted preheater, catalyst chamber, and blower. In the event of a power loss to the facility, the ozone destruct system will run off the on-site generator. 17) page 5-21 5.3.3.8 Ozone Contact Tank Where will the off-gas destruct system exhaust out-gas off the site boundary? This element or the impacts of the exhaust from the pressure vacuum relief valve were not evaluated in the Project 2018 EIR or the 2021 Project Addendum. Please conduct further analysis of any and all potential air quality impacts and hazard mitigations related to this element and generator impacts for noise and air quality degradation or public health and safety risks. "In addition to the off-gas destruct system connection to the top of the Ozone Contact Tank, the tank will be provided with a pressure vacuum relief valve to protect against pressurizing the contact tank in the event of a destruct system failure. Exhaust from the pressure vacuum relief valve will be routed to the south edge of the MF Feed Tank, away from the site boundary. An additional 2-inch port will be provided on the top of the Ozone Contact Tank for the ability to install foam control equipment if deemed necessary during start-up and operation."	The equipment described in the comments are standard components of the proposed ozone pretreatment system evaluated under CEQA and the analysis is inclusive of the construction and operational elements associated with that system. Pages 5-8 of the 2021 Addendum to the EIR: "Due to the higher than expected nitrites in the treated secondary effluent described above, pretreatment is required. However, rather than nBAF pretreatment at the SC WWTF (considered in the 2020 Addendum), the Project would include an ozone pretreatment system at the Chanticleer site. Ozone and nBAF pre-treatment are equally effective nitrite pre-treatment systems. This approach has the environmental advantage of not requiring installation of deep piles to support the treatment system as would have been necessary for nBAF systems. Further, nBAF generates more backwash than ozone, which requires disposal to the wastewater system. Thus, the proposed pre-treatment system has been updated from that considered in the 2020 Addendum to reduce the amount of construction required to support the pre-treatment system and to reduce the volume of backwash requiring disposal." Page 23 of the 2021 Addendum to the EIR: "Site specific environmental review of the treatment facility revisions, along with environmental review prepared for the Certified EIR and 2020 Addendum have led the District to conclude that the Project would not result in any new impacts not previously disclosed in the Certified EIR; nor would it result in a substantial increase in the magnitude of any significant environmental impact previously identified. It is also noted that the Project would be subject to the mitigation measures already adopted as part of the adopted MMRP. For these reasons, an addendum to the Certified EIR would be sufficient to meet the requirements of CEQA Section 15164 and that an addendum need not be circulated for public review but can be included in or attached to the final EIR. This 2021 Addendum also serves as documentation that the proposed Project changes do not trigger any of the conditions in CEQA Guidelines Section 15162; therefore, a subsequent EIR is not required." The destruct off-gas is being routed away from the site boundary. The design includes the best available technology, including ambient ozone sensors. The project is complying with the California Fire Code, which includes inspection by a fire marshal. The vacuum relief valve is only used if the tank became over-pressurized, and controls are in place to minimize this.
25	Becky Steinbruner	18) Page 5-21 regarding holding times for ozonation are speculative because the design of the PureWater Soquel Ozone treatment phase has had no Pilot Project, and will be modeled on the PureWater Monterey system, a much larger treatment system. "The design of the Ozone Contact Tank was informed in part by Monterey One Water's (M1W's) Pure Water Monterey (PWM) ozone contactor design. Piloting of the ozone system was not conducted for the PWS project. However, the wastewater treatment processes and AWPF influent water quality for PWS are similar to PWM, and so a conservative design approach was taken based on the PWM design." The PWM Project is larger, with a 3,500AcreFeet/Year capacity and 5mgd system operation. PureWater Soquel will produce 1500 AcreFeet/year with a 1.7mgd system operation. Therefore, holding times cannot be assured successful disinfection rates, based solely on a hypothetical model that has been designed and tested without a pilot program. https://montereyonewater.org/261/Pure-Water-Monterey-Overview Please conduct a Pilot Project of the ozone contact tank operation to assure effective contact time with source water in the treatment process. Please conduct a Subsequent EIR or updated Addendum for this vital component to assure public health and safety and in compliance with CEQA.	At this time, the District is not using ozone for disinfection credit. The primary purpose of the ozone system is to improve operational performance of equipment downstream (e.g., reduce fouling of MF membranes). Piloting is not necessary because we will have operational control features in place that monitor performance of the system to optimize ozone dose control. PWM Project also uses ozone for operational control and not disinfection credit.

Comments

Reviewer			
Comment Number	**Name of Commenter**	**Comment**	***Response***
26	Becky Steinbruner	19) Page 5-25 Table 5-23 provides pore size for the MF but there is no information provided regarding assurances of contaminants that will be removed or not removed by this pore size, in accordance with public health standards and there is no information regarding the pressure under which this system would operate, thereby influencing effective levels of disinfection and also influencing energy demand. Pore Size micron 0.03 Please provide analysis of contaminant removal and mitigations for long-term power outages.	The MF system selected has been pre-approved by the Division of Drinking Water and validated to achieve the disinfection credit required for this project. Furthermore, the operations of the membrane will follow requirements of DDW and the Membrane Filtration Guidance Manual for continuous monitoring of turbidity and daily direct integrity testing, which are an indicator of membrane performance. The system will shutdown and the AWPF will not produce purified water during any power outages. Refer to Section 13.4 for more details.
27	Becky Steinbruner	19) The Engineering Report provides geo-characterization only for the Twin Lakes Church Injection Well (page 1085). Please include such analysis of the physical characterization for soils in the Willowbrook and Monterey Injection Well sites.	See response to Comment #8
28	Becky Steinbruner	20) page 1313 please explain what Radio QC figures are relative to the Twin Lakes Church injection well.	Analytical laboratories perform several different quality control (QC) tests to ensure the data being reported is of sufficient quality. The purpose of the laboratory QC protocols is to evaluate the performance of the analytical laboratory. The laboratory report will note any anomalies in performing the QC tests in a case narrative section of the report and state if the analytical anomalies affect the data quality. The purpose of collecting water from the aquifer zones during the TLC pilot well program was to evaluate the native groundwater chemistry. A wide range of analyses was performed on the native groundwater samples to provide a comprehensive evaluation of the groundwater. The results represent the existing groundwater conditions prior to any injection operations. The laboratory issues noted QC case narratives on the Radio Chemistry analysis, and other water quality analyses, did not invalidate any of the reported data for the intended use of evaluating the native groundwater quality.
29	Becky Steinbruner	21) Please provide better explanation of real-time source water fluctuations and mitigations for operations when spikes of contaminants occur.	Real-time sampling is not required per the Title 22 regulations. This project utilizes the best practices in the industry and according to regulatory requirements. In addition, the City of Santa Cruz has developed a revised source control program to meet the source control monitoring of the Title 22 regulations. Furthermore, the project uses online analyzers to measure parameters that are reflective of performance, which will provide real-time indication of upstream WWTP performance. Refer to Section 14 for more detail.
30	Becky Steinbruner	22) Please provide plan for real-time sampling in source water for contaminant profiles and variations.	See response to comment #29.
31	Becky Steinbruner	23) page 307 fails to list NDMA as a contaminant.	NDMA is included in Table 14-15.
32	Becky Steinbruner	24) Please explain why baseline sampling of nearby private wells has not been done to establish effective modeling of injected water travel time.	Baseline sampling of wells is not needed to effectively model travel times. As described in Section 14.7, SqCWD will collect water quality samples for the tracer study from private wells nearest the SWIP recharge wells if given access by well owners. This will include sampling prior to operation and the tracer study to establish pre-operation conditions at the wells.
33	Becky Steinbruner	25) page 327 shows unrealistic model of flow because it does not reflect downflow direction of groundwater.	Figure 14-6 shows refined particle tracking that is based on the GSFLOW model of the Basin that includes regional flow to south.
34	Becky Steinbruner	The Twin Lakes Church Injection well is the sole source of geo-modelling and cannot be extended to the Willowbrook and Monterey well hypothetical models. The models do not take into account the ASR impact of the City of Santa Cruz projects.	The modeling in the Title 22 ER is based on the GSFLOW of the Basin that has been calibrated to data throughout the Basin as shown in Section 3.3 of Appendix D. The model simulations shown in the Title 22 ER do not include operation of City of Santa Cruz ASR. However, prior modeling for the Basin Groundwater Sustainability Plan (GSP) showed minimal impact of ASR on groundwater levels in the PWS area (see GSP Figure 4-1).

Appendix B: City of Santa Cruz Wastewater Treatment Plant Pretreatment Program 2021 Annual Report

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CITY OF SANTA CRUZ WASTEWATER TREATMENT PLANT

PRETREATMENT PROGRAM

2021

ANNUAL REPORT

COMPILED BY THE ENVIRONMENTAL COMPLIANCE PROGRAM

CITY OF SANTA CRUZ WWTF

PRETREATMENT ANNUAL REPORT

PCS Data Entry Form

PPS1

POTW Name: City of Santa Cruz Wastewater Treatment Plant

NPDES Permit #: CA0048194

Period Covered By This Report:	1-1-21 (PSSD)	to	12-31-21 (PSED)	
Number of Significant Industrial Users in SNC With Pretreatment Compliance Schedule:		1		(SSNC)
Number of Notices of Violation and Administrative Orders Issued Against Significant Industrial Users:		7		(FENF)
Number of Civil and Criminal Judicial Actions Against Significant Industrial Users:		0		(JUDI)
Number of Significant Industrial Users with Significant Violations Published:		0		(SVPU)
Number of Industrial Users From Which Penalties Have Been Collected:		3		(IUPN)

CONTENTS

SECTION I	ANALYSIS OF POLLUTANTS IDENTIFIED IN SECTION 307(A) OF THE CLEAN WATER ACT, POLLUTANTS CONTRIBUTING TO UPSET, INTERFERENCE, AND PASS-THROUGH
SECTION II	BASELINE MONITORING REPORTS
SECTION III	LIST OF INDUSTRIAL USERS
SECTION IV	2021 FOURTH QUARTERLY STATUS REPORT
SECTION V	SUMMARY OF COMPLIANCE AND ENFORCEMENT ACTIVITIES
SECTION VI	PRETREATMENT PROGRAM CHANGES
SECTION VII	PRETREATMENT PROGRAM BUDGET SUMMARY
SECTION VIII	PUBLIC PARTICIPATION
SECTION IX	CHANGES IN SLUDGE DISPOSAL
SECTION X	COUNTY OF SANTA CRUZ PRETREATMENT PROGRAM REPORT 2021

SECTION I. ANALYSIS OF POLLUTANTS IDENTIFIED IN SECTION 307(A) OF THE CLEAN WATER ACT, POLLUTANTS CONTRIBUTING TO PASS-THROUGH

This section summarizes the results of analyses of pollutants regulated at the Section 307A of the Clean Water Act.

1. The term *Interference* as defined at 40 CFR 403.3 is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:
   (1) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
   (2) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.
2. The term *Pass-Through* as defined at 40 CFR 403.3 means a discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Plant performance during the year showed no evidence of interference or pass-throughs contributed by dischargers. In addition, comprehensive analyses of all reports from the regulated and permitted industries in Santa Cruz was conducted in preparation of this report. The analyses showed no evidence of any discharge qualifying for this designation in 2021.

SECTION II. BASELINE MONITORING REPORT.

BASELINE MONITORING REPORT

Industry Baseline Monitoring Reports (BMR) have been reviewed in order to reflect any changes undertaken by permitted industries during the course of 2021.

Changes in status include:

> **Anton Santa Cruz, LLC** was issued a temporary dewatering permit for discharge to the sanitary sewer for construction at 810 Pacific Avenue. Baseline monitoring shows extracted groundwater is in compliance with the local Sewer System Ordinance, Chapter 16.08, and suitable for discharge.

Permits were renewed to the following industrial users in 2021:

- **City of Santa Cruz Water Department**

Permits were issued to the following local Liquid Waste Haulers in 2021:

- **CA State Parks**
- **Crown Sanitation**
- **Greenline**
- **Green Planet Sanitation**
- **Honey Bucket**
- **Jeff Hill**
- **United Site Services**

The following is the current version of the City's Baseline Monitoring Report Form as made available to the public through the City's website at:

http://www.cityofsantacruz.com/home/showdocument?id=6019

INFORMATION REQUIREMENTS FOR BASELINE MONITORING REPORT

CITY OF SANTA CRUZ PRETREATMENT PROGRAM
INSTRUCTIONS FOR BASELINE MONITORING REPORT

Following are instructions for filling out the subsequent "Information Requirements for Baseline Monitoring Report" form:

1. Briefly describe the nature of business or service performed at this facility. This description should include all manufacturing processes, including those not related to the categorical industry (use additional sheets if necessary).
2. Give the production rate of this facility (usually given as an annual average production or monthly average).
3. Provide the appropriate Standard Industrial Classification (SIC) code for this facility.
4. Self-explanatory.
5. Provide average and maximum waste flows from all regulated process streams. If process waste streams are combined either with other process waste streams or non-process (sanitary, cooling water, etc.) waste streams, these individual flow rates should be given.
6. Each industrial user will sample, analyze and report on all regulated pollutants specific to each process (refer to appropriate subcategory in regulations for specific pollutants). An attachment should be provided indicating the types of samples (i.e., grab, composite, flow proportioned) the frequency and number of samples; time, date, and locations of the sampling events; and certification that the method of analysis meets the regulatory requirements. The facility must ascertain whether it can meet the 30-day average, calculated average, daily maximum or calculated maximum limit. All pretreatment standards are process related and a facility must comply with the standard at the end of each regulated process. However, EPA recognizes that many facilities combine their wastewater process lines, cooling water, and sanitary wastes prior to treatment or discharge to municipal sewers. Hence, a facility can sample at a combined point, but will need to adjust the categorical limit by employing the *Combined wastestream formula* which is contained in Section 403.6(e) of the General Pretreatment Regulations (Federal Register January 28, 1981). If this is the case with your facility, you must employ the formula and provide all additional data used for calculations. For further explanation, please refer to 40 CFR 403.6(e).
7. If answer was yes, skip Question 8, and go to Question 9.
8. An explanation is needed describing how the facility intends to meet Categorical Standards. If additional pretreatment and/or operations and maintenance are required, then an attachment must be provided describing the proposed system and a schedule of dates for commencement and completion of events leading to the construction and operation of the system.
9. Any other environmental control permits (i.e., NPDES, hazardous material, etc.) held by this facility must be listed.

INFORMATION REQUIREMENTS FOR BASELINE MONITORING REPORT

Facility Name _____
Owner/Operator _____
Address _____
_____
_____

1) Briefly describe the products produced and manufacturing process used in your operation
_____
_____
_____.

2) Production Rate: _____

3) SIC Code: _____

4) Facility Diagram: Attach a copy of your facility flow schematic diagram of all regulated process, including points of discharge to the sanitary sewer system.

5) Wastewater Flow Measurement:

Regulated Process (Type)	Daily Average (gal/day)	Daily Maximum (gal/day) or	Estimated (E) Measured (M)

Non-Regulated Process (Type)	Daily Average (gal/day)	Daily Maximum (gal/day) or	Estimated (E) Measured (M)

6) Measurement of Pollutants: Attach the most recent results from the sampling and analysis during normal working hours of all regulated process streams including the following information:
a. Sample Type (i.e., flow proportional, composite, grab)
b. Frequency of Samples
c. Time, date, and location of sampling event
d. Method of analysis
e. Comparison of results with applicable pretreatment standards
f. If alternate limits (i.e., combined wastestream formula) are calculated, include the limit and all supporting data.

INFORMATION REQUIREMENTS FOR BASELINE MONITORING REPORT

7) Certification: Are pretreatment standards for your industry being met on a consistent basis by this facility?

□ YES □ NO

If "yes", go on to Question 9.

8) If answer to number 7 is "no", will additional pretreatment and/or operations and maintenance be required for this facility to meet pretreatment standards?

□ YES □ NO

If "no", attach a description of the required pretreatment and/or operations and maintenance to gain compliance, and include schedule of dates for commencement and completion of events leading to the construction and operation of this additional pretreatment.

9) List any other environmental control permits held by this facility:

_____

_____

_____

_____

_____

I have personally examined and am familiar with the information submitted on this form and attachments. Based upon my inquiry of those individuals immediately responsible for obtaining the information reported herein, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, as dictated by 40 CFR 403.12(m).

_____ _____

Signature of Official Date

_____

Title of Official.

SECTION III. LIST OF INDUSTRIAL USERS.

Complete Business Listing by Class

CLASS	IU Name	IU Number	Business Address
Agency	Dominican Rehabilitation Center	127	610 Frederick Street
	Sutter Urgent Care	1114	2025 Soquel Avenue
AUTO BODY	Affordable Repairs Paint & Body	982	1025 B Water Street
	Art of Steel	208	105 Bronson Street
	Bordner Auto Body	71	130 Center Street
	Chuck Fanucci Auto Body	92	211 Mcpherson Street
	Keener Auto Body	653	1215 Water Street
	Perrigos	260	251 Washington Street
	Riley Collins	103	113 Watson Street
	Santa Cruz Auto Body Inc.	299	324 River Street
	Scotts Body Shop	328	140 Center Street
	Smitty's Restoration	878	1218 Fair Avenue
	Westons Auto	404	1298 Fair Avenue
AUTO DEALER	Auto One	651	1215 Water Street
	Auto Trade Center	1090	1000 Water Street
	North Bay Ford Dealership	248	1999 Soquel Avenue
	Ocean Motorsports	1078	1303 Ocean Street
	Santa Cruz Nissan	898	1605 Soquel Avenue
	Santa Cruz Nissan Dodge Volkswagen	310	1616 Soquel Avenue
	Santa Cruz Nissan/Volkswagen	322	1616 Soquel Avenue
	Santa Cruz Volkswagen Dodge	924	1616 Soquel Avenue
	Abraham Auto Detail	646	1000 Water Street
	Central Coast Audio and Tint	300	1207 Water Street
AUTO ELECTRIC	Tims Auto Electric	377	226 Benito Avenue
AUTO RENTAL	Autoworld Sales and Leasing	27	725 Soquel Avenue
	Avis Rent a Car	28	630 Ocean Street
	Enterprise	140	919 Ocean Street
	First Transit	209	117 Fern Street
	Hertz Local Edition	173	130 Center Street
AUTO REPAIR	Aamco Transmissions	11	1218 Ocean Street
	Absolute Auto Glass, Inc	1087	1709 Soquel Avenue
	Advanced Auto	13	1025 Water Street
	AE Motorsports	671	140 Sylvania Street
	Ainsworth	142	815 Almar Avenue
	Aloha Motors	880	1303 Ocean Street

	Big O Tires	655	1219 Soquel Avenue
	Calderon Tires	524	309 Front Street
	Cashs Automotive Service	84	619 River Street
	City of Santa Cruz Fleet Services	93	1125 River Street
	County of Santa Cruz Fleet Services	112	701 Ocean Street
	Cycle Revolution	805	127 Benito Avenue
	De Laveaga Service Center	652	1215 Water Street
	Doc Auto	427	908 Ocean Street
	Fidelity Automotive	149	916 Soquel Avenue 5 E
	Firestone Complete Auto Care	662	510 Water Street
	Goodyear Tires & Auto Repair	162	1203 Water Street
	Graniterock-Fleet Maintenance Yard	164	129 Coral Street
	Hennings Werkstatt Inc.	171	1025 Water Street
	Jiffy Lube, Store # 2334	187	1705 Soquel Avenue
	Jim Ludy Automotive Maintenance	188	501 Soquel Avenue
	Las Animas - Auto	801	146 Encinal Street
	Legacy Automotive	212	318 River Street
	Lloyd's Tire Service	523	303 River Street
	Marty Mechanic	228	1915 15th Avenue
	Mission Auto Care	535	823 Mission Street
	Mobile German Auto Works	238	1743 Escalona Drive
	Monterey Bay Automotive	240	318C River Street
	Ocean Auto Repair	892	1415 Ocean Street
	P. Magana Tires	1086	110 Stanford Avenue
	Polar Radiator Service Inc.	270	114 Coral Street
	Precision Mercedes	650	1191 Water Street
	Rene's Auto Repair	279	501 Soquel Avenue
	Reyes Auto Repair	511	1000 Water Street
	RPM Auto Repair	290	1025-C Water Street
	Rustys Honda and Mazda Repair	292	318 River Street
	Santa Cruz Auto Tech	302	738 N Branciforte Avenue
	Santa Cruz Automotive	303	1000 Water Street
	Santa Cruz High School Auto Shop	312	415 Walnut Avenue
	Santa Cruz Imported Truck Service	313	132 Benito Avenue
	Santa Cruz Metro Transit District	318	120 Golf Club Drive
	Santa Cruz Motorsports	320	211 Cedar Street
	Smog Plus Service	1092	1505 Soquel Avenue
	Stanford Ave. Garage	338	110 Stanford Avenue
	The Engine Room	373	125 Front Street
	Van Café	400	1823 Soquel Avenue

	Water Star Motors	403	318 A River Street
	Westside Auto Repair	104	115 Mcpherson Street
	Wheel Works	417	220 Front Street
AUTO SALES	Argus Co.	1075	905 Water Street
	Beach Auto Sales/Pacific Avenue Motors	37	512 Pacific Avenue
	Sunset Auto Sales	966	1800 C Soquel Avenue
AUTO WASH	Beach Cities Auto Detail	1070	434 Barson Street
	Bei Scott Car Wash/Water	43	827 Water Street
	Santa Cruz Metro Transit District	319	1200 River Street
	Westside Carwash	42	2321 Mission Street
	Whalers Car Wash	406	2001 Soquel Avenue
AUTO-MOTORCYCLE SALES	Stoodley's Saw Service	116	127 Benito Avenue
BAKERY	Allbright's Donut Shoppe	17	1055 Water Street
	Bagelry on Seabright Avenue	31	1636 Seabright Avenue
	Beckmann's Bakery	39	104 Bronson Street
	Companion Bakeshop	41	2341 Mission Street
	Emilys Good Things To Eat	138	1129 Mission Street
	Ferrells Donut Shop #1	147	2227 Mission Street
	Ferrells Donut Shop #2	148	1403 Ocean Street
	Kellys French Bakery	195	401 Ingalls Street
	The Buttery	372	702 Soquel Avenue
BOAT REPAIR	Monterey Bay Marine Engine Co.	241	555 Brommer Street
	Santa Cruz Harbor Boatyard	323	495 Lake Avenue
Brewery	Humble Sea Brewing Co	869	820 Swift, # A Street
	Venus Spirits	974	427-A Swift Street
	Seabright Brewery	329	519 Seabright Avenue
	Shanty Shack Brewing	949	138 Fern Street
	Santa Cruz Mountain Brewing	679	402 Ingalls, #27 Street
	Uncommon Brewers	961	303-40-H Potrero Street
CONVALESCENT	New Life Center	245	707 Fair Avenue
DENTAL	A. Gavin mcClure, DDS	1109	525 Center Street
	Audrey Wingo DDS	1121	550-G Water Street
	Christie Family Dentistry	1122	550-E1 Water Street
	Dientes Community Dental Beach Flats Clinic	1108	302 Riverside Avenue
	Donald P Connolly DDS	1113	824 Mission Street
	E. John Baron DDS Inc	1118	550-L1 Water Street
	Five Gables Family Dentistry	1107	500 Mission Street

	Heit Family Dentistry	1111	903 Cedar Street
	Kai Family Dentistry	1117	550-i5 Water Street
	Larson Don W DDS	1112	916 Center Street
	Mission Hill Dental	1106	615 Mission Street
	New Street Dental	722	525 Center Street
	Randall Medefesser DDS	1119	550-J1 Water Street
	Santa Cruz Dental Group	1104	1017 MIssion Street
	Santa Cruz Dentists	1110	1200 Pacific Avenue 6 235-Q
	Santa Cruz Pacific Dental	1120	550-J2 Water Street
	Santa Cruz Smiles	1105	930 Mission Street
	Western Dental Inc.	912	1107 Ocean Street
DRY CLEANER	Pacific Dry Cleaners	819	507 Cedar Street
	Almar Cleaners and Shoe Repair I	18	857 Almar Avenue
	Del Mar Cleaners	122	1307 Soquel Avenue
	Mission Dry Cleaner	236	1224 Mission Street
	Vapor Cleaners	397	285 Water Street
FOOD CATER	An Epicurious Lifestyle	598	104 Bronson Suite 13 Street 6 13
	Creative Cultures	590	2131 Delaware Avenue
	Kitchen Santa Cruz	291	216 A Fern Street
FOOD MARKET	Days Market Liquors & Deli	120	526 Seabright Avenue
	Del Pueblo Market	123	2118 Soquel Avenue
	Food Bin & Herb Room	447	1130 Mission Street
	La Plaza Market	141	341 Ocean Street
	New Leaf Market	244	1101 Fair Avenue
	Ocean Market Market & Deli	1067	304 Ocean Street
	Safeway	295	2203 Mission Street
	Safeway Stores on Morrissey	296	117 Morrissey Boulevard
	Shoppers Corner/Meat Dept.	332	622 Soquel Avenue
	Staff Of Life Market	430	1266 Soquel
GAS STATION	7-Eleven #38003	393	1319 Ocean Street
	7-Eleven #38006	394	2202 Mission Street
	Apco Gasoline	23	1725 Mission Street
	Chevron	388	904 Mission Street
	Chevron	251	404 Soquel Avenue
	Flyers	689	139 Encinal Street
	Ocean Shell	389	805 Ocean Street
	OM Group Mission Street	396	335 Mission Street
	Om Mart - 76	1094	1516 Soquel Avenue
	Rod & Ros Inc. dba ARCO	286	1024 Water Street
	Rotten Robbie #35	288	1906 Mission Street

	Santa Cruz County Fleet Services	308	691 Ocean Street
	Sav on Gasoline	326	1415 Ocean Street
	Soquel Auto Sales	390	1505 Soquel Avenue
	US Pro	534	823 Mission Street
	Valero	1096	1319 Ocean Street
	Valero Gas and Shop - Soquel Ave	395	1516 Soquel Avenue
HOTEL	Best Western All Suites Inn	46	500 Ocean Street
Laboratory - Commercial	QuantaPhy	967	440 Encinal Street
	Santa Cruz Biotechnology	305	2141 Delaware Avenue
	Dovetail Genomics	799	2161 # B Delaware Avenue
	Two Pore Guys	798	2161 Delaware Avenue
MANUFACTURING	Anatometal Inc.	20	165 Dubois Street
	Grizzly Powder Coating	803	397 Coral Street
RECREATION VEHICLE REPAIR	RV Service Center	293	2525 Mission Street
RESTAURANT	515 Kitchen and Cocktails	33	515 Cedar Street
	Akira Sushi	89	1222 Soquel Avenue
	Alderwood	483	155 Walnut Street
	Aldo's Harbor Restaurant	15	616 Atlantic Avenue
	At Thai Recipe	370	2106 A Mission Street
	Bad Animal Books	1065	1011 Cedar Street
	Bagelry on Cedar Street	30	320 A Cedar Street
	Bantam	572	1010 Fair Avenue
	Beach Market	460	120 Riverside Avenue
	Beach Street Café	38	399 Beach Street
	Beach Street Pizza and Bar	167	303 Beach Street
	Betty Burgers	47	505 Seabright Avenue
	Betty's Eat Inn	476	1222 Pacific Avenue
	Betty's Noodle House	481	920 Pacific Avenue
	Bistro One	669	1060 River Street 1 112
	Blaze Pizza	1015	1901, Suite 102 Mission Street
	Boardwalk Bowl	1022	115 Cliff Street
	Boardwalk-Surf City Grill	66	400 Beach Street
	Boardwalk/Barbary Coast	51	400 Beach Street
	Boardwalk/Barnacle Bills	52	400 Beach Street
	Boardwalk/Beach Deck	53	400 Beach Street
	Boardwalk/Burgers	54	400 Beach Street
	Boardwalk/Cali Wraps	953	400 Beach Street
	Boardwalk/Coasters Bar-Grill	55	400 Beach Street

	Boardwalk/Coconut Grove	56	400 Beach Street
	Boardwalk/Dipper Diner	57	400 Beach Street
	Boardwalk/Fish & Fry	58	400 Beach Street
	Boardwalk/Fishermans Galley	59	400 Beach Street
	Boardwalk/Funnel Cakes	60	400 Beach Street
	Boardwalk/Handout	62	400 Beach Street
	Boardwalk/Hot Dawgs	63	400 Beach Street
	Boardwalk/Hot Dog/Chicken	64	400 Beach Street
	Boardwalk/Pizza Hut/Taqueria	65	400 Beach Street
	Boardwalk/Twinkies	61	400 Beach Street
	Boardwalk/World Grill	508	400 Beach Street
	Boca del Cielo Inn	616	118 First Street
	Boccis Cellar	67	140 Encinal Street
	Branciforte Middle School	692	315 Poplar Avenue
	Burger	521	1520 Mission Street
	Burger King on Mission Street	74	2015 Mission Street
	Burger King on Soquel Avenue	75	1302 Soquel Avenue
	Buttercup Cakes	247	1411 Pacific Avenue
	Café Brazil	76	1410 Mission Street
	Cafe Delmarette	479	1126 Pacific Avenue
	Café El Palomar	77	2222 East Cliff Drive
	Cafe Gratitude	480	103 Lincoln Street
	Café Limelight	79	1016 Cedar Street
	Café Mare	80	740 Front Street
	Catalyst	85	1011 Pacific Avenue
	Central Coast Creamery	1098	725 Front Street
	Central Coast Juicery	1089	111 Locust Street
	Charlie Hong Kong Noodles	88	1141 Soquel Avenue
	Chipotle	157	550 River Street
	Chocolate	91	1522 Pacific Avenue
	Civic Center/Santa Cruz	97	307 Church Street
	Coffeetopia	101	1723 Mission Street
	Coffeeville	928	533 Ocean Street
	Coldstone Creamery	102	1129 Pacific Avenue
	Costco	109	220 Sylvania Avenue
	County Cafeteria	110	701 Ocean Street
	County Jail/Foodservices	111	259 Water Street
	Crepe Place	114	1134 Soquel Avenue
	Crow's Nest	115	2218 East Cliff Drive
	Cruz Creamery	950	815 Ocean Street

	De La Hacienda	172	354 Washington Street
	De LaVeaga Golf Course/Restaurant	121	401 Upper Park Road
	DeLaveaga Elementary School	124	1145 Morrissey Boulevard
	Denny's	125	1515 Ocean Street
	Dominoes Pizza	129	2391 Mission Street
	Donnelly Fine Chocolates	130	1509 Mission Street
	Dream Inn	131	175 West Cliff Drive
	Dunkin Donuts	1004	1314 Ocean Street
	Earth Belly	706	381 Soquel Avenue
	El Hermoso Mar	203	313 Beach Street
	El Huarache	532	920 Pacific Avenue
	El Palomar	134	1336 Pacific Avenue
	El Salchichero	678	402 Ingalls Street 6 5
	Elks Lodge No. 824	136	150 Jewell Street
	Engfer Pizza Works	139	537 Seabright Avenue
	Extra Kitchen Specialty Food Commercial Kitchen	346	254 Potrero Street
	Falafel House	143	113 Walnut Avenue
	Falafel Hut	144	309 Beach Street
	Falafel Of Santa Cruz	145	1510 Mission Street
	Feel Good Foods, Kitchen	146	306 Potrero Street
	FireFish Grill	410	460 Municipal Wharf
	Firefly Cafe	486	131 Front Street
	Five Guys	364	1101 Pacific Avenue
	Foster Freeze on Laurel Street	152	229 Laurel Street
	Front Street Kitchen	487	504-A Front Street
	Front Street Residential	154	126 Front Street
	Gabriella Café	155	910 Cedar Street
	Georgiana Bruce Kirby Prep School	501	425 Encinal Street
	Golden City	159	1230 Mission Street
	Golden Palace	201	415 Ocean Street
	Greek Orthodox Church	165	223 Church Street
	Grocery Outlet	882	120 Morrissey Boulevard
	Harbor High School	168	300 La Fonda Avenue
	Harvey West Clubhouse	170	325 Evergreen Street
	Hindquarter Bar & Grill	174	303 Soquel Avenue
	Hom Korean Kitchen	175	1100 Pacific Avenue
	Homeless Community Resource Center	176	115 Coral Street
	Hula's Island Grill	90	221 Cathcart Street
	I Love Sushi	488	516 Front Street

	Ideal Bar & Grill	177	106 Beach Street
	Ike's Love & Sandwiches	1003	1318 Ocean Street
	India Joze	194	418 Front Street
	Iveta Gourmet	444	2125 Delaware Avenue
	Jack In The Box	178	640 Ocean Street
	Jacks Hamburgers	179	202 Lincoln Street
	Jake's Coffee Bar	484	46 Front Street
	Jalapenos Taqueria on Laurel Street	180	206 Laurel Street
	Jamba Juice	182	1550 Pacific Avenue
	Java Cruz Coffe Shop	358	920 Pacific Avenue
	Java Junction	183	519 Seabright Avenue
	Java Junction	375	2222 East Cliff Drive
	Java Junction River St	184	580 River Street
	Jefferys Restaurant	186	2050 Soquel Avenue
	Joe's Pizza & Subs	190	841 N Branciforte Avenue
	Johnny's Harborside	191	493 Lake Avenue
	Kiantis Pizza and Pasta	200	1100 Pacific Avenue
	Kuumbwa Jazz Center	202	320 Cedar Street
	La Posada	206	609 Frederick Street
	La Posta	207	538 Seabright Avenue
	Laili Restaurant	509	101 Cooper Street 6 B
	Las Palmas Taco Bar	211	55 Front Street
	Lillian's Italian Kitchen	890	1148 Soquel Avenue
	Linda's Seabreeze Café	215	542 Seabright Avenue
	Little Caesars	216	233 Ocean Street
	Loard's Ice Cream	533	307 Beach Street
	Los Pinos	220	2019 Pacific Avenue
	Los Primos Taqueria	363	425 Barson Street
	Louden Nelson Center	221	301 Center Street
	Lulu Carpenters	222	1545 Pacific Avenue
	Lupulo Craft Beer House	618	233 Cathcart Street
	M.G. Sushi	1084	1733 Seabright Avenue
	Mackenzies Kandy Kitchen	224	1492 Soquel Avenue
	Malabar Restaurant	489	514 Front Street
	Mandarin Gourmet	217	1010 Cedar Street
	Mariannes Ice Cream	225	1020 Ocean Street
	Mariannes-Westside Production	226	2100 Delaware Avenue
	Marini's Westside Production	758	322 Ingalls Street
	May's Sushi Restaurant	230	1800 Soquel Avenue
	McDonald's	231	1210 Ocean Street

	McDonalds, Mission	232	1421 Mission Street
	Mission Hill Creamery	512	1101 Pacific Avenue 5 B
	Mission Hill Junior High Kitchen	237	425 King Street
	Mission Street Barbeque	198	1618 Mission Street
	Mobo Sushi & The Moon	239	105 River Street
	Motiv	490	1209 Pacific Avenue
	Mozaic	99	110 Church Street
	Mumbai Delights	199	810 Pacific Avenue
	Mutari	561	504A Front Street
	New Leaf Community-Pacific Avenue	243	1134 Pacific Avenue
	Nick The Greek	495	1133 Pacific Avenue
	Ninety Nine Bottles	246	110 Walnut Avenue
	TZONE	446	1717 Mission Street
	Monster Pot	250	431 Front Street
	Oswald's	491	121 Soquel Avenue
	Oyunaa's Mongolian Cuisine	34	1209 Soquel Avenue
	Pacific Blue Inn	492	636 Pacific Avenue
	Pacific Cookie Company	254	1203 Pacific Avenue
	Pacific Cookie Company	255	303 Potrero Street
	Pacific Cultural Center	256	1307 Seabright Avenue
	Pacific Thai	257	1319 Pacific Avenue
	Panda Express	517	2121 Mission Street
	Paradox Hotel	384	611 Ocean Street
	Parish Publick House	456	841 Almar Avenue
	Pearl of the Ocean	334	736 Water Street
	Peet's Coffee & Tea	262	1409 Pacific Avenue
	Penny Ice Creamery	493	913 Cedar Street
	Phoenix Restaurant	264	2301 Mission Street
	Pizza My Heart	265	1116 Pacific Avenue
	Pizzeria Avanti	281	1711 Mission Street
	Plantronics	267	345 Encinal Street
	Pleasure Pizza	253	1415 Pacific Avenue
	Poet & Patriot Irish Pub	268	320 Cedar Street
	Poke House	1097	1543 Pacific Avenue
	Poki Bowl	50	1121 Soquel Avenue
	Pono Hawaiian Grill	117	120 Union Street
	Portuguese Hall	271	216 Evergreen Street
	Pour Taproom -Surf City Kitchen	1012	110 Cooper Street
	Quality Market	274	221 Riverside Avenue
	Quickly	193	1010 Pacific Avenue

	Real Thai Kitchen	277	1632 Seabright Avenue
	Red Restaurant and Bar	278	200 Locust Street
	Ristorante Avanti	457	1917 Mission Street
	Ristorante Italiano	282	555 Soquel Avenue
	River Café and Cheese Shop	284	415 River Street
	River Street Shelter	285	115 Coral Street
	Rosie McCanns Irish Pub	287	1220 Pacific Avenue
	Royal Taj India Cuisine	1074	270 Soquel Avenue
	Sabieng Thai House	294	1218 Mission Street
	Sala Thai	369	353 Soquel Avenue
	Samba Rock Café	298	291 Water Street
	Santa Cruz Bible Church	304	440 Frederick Street
	Santa Cruz Coffee Roasting Co.	306	1330 Pacific Avenue
	Santa Cruz Diner	309	909 Ocean Street
	Santa Cruz Hotel	537	1003 Cedar Street
	Santa Cruz Sports Arena	530	140 Front Street
	Sante Adairius Rustic Ales	1017	1315 Water Street
	Saturn Café	324	145 Laurel Street
	Sawasdee By the Sea	83	101 Main Street
	Seabright Deli	1079	415 Seabright Avenue
	Sentinel Cafe	482	877 Cedar Street
	Serendipity Saucy Spreads	519	306 Potrero Street
	Sesame Korean Grill	499	435 Front Street
	Shogun Restaurant	331	1123 Pacific Avenue
	Shrine Coffee	765	544 West Cliff Drive
	Shun Feng	107	420 River Street
	Snap Taco	21	1108 Pacific Avenue
	Soif	333	105 Walnut Avenue
	Soquel Quality Meat Market #2	1069	341 Ocean Street
	St Francis Kitchen	335	205 Mora Street
	Stagnaro Bros. Seafood	337	320 Washington Street
	Starbucks Coffee	339	1335 Pacific Avenue
	Starbucks-Ocean St	946	745 Ocean Street
	Steamer Lane Supply	766	701 West Cliff Drive
	Subway	804	811 Ocean Street
	Subway #49918	643	1723 Soquel Avenue
	Subway Sandwiches	341	2215 Mission Street
	Subway Sandwiches	342	825 Pacific Avenue
	Sunshine Villa	344	80 Front Street
	Surf City Billiards Bar & Cafe	496	931 Pacific Avenue

	Kind Brewery	78	429 Front Street
	Sushi Totoro	347	1701 Mission Street
	Sweet Curls	1066	1010 Pacific Avenue
	Tabby Cat	510	1101 Cedar Street
	Taco Bell 3175 on Soquel Avenue	351	1404 Soquel Avenue
	Taco Bell on Mission Street	352	1405 Mission Street
	Tacos Morenos	353	1053 Water Street
	Tams Chinese Restaurant	355	2403 Mission Street
	Taqueria Agave	151	1836 Soquel Avenue
	Taqueria Jalapenos y Pupuseria	73	107 Leonard Street
	Taqueria La Cabana	359	2332 Mission Street
	Taqueria Los Pericos	360	139 Water Street
	Taqueria Santa Cruz	361	2215 Mission Street
	Taqueria Santa Cruz Two	362	1002 Soquel Avenue
	Taqueria Vallarta	365	608 Soquel Avenue
	Taqueria Vallarta	366	1221 Mission Street
	The Abbey Coffee, Art & Music Lounge	475	380 Mission Street
	The Habit Burger Grill	903	1400 Suite 2 Ocean Street
	The Picnic Basket	506	125 Beach Street 6 B
	The Sandwich Shop	275	1010 Pacific Avenue
	The Water St. Grill	659	503 Water Street
	Togo's	649	849-B Almar Avenue
	Togo's Great Sandwiches	378	902 Ocean Street
	Tony & Albas Pizza	380	817 Soquel Avenue
	Top a Lot Yogurt	381	738 Water Street
	Tramonti	357	528 Seabright Avenue
	Upper Crust Pizza	391	2415 Mission Street
	Vasilis	398	1501 Mission Street
	Verve Coffee Roasters	500	1540 Pacific Avenue
	Verve Coffee Roasters	686	104 Bronson Street
	Verve Coffee Westside	824	1010 Fair Avenue 6 I
	Veterans Memorial Building	399	846 Front Street
	VIDA	975	1203 Mission Street
	VIM	371	2238 Mission Street
	Viva's Mexican Food	181	1201 Soquel Avenue
	Walnut Avenue Café	402	106 Walnut Avenue
	West End Tap & Kitchen	68	334 Ingalls Street
	Westside Coffee Company	405	849 Almar Avenue
	Wharf/Dolphin Restaurant	409	Municipal Wharf
	Wharf/Gildas Family Restaurant	411	494 Municipal Wharf

	Wharf/Marinis Munchies	412	Municipal Wharf
	Wharf/Olitas Cantina & Grill	414	650 Municipal Wharf
	Wharf/Riva Fish House	415	Municipal Wharf
	Wharf/Splash	408	Municipal Wharf
	Wharf/Stagnaro Bros. Seafood	416	Municipal Wharf
	Wharf/Woodies Cafe	505	25 Municipal Wharf N/A
	Whole Foods Market	418	911 Soquel Avenue
	Wingstop	514	845 Almar Avenue
	Woodstock's Pizza	420	710 Front Street
	Yan Flower	422	617 Pacific Avenue
	Your Place	205	1719 Mission Street
	Zacharys Restaurant	424	819 Pacific Avenue
	Zoccolis Delicatessen	425	1534 Pacific Avenue
CATEGORICAL	Persys Engineering	261	815 Swift Street
SIG NON-CATEGORICAL	City of Santa Cruz Water Treatment Plant	95	715 Graham Hill Road
	City of Santa Cruz, Class III Landfill	96	605 Dimeo Lane
	Santa Cruz Nutritionals	169	2200 Delaware Avenue
	University of California, Santa Cruz	440	1156 High Street
WASTE HAULER	Allard's Septic Service	16	12968 HWY 9 Highway,Boulder Creek,CA,95006,USA
	California Department of Parks and Rec	81	303 Big Trees Park Road,Felton,CA,95018,USA
	Coastal Septic	100	5460 McKinley Way,Felton,CA,95018,USA
	Don Chapin Co / DBA Tom's Septic Construction	379	560 Crazy Horse Canyon Road,Salinas,CA,93912,USA
	Green Planet Sanitation	1037	9319 East Zayante Road,Felton,CA,95018,USA
	Greenline Liquid Waste Hauler	166	1128-A Madison Lane,Salinas,CA,93907,USA
	Hensley Construction	441	9540 HWY 9 Highway,Ben Lomond,CA,95005,USA
	Jeff Hill & Sons Excavation	185	485 Marion Avenue,Ben Lomond,CA,95005,USA
	Mr Pumper Septic and Drain	242	676 West Drive,Felton,CA,95018,USA
	Pete's Outflow Technicians	263	3146 Valencia Road,Aptos,CA,95003,USA
	SeQuential Biodiesel	886	3333 35th Avenue

	Steve Johnson Coastal Septic	439	5843 Graham Hill Road,Felton,CA,95018,USA
	The Honey Bucket Man	927	PO Box 368 Center,Davenport,CA,95017,USA
	United Site Services of CA	1020	495 Brunken Street,Salinas,CA,93901,USA
WINERY	Bonny Doon Winery	69	328 Ingalls Street
	EQUINOX	969	427-C Swift Street
	MJA Vineyards	970	328-A Ingalls Street
	Santa Cruz Mountain Vineyard	971	334-A Ingalls Street
	Sones Cellars	973	334-B Ingalls Street

SECTION IV. FOURTH QUARTER STATUS REPORT

2021 Fourth Quarterly Status Report

The following section includes significant program activities completed during the fourth quarter of 2021, including the narrative summary and compliance table of industrial users in violation of applicable pretreatment standards in the fourth quarter of 2021.

City of Santa Cruz

PRETREATMENT PROGRAM

Fourth Quarter 2021, Summary Attachment

SANTA CRUZ NUTRITIONALS –A large storm washed debris into the storm drain and a sump pump collecting storm water was discharging to the sewer. A Notice of Violation was sent in response to these violations. The City discussed these violations with Santa Cruz Nutritionals management and the facility now conducts regular storm water inspections onsite.

All other dischargers were in compliance during the 4th quarter of 2021.

City of Santa Cruz

2021 FOURTH QUARTERLY STATUS REPORT

INDUSTRIAL USER NAME & ADDRESS	PREVIOUS QUARTERS NOT IN COMPLIANCE	PARAMETER	REPORTED LEVEL (mg/L)	LIMIT VIOLATED (mg/L)	FLOW	CONTROL AUTHORITY ACTIONS
Santa Cruz Nutritionals 2200 Delaware Ave.	3	Discharge to storm drain	N/A	N/A	25,000-30,000 gpd	Notice of Violation. See summary.

SECTION V. SUMMARY OF COMPLIANCE AND ENFORCEMENT ACTIVITIES

SUMMARY OF COMPLIANCE AND ENFORCEMENT ACTIVITIES

The following section summarizes the compliance and enforcement activities relating to the permitted industrial users within the purview of the City of Santa Cruz Pretreatment Program during the calendar year 2021.

SANTA CRUZ NUTRITIONALS – In the fourth quarter, a large storm washed debris into the storm drain and a sump pump collecting rain was discharging to the sewer. A Notice of Violation was sent in response to these violations. The City discussed this violation with Santa Cruz Nutritionals management and the facility now conducts regular storm water inspections onsite.

PERSYS ENGINEERING – was in compliance throughout 2021.

SANTA CRUZ BIOTECHNOLOGY – was in compliance throughout 2021.

SANTA CRUZ CLASS III LANDFILL – was in compliance throughout 2021.

CITY OF SANTA CRUZ WATER DEPARTMENT – In the first quarter, a permit concentration limit of TSS at 3,320 mg/L and a pounds per day limit of 2,085 was violated, when self-monitoring sampling revealed TSS at 4,125 mg/L and 2,933 pounds per day. A Notice of Violation was sent in response to these violations.

SANTA CRUZ HARBOR BOATYARD (SCHB) – In the first quarter, City monitoring revealed violations of copper in excess of the 2.17 mg/L limit. A Notice of Violation was sent in response to these violations and, as a result of TRC criteria, this industrial user is in significant non-compliance.

UNIVERSITY OF CALIFORNIA AT SANTA CRUZ (UCSC) – was in compliance throughout 2021.

SECTION VI. PRETREATMENT PROGRAM CHANGES

Although there were no pretreatment program changes in 2021, a few significant developments are reported here to highlight the trajectory of the program and its development.

1. The pretreatment arm of the Environmental Compliance program began sampling in July 2020 to evaluate local sewer use limits on pollutants from industrial dischargers. This quarterly sampling project, organized with management assistance and expert consultation with Kennedy-Jenks and Associates, is partnered with the County of Santa Cruz. In addition, due to the newer program responsibilities to provide overview and control of additional novel (non-NPDES) compounds for the integrity of the Pure Water Soquel (a joint project led by Soquel Water District) to reuse WWTF effluents for domestic well-water recharge and protection from saltwater intrusion to the local aquafer, an enhanced source control project was implemented.

2. The pretreatment program continued to utilize respirometry to check the toxicity of chemicals proposed for discharge to the sewer system, as well as to check the ideal conditions for the efficient biodegradation of TOC, supporting and informing knowledge of local wastewater treatment to avoid situations where pass-through may occur.

3. The program deployed the semi-permeable membrane devices (SPMD) for periods of 30 days in influent and effluent wastewater streams. This effort and its data enable the program to evaluate its own effectiveness in controlling the inflow of anthropomorphic and other trace organic compounds into the treatment stream. The concentrations observed indicate that the compounds do not currently pose challenges for violations and/or pass-through at WWTF.

4. The pretreatment continues to support and manage the local Extended Producer Responsibility Ordinance with medication and sharps take-back, to avoid the inefficient treatment and pass through of such drugs and pharmaceuticals. Many pharmacies throughout the City continue to collect unwanted medications and several outdoor sharps-deposit kiosks are installed locally—the numbers of which are increasing regularly.

5. Finally, all biosolids product from the facility was land applied and was of quality consistent with the regulations.

SECTION VII. PRETREATMENT PROGRAM BUDGET SUMMARY

The following table represents a summary of the program budget for 2021.The budget represents no significant changes from previous years except in the completion of the update to the Enforcement Response Plan and the acquisition of additional sampling and monitoring technologies.

PRETREATMENT PROGRAM BUDGET SUMMARY	
The Pretreatment Program Total Budget for 2021 was	$830,447
And it included:	
Salaries and Benefits	$350,000
Supplies and Services (approximately)	$100,000
Public Participation (Outreach and Recognition Programs)	$35,000
Travel and Training (approximately)	$20,000
Capital Outlay	$0

Current equipment inventory includes:

1. 6 composite samplers
2. 3 trucks (shells, racks, sliding beds, crane/hoist)
3. 3 Smartphones/Tablets
4. 4 video cameras and mounts for patrol vehicles
5. 1 digital projector
6. 3 portable pH meters
7. 3 portable Redox/Conductivity meters
8. 2 Delta-Tox mobile toxicity analyzer
9. 3 Laptop computer (Two workstations and one outreach laptop)
10. 3 desktop workstations
11. 4 tablets (field monitoring devices, to access internet and program database)
12. 2 portable multi gas detectors
13. 2 HP Laser printers
14. 8 Portable programmable samplers
15. Office furniture
16. Tool boxes
17. 1 (iPACS) Pretreatment and administration control database site license
18. 4 Licenses for Mobile Gov (software for field monitoring)

19. 1 portable (continuous) pH meter
20. 1 portable flow meter
21. 1 conductivity meter
22. 2 portable peristaltic pumps
23. 1 refrigerator
24. 3 smartphones
25. 1 YSI multi-sonde
26. 2 one million candle power flashlights
27. 1 portable generator
28. 1 Respirometer and miscellaneous tools and equipment.
29. 4 digital cameras

SECTION VIII. PUBLIC PARTICIPATION

PUBLIC PARTICIPATION

1. In fulfillment of its obligation under the Clean Water Act at 40 CFR 403.8 (f) (2) (viii) (A) through (H), the Environmental Compliance program completed a thorough review of its annual list of industrial dischargers found none to have violated the Technical Reporting Criteria (TRC) for meeting Significant Non-Compliance status.
   A publication of this finding was made and below is a copy of the Proof of publication in the Santa Cruz Sentinel on the pages below:

2. The Annual Pollution Prevention Award dinner for 2021 was postponed due to the ongoing infection levels for COVID-19 in the City and County, and the prevailing County Health Officers regulations proscribing large gatherings. However Industrial Users, largely consisting of Food Service Facilities and Vehicle Service Facilities, enrolled in the program's Clean Ocean Business (COB) and who maintained compliance, (for 1, 5, 10, 15, and 20 years) were celebrated by publication in the city's entertainment weekly, and its largest newspaper. Copies of those publications are embedded in the pages below.

   Special plaques and acrylic sculptures were distributed to the longer-term (5-; 10-; 15-; and 20-year) consistent compliers.

SECTION IX. CHANGES IN SLUDGE DISPOSAL

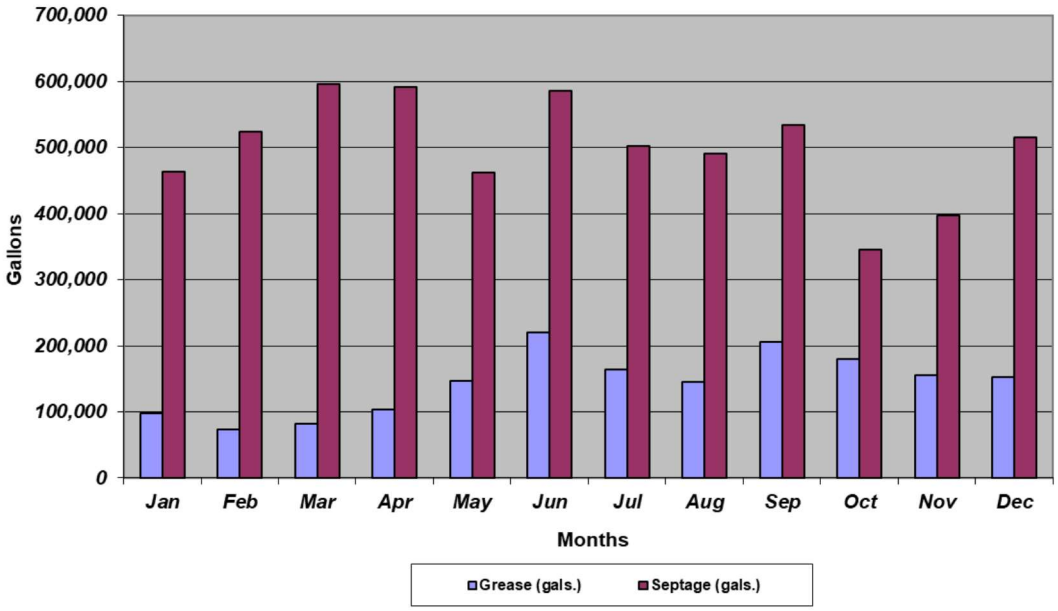
There were no major changes to the City's sludge treatment and/or disposal program activities in 2021. The remainder of this section includes data and a graph provided to illustrate the biosolids quality and loading at the facility through the reporting period of 2021, illustrated by the quantity of grease and septage wastes received from licensed liquid waste handlers at the facility in 2021.

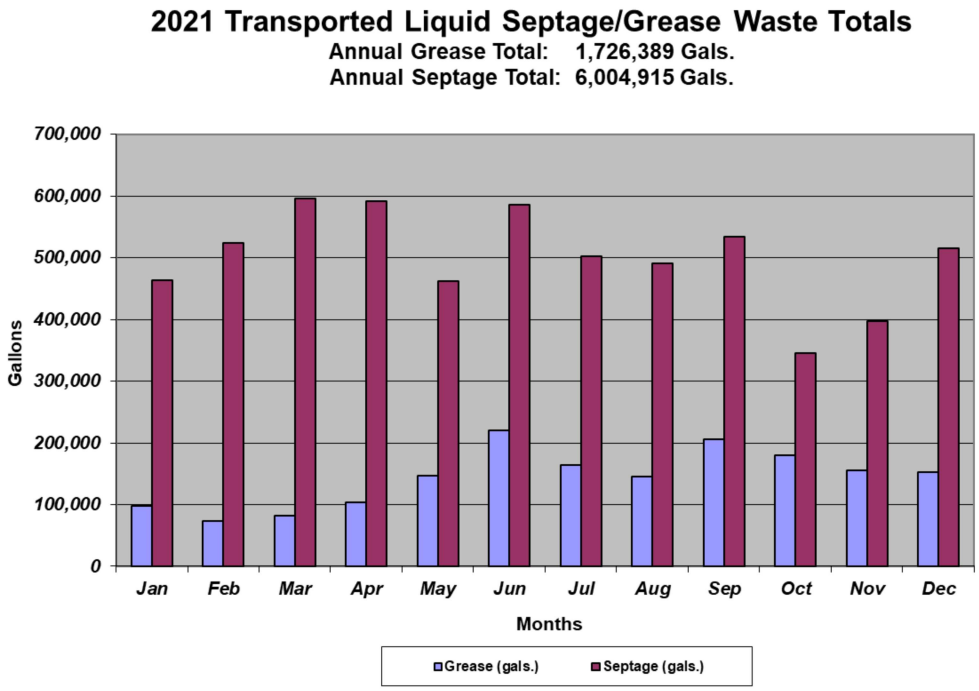
Liquid Waste Hauler Discharge to City of Santa Cruz WWTF
2021

Month	Grease (gals.)	Septage (gals.)
Jan	98,180	462,877
Feb	73,899	523,896
Mar	82,711	595,420
Apr	402,923	590,866
May	147,135	461,286
Jun	220,054	586,265
Jul	163,358	501,975
Aug	145,504	491,224
Sep	205,920	534,294
Oct	173,316	344,924
Nov	155,181	396,652
Dec	152,208	515,236
Totals	1,726,389	6,004,915

2021 Transported Liquid Septage/Grease Waste Totals

Annual Grease Total: 1,726,389 Gals.
Annual Septage Total: 6,004,915 Gals.





END PAGE FOR CITY OF SANTA CRUZ WWTF 2020 PRETREATMENT PROGRAM ANNUAL REPORT.

The following pages were submitted as the County of Santa Cruz Annual Pretreatment Program Report 2021.

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SANTA CRUZ COUNTY SANITATION DISTRICT

701 OCEAN STREET, SUITE 410 · SANTA CRUZ, CA · 95060-4073
(831) 454-2160 · FAX (831) 454-2089 · TDD: (831) 454-2123 · WWW.SCCSD.US
MATT MACHADO, DISTRICT ENGINEER

2/2/2022

MR. MARK DETTLE
DIRECTOR OF PUBLIC WORKS
CITY OF SANTA CRUZ
809 CENTER STREET
SANTA CRUZ, CA 95060

SUBJECT: 2021 ANNUAL PRETREATMENT PROGRAM REPORT

Dear Mr. Dettle:

Attached is a copy of the Santa Cruz County Sanitation District's Pretreatment Program Report for the 2021 reporting year.

Should you require additional information regarding the contents of said report, please contact Monica Tomlinson, Environmental Programs Coordinator at (831) 477-3988.

Yours truly,

MATT MACHADO
District Engineer

By: DocuSigned by:
Beatriz Barranco
35A2FCF930A14FB...
Beatriz Barranco
Sanitation Operations Manager

MT/arg:22-008.docx

Attachments: Pretreatment Program Annual Report 2021

Cc: Board of Directors, SCCSD
Akin Babatola, City of Santa Cruz

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SANTA CRUZ COUNTY
SANITATION DISTRICT
ANNUAL PRETREATMENT REPORT
2021

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CONTENTS

SANTA CRUZ COUNTY SANITATION DISTRICT PRETREATMENT PROGRAM 2-6

PROGRAM SUMMARY
ORGANIZATION CHART
FOURTH QUARTER SUMMARY

PRETREATMENT REPORTING REQUIREMENTS 6-10

SAMPLING RESULTS
BASELINE MONITORING
INDUSTRIAL USER REPORTS
INDUSTRIAL INSPECTION
COMPLIANCE AND ENFORCEMENT
PROGRAM BUDGET
PRETREATMENT PROGRAM CHANGES
SEWER SERVICE CHARGES

FATS OILS AND GREASE PROGRAM 11-12

COMMERCIAL SOURCE CONTROL
RESIDENTIAL OUTREACH

PUBLIC PARTICIPATION 12-14

CONCLUSION SUMMARY 15

PRETREATMENT ANNUAL COMPLIANCE REPORT 17-26

TABLE 1.1 INDUSTRIAL USER REPORT
TABLE 1.2 DISTRICT WASTEWATER DISCHARGE LIMITATIONS
TABLE 1.3 PURE WATER SOQUEL PARAMETERS
TABLE 1.4 INDUSTRY REMOVALS
TABLE 1.5 INDUSTRY ADDITIONS
TABLE 2.1 ANNUAL INSPECTIONS COMPLETED
TABLE 2.2 MONITORING AND COMPLIANCE/ENFORCEMENT STATUS REPORT
TABLE 2.3 SUMMARY OF PRETREATMENT PROGRAM BUDGET
ATTACHMENT A: FOURTH QUARTER MONITORING RESULTS
ATTACHMENT B: RESTAURANT AND LIGHT INDUSTRY INVENTORY
ATTACHMENT C: ENFORCEMENT RESPONSE AND FINES

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SANTA CRUZ COUNTY SANITATION DISTRICT

ANNUAL PRETREATMENT PROGRAM REPORT 2021

NPDES Permit Holder or Sewage Authority Name: Santa Cruz County Sanitation District

Report Date: January 31, 2022

Period Covered by This Report: January 1, 2021 to December 31, 2021

Period Covered by Previous Report: January 1, 2020 to December 31, 2020

Name of Wastewater Treatment Plant(s): City of Santa Cruz Wastewater Treatment Facility

NPDES Permit Number: CA0048194, WDR Order No. R3-2017-0030

Person to contact concerning information contained in this report:

Name: Monica Tomlinson

Title: Environmental Programs Coordinator

Mailing Address: 701 Ocean Street, Rm. 410

Santa Cruz, CA 95060

Telephone: (831) 477-3988

Based upon my inquiry of those individuals immediately responsible for obtaining the information reported herein, I believe that the submitted information is true, accurate, and complete.

2/2/2022

Date

DocuSigned by:
50EBAC64454C48C...

Signature of Official
District Engineer

Table 1.1 Industrial User Report
Table 1.2 Santa Cruz County Sanitation District Wastewater Discharge Limitations
Table 1.3 Pure Water Soquel Parameters
Table 1.4 Industry Removals
Table 1.5 Industry Additions
Table 2.1 Annual Inspections Completed
Table 2.2 Monitoring and Compliance/Enforcement Status Report
Table 2.3 Summary of Pretreatment Program Budget
Attachment A: Fourth Quarter Monitoring Results
Attachment B: Restaurant and Light Industry Inventory
Attachment C: Enforcement Response and Fines

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PROGRAM SUMMARY

The Santa Cruz County Sanitation District (District) owns, operates, and maintains a sanitary sewer system that serves a portion of the unincorporated areas of Santa Cruz County. The District sanitary sewer system facilities include approximately 220 miles of gravity sewers, 14 miles of force main, and 35 pump stations. The District does not own nor is it responsible for maintenance or repair of any portion of the sewer service laterals. The District collects and transmits all sewage to the City of Santa Cruz for treatment and discharge. The collection system is enrolled in the statewide general waste discharge requirements for sanitary sewer systems. An inter-jurisdictional agreement approved by the State Regional Water Quality Control Board is used to differentiate the City of Santa Cruz and District Pretreatment responsibilities within the respective jurisdictions. Both the City and the District have Pretreatment staff. The District is required to reflect or mirror any City Pretreatment requirements, ordinances, or codes.

The pretreatment program operates under the Environmental Compliance Unit (ECU) of the Santa Cruz County Sanitation District. The ECU continues to monitor all existing and potential commercial and industrial users by questionnaire, inspection, surveillance monitoring, and compliance sampling when necessary. Industrial users are inspected once per year unless items are identified during the inspection which require follow-up. Compliance sampling by ECU staff of Significant Industrial Users (SIUs) occurs once per year at a minimum. The Sanitation District's pretreatment program has been fully implemented for many years. In addition, improvements are always being made to ensure the program's continued compliance and efficiency. An Environmental Programs Coordinator manages the approved Pretreatment Program.

This year the pretreatment program continued to work on reducing sanitary sewer overflows caused by grease and non-dispersible wipes from both commercial and residential sources. The District distributed outreach material that highlights the problems with flushing fats, oil, and grease (FOG) and non-dispersible wipes down the sewer. Additional inspections were conducted in areas with higher FOG loadings in the sewer lines. The largest source of FOG in the sewers continues to be from residential sources. Additional districtwide public outreach was conducted throughout the year. Door to door outreach and FOG insert mailings were conducted in areas that were reported as having high FOG loadings.

There was a staffing shortage during this reporting period. One Inspector was on leave for 5 months. Otherwise, the Environmental Compliance Unit was fully staffed for the remainder of this reporting period.

There were several changes in business ownership and a few new businesses this year. All the new users were identified to be in the light industry category. Initially, those businesses will be inspected annually and will not be subject to pretreatment sampling requirements, however, during annual inspections, the environmental compliance inspector will be able to determine if operational changes warrant future pretreatment sampling requirements.

Six businesses within the District are Significant Industrial Users (SIUs). All SIUs were inspected and sampled by the District. There were no SIUs in significant non-compliance. However, one SIU, Bargetto Winery was issued a Letter of Violation (LOV) during the third quarter for a pH violation and for not adhering to required procedures for calibrating their pH probes. The LOV required Bargetto to address the pH violations and to upgrade their

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pretreatment system with a pH probe and a high liquid level alarm mechanism installed at their final discharge sump. The pH violation was addressed immediately; Bargetto was given a deadline of March 21, 2022 to upgrade their pretreatment system and at the time of this report a tentative plan has been established. The ECU continues efforts to reduce violations through communication, education, on-site inspections, and public outreach.

The District is working in conjunction with the City of Santa Cruz to complete a Local Limits study. This requires SIUs to be monitored for four quarters for the current list of Local Discharge Limit parameters found in Table 1.2. The District performed this additional SIU monitoring for all Local Limit parameters during the third and fourth quarter of 2020 and during the first and second quarter of 2021.

In addition to the Local Limits study, the District and the City of Santa Cruz are also participating in a "Pure Water Soquel" monitoring exercise. This entails monitoring all SIUs for additional parameters to meet the Division of Drinking Water's requirements for recycled wastewater use in groundwater recharge. This exercise was completed in the fourth quarter of 2020. However, after the data was analyzed, it was determined that all SIUs, except for the Water Departments, would need to be monitored for additional parameters. Those additional parameters are attached in Table 1.3. This exercise was completed during the second, third and fourth quarters of 2021.

Pretreatment inspectors educate light industries operating in Santa Cruz County on process-specific pollution prevention and waste minimization opportunities. During inspections, Best Environmental Management Practices (BMPs) pamphlets and demonstrations for each particular industry are conveyed to business owners, managers, and employees. BMPs have been developed for vehicle service facilities, dentists, photo processors, restaurants, dry cleaners, printers, machine shops, surfboard manufacturers, paint contractors, mobile carwash businesses and medical facilities.

The Districts wastewater laboratory successfully went through the recertification process required by the Environmental Laboratory Accreditation Program (ELAP).

In accordance with State Pretreatment Program requirements, the District continued to follow its Enforcement Response Plan to better effect compliance of all significant offenders of the District's discharge standards. Consequently, the District is prepared to bring repetitive, non-compliant dischargers before the Board of Directors for the appropriate assessment of penalties.

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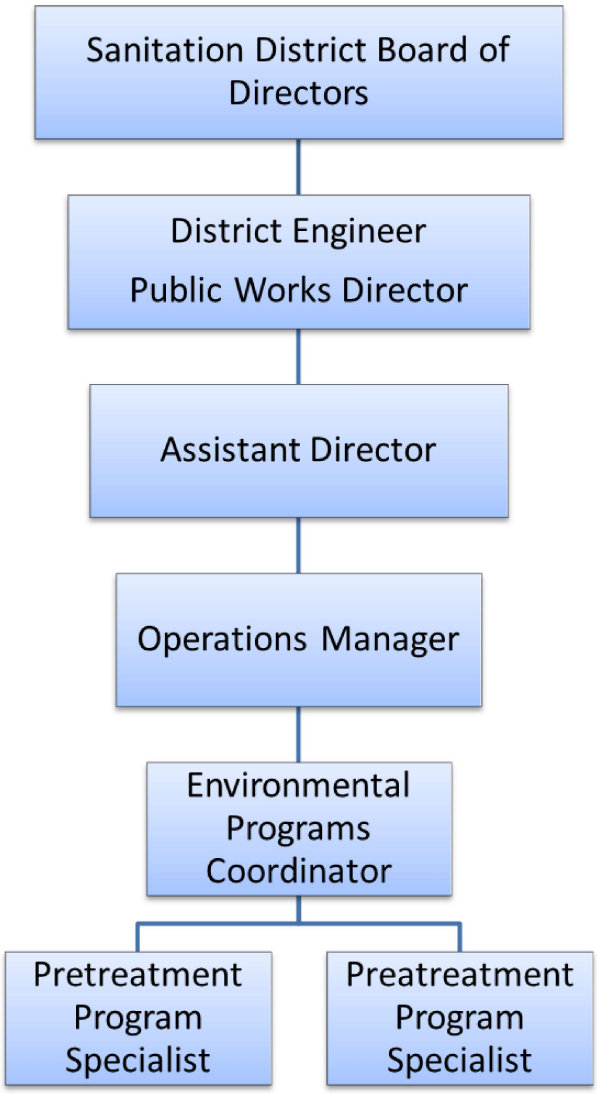
Wastewater Operations Source Control Organizational Chart



Matt Machado	District Engineer/Director of Public Works
Kent Edler	Assistant Director of Public Works
Beatriz Barranco	Sanitation Operations Manager
Monica Tomlinson	Environmental Programs Coordinator
Leslie Rios	Pretreatment Program Specialist
Marisol Goulett	Pretreatment Program Specialist

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SANTA CRUZ COUNTY SANITATION DISTRICT

2021 FOURTH QUARTERLY REPORT SUMMARY

The District performed routine inspections of the Significant Industrial Users (SIUs) currently operating within the District and performed additional routine inspections of light industries and the food service industry. All SIUs were found to be in compliance during this quarter.

The District continued its public outreach and education program targeting residential sources of sewer stoppages caused by flushing non-dispersible wipes and FOG. Prior to the Thanksgiving and Christmas holidays, a television commercial was aired locally that conveys the importance of keeping fats, oils, and grease (FOG) out of the sewers. The commercial aired during the fourth quarter. Additionally, Fight FOG ads were printed in the Good Times, Home & Garden, Capitola Times, and Times Publishing Group Holiday Gift Guide newspaper publications during this quarter.

Pretreatment Reporting Requirements NPDES Permit No. CA0048194

Results of Sampling Analysis

The District pumps its effluent from the D.A. Porath Pump Station at 2750 Lode Street, the last pump station prior to pumping to a force main to the City of Santa Cruz POTW at 110 California Street. The data provided by the City of Santa Cruz represents the combined flow from the City and outlying District areas and meets the requirements of the NPDES permit. Please refer to the annual report for the City of Santa Cruz for analytical results pertaining to the NPDES permit requirements.

Upset, Interference, or Pass-Through Incidents

There were no upsets, instances of interference, or pass-through incidents caused by the District's industrial user discharges.

Baseline Monitoring Reports (BMRs)

When a potential discharger of industrial wastes has been identified, an industrial wastewater application and survey is sent to that potential discharger. After the completed application has been returned and subsequently reviewed by the Environmental Programs Coordinator, the decision is then made whether to require baseline testing and/or wastewater permitting. Existing permitted industries are semi-annually reviewed for baseline monitoring requirements. The need to submit a baseline monitoring report is determined for all non-categorical industrial dischargers at that time.

There were several changes in business ownership and approximately three new food service facilities were added this year. Initially the light industry facilities will be inspected annually and will not be subject to pretreatment sampling requirements, however; during annual inspections, the Environmental Compliance Inspector will be able to determine if operational changes warrant future pretreatment sampling requirements. No additional SIUs or Categorical Significant Industrial Users (CSIUs) were added to the District during this reporting period.

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List of Industries, Standards that Apply, Noncategorical Industrial Users, and Compliance Status

Industrial users listed in Table 1.1 are Significant Industrial Users (SIUs) that require District wastewater discharge permits. They have been identified either as an industry group, or as a single discharger having a potential impact on the wastewater treatment system. The District used its method of classification of industrial dischargers in accordance with the definitions and guidelines set forth in the Pretreatment Program Description, the Codified Federal Regulations, and the requirements of the NPDES permit. Table 1.2 details the District's local wastewater discharge limitations. Table 1.4 & 1.5 detail any SIUs and permitted businesses that were added or deleted during this reporting period.

Industrial Inspections

Table 2.1 summarizes all inspections of restaurants and light industrial users during this reporting period. Table 2.2 presents a summary of sampling and inspection results for all SIUs and permitted businesses, including their name, address, and compliance status. Definitions for the descriptions in Table 2.2 are also provided.

All SIU and permitted dischargers are scheduled for inspection at least once a year. In addition, the SIU dischargers must submit self-monitoring reports (SMR) to the District semi-annually. District personnel sample the effluent of SIUs at least once per year and sometimes twice per year.

Light industries that discharge industrial wastewater within the District are also subject to annual inspection. A report compiled from the District's pretreatment program database is included as Attachment B. The report contains a list of all facilities subject to inspection and/or monitoring. This year 321 food establishment and 133 light industrial user (vehicle service facilities, dry cleaners, machine shops, etc.) inspections were completed.

In addition to routine inspections, the Environmental Compliance Unit also responds to and investigates various other events. These events include:

Sanitary Sewer Overflows

- The ECU coordinates with the District Operations staff to collect information regarding the overflow.
- Collects samples when necessary.
- Investigate the source and take appropriate enforcement actions.
- Distribute public outreach information about preventing sanitary sewer overflows and alert surrounding neighbors if there is a potential for people to be exposed.

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Illicit discharges

- In compliance with State stormwater regulations, the ECU works with other County departments to respond to illicit discharges from both commercial and residential sources.



Environmental Compliance Unit responds to an illicit discharge of cement debris into the public storm drain system.

Summary of Compliance and Enforcement Activities

There were eight minor light industry violations issued this year. Businesses with minor violations are issued a Corrective Action at the time of inspection or upon discovery of violations. Such violations include non-compliant stormwater discharges, failure to provide maintenance records in a timely manner, or improper grease management in restaurants. The environmental compliance inspector follows up within an assigned timeframe to ensure compliance is achieved. If the violation is not corrected, enforcement actions increase according to the District's Enforcement Response Plan. The District continues efforts to reduce these types of violations through communication, education, on-site inspections, and public outreach.

There were five LOVs issued this year and one Administrative Citation. Two food service facilities were issued LOVs for failure to provide grease trap maintenance records, two residential users were issued LOVs for private lateral sanitary sewer overflows. One SIU was issued a LOV for a pH violation; this was discussed in more detail in the 3rd Quarter report.

The Environmental Compliance Unit now has the ability to issue Administrative Citations, or tickets in the field, for chronic violations of the Santa Cruz County Runoff and Pollution Control Ordinance. One property manager for a large complex serving many food service facilities was issued an Administrative Citation for repeated failure to mitigate storm water issues in the garbage and recycling enclosure area.

Pretreatment Program Changes

As noted above, there was a staff shortage during this reporting period. One Inspector was on leave for 5 months. Otherwise, the Environmental Compliance Unit was fully staffed for the

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remainder of this reporting period. No other significant changes occurred during this reporting period.

Summary of Pretreatment Program Budget

Table 2.3 presents a summary of expenditures and inventory. The 2021-2022 Pretreatment Program budget was established at $506,389. Additionally, funds were set aside for public outreach totaling $55,700 and $120,000 for the Green Business Program. Funds for the pretreatment laboratory work and supplies were established at $35,000 for this reporting period. Revenue for the program is obtained from commercial and industrial user fees through the Sanitation District's Operating Fund.

The 2021/2022 fee schedule is:

Single Family Residence	$880.92/year
Multiple Family Residence	$762.48/year
Mobile Home	$655.80/year
Other Business (General)	$372.48/year + $9.32/HCF
Bakeries/Donut Shops	$372.48/year + $12.01/HCF
Restaurants/Catering	$372.48/year + $12.01/HCF
Food Processing	$372.48/year + $13.74/HCF
Funeral Parlor/Mortuary	$372.48/year + $13.74/HCF
State Parks	$372.48/year + $9.05/HCF
Dominican Hospital	$372.48/year + $9.66/HCF
Chaminade	$372.48/year + $12.13/HCF
All Schools (by water use)	$372.48/year + $9.05/HCF
Elementary and Middle Schools (by ADA)	$372.48/year + $24.17/ADA
High Schools (by ADA)	$372.48/year + $36.30/ADA
Community Colleges	$372.48/year + $31.96/FTES
Septic tanks/Vacant land	$0.00

HCF = Hundred Cubic Feet ADA = Average Daily Attendance FTES = Full Time Equivalent Students

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FOG Source Control Program

The FOG Source Control Program is administered, along with the pretreatment program, by the Environmental Compliance Unit. The FOG Source Control Program has been in place since 1977. The District continues to implement a successful FOG program and maintains compliance with the District's Sanitary Sewer Management Plan (SSMP). The program elements include:

Residential FOG Control

The residential FOG outreach program consists of advertising in the Good Times, Home & Garden and Aptos & Capitola Times newspapers, on social media and mailers, as well as door hangers used in areas where known grease problems exist. The focus of the program is to educate residents and small businesses on the proper disposal of FOG and about the consequences of discharging grease and other harmful wastes into the sewer. Currently, the public outreach program contains several elements designed to help educate the public about FOG issues.

The District developed a bilingual (Spanish and English) pamphlet titled "Think Before You Flush" which is distributed in residential areas that are consistently having problems. This pamphlet details what is not appropriate to send down residential sinks and flush down toilets, and why these issues are important. The "Think Before You Flush" pamphlet details explicitly what causes FOG problems, how to reduce FOG loads on the sewer lines, and why it is important to eliminate FOG from sewer lines. Additional public outreach material includes bilingual (Spanish and English) residential door hangers that are distributed to residential areas where sewer maintenance workers and repeat sanitary sewer overflows indicate there are FOG problems. As with the "Think Before You Flush" pamphlet, the door hangers identify the problems associated with FOG and how these problems can be mitigated. The door hangers and FOG insert mailers alert residents that the District is experiencing problems in the surrounding sewer lines due to grease.

During the second quarter, Sanitation Operations staff notified ECU of two pump stations that were filling up with excessive amounts of FOG. These pump stations serve residential areas and a FOG insert mailer was sent to all the residents who discharge to these pump stations.

Twice a year the District publishes an educational grease ad in several local papers to reduce residential sources of grease in our sanitary sewer. The ad is published before Thanksgiving and Christmas in order to reduce problems associated with grease from deep frying turkeys and other holiday meals. The ad details ways in which people can reduce FOG in sewers and properly dispose of cooking grease.

The District previously partnered with the Monterey Regional Water Control Agency (MRWPCA) to develop a television commercial that conveys the importance of keeping fats, oils, and grease out of the sewers. The commercial is aired on KSBW annually during the holiday season.

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FOG advertisement published several times a year.

Commercial FOG Control

Significant effort has been focused on reducing Sanitary Sewer Overflows (SSOs) caused by FOG. There are currently 284 food service facilities that have FOG control devices in the Santa Cruz County Sanitation District. All commercial businesses are inspected annually or more if needed. The Santa Cruz County Sanitation District Code gives the District authority to prohibit discharges to the collection system. Title 7 Section 7.04.340, "Preliminary Treatment Facilities" details the requirements of the District Code stating that all food service facilities must have a grease interceptor or trap. Grease interceptors and traps must meet sizing requirements and design criteria set forth by the District. All grease interceptors and traps must be maintained according to a pump schedule specified by the District Engineer. Invoices and manifests of pumping must be sent to the Environmental Compliance Unit as proof of maintenance.

During the second quarter, ECU was notified that one of the District's pump stations was chronically filling up with excessive amounts of FOG. ECU determined that the source of FOG was from a nearby restaurant's grease interceptor that was failing, in disrepair and was not being maintained according to their required cleaning schedule. This restaurant was put on a compliance schedule with a timeframe to replace and/or repair the old, failing grease interceptor and to increase the cleaning frequency.

Special 30-day and 90-day flush schedules are implemented by the sewer maintenance crew in areas that have higher grease loadings in the lines. The sewer line maintenance crew regularly meets with the ECU to discuss the problematic lines in the District. Based on that information, the ECU investigates the sources of the grease problems and performs repeat inspections. Food service facility inspections were conducted by the environmental compliance staff throughout the year. Increased efforts were aimed at reducing grease related SSOs and stormwater pollution caused by commercial establishments. In addition, District pretreatment inspectors review building plan sets for new restaurants to ensure implementation of Sewer Use Ordinance requirements for grease control devices.

Best Management Practices (BMPs) requirements for food service facilities include installing screens on all sink drains used for dishwashing, eliminating the use of grease interceptor/trap

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additives, eliminating the use of garbage disposal units, scraping all plates prior to the primary rinse, and proper storage of used deep-fryer oil. District staff developed a bilingual (Spanish and English) "Restaurant Wastewater" BMP pamphlet that details the appropriate ways to reduce FOG in sewer laterals and municipal sewer lines. It also details proper janitorial cleaning methods, the differences between interior and exterior grease interceptors and their maintenance requirements.

Inspectors use an asset management software to query the facilities that are due for inspections. Some facilities will receive multiple inspections if corrective actions are required. To further the District's sustainability goals, the ECU utilizes tablets in order to make inspections a paperless process. The tablets sync inspection data in real-time to the District's database. The Environmental Compliance Inspectors completed approximately 321 FOG inspections during this reporting period.

Summary of Public Participation Activities

No industrial users were published in the newspaper for Significant Noncompliance during this reporting period.

Pollution Prevention Public Outreach and Education

Pretreatment staff continues to educate light industries operating in Santa Cruz County Sanitation District on process-specific pollution prevention and waste minimization opportunities. During inspections BMP pamphlets and demonstrations for each particular industry are provided to business owners, managers, and employees. BMPs have been created for vehicle service facilities, dentists, photo processors, restaurants, dry cleaners, printers, machine shops, surfboard manufacturers, paint contractors, mobile car washes and medical facilities.

Every year in April, the District participates in Earth Day Santa Cruz. The event provides an opportunity to educate children and the community about proper use of residential sewers. The event is attended by nearly 3,000 people. District Pretreatment staff had been working with other cities and non-profits to coordinate the annual Earth Day event, which was to be held in April 2021. However, due to the COVID-19 pandemic the event was canceled this year.

The Sanitation District has been a key task force member and coordinator of the Monterey Bay Area Green Business Program since 2004. Goals of the Green Business Program include promoting pollution prevention, waste minimization, and implementing best management practices that go above and beyond the regulatory standards. Currently the Sanitation District supports the Green Business Program financially and ECU Inspectors offer wastewater and stormwater technical assistance to help certify local businesses as Green Businesses.

The District, in collaboration with other County and City agencies, was successful in implementing a pharmaceutical and sharps disposal program. The goal of the program is to provide a convenient and permanent system to collect used sharps and unwanted pharmaceuticals in the County of Santa Cruz. MED-Project LLC operates a Product Stewardship Plan for Unwanted Medicine and Sharps from Households in the County of Santa Cruz under the Santa Cruz County Safe Drug and Sharps Disposal Ordinance, Santa Cruz County Code sections 7.95.010 – 7.95.120

In Fiscal year 2020/21, MED-Project collected 2,894.9 pounds of Unwanted Medicine through Unwanted Medicine Kiosk Drop-Off Sites and 2,777 pounds of Sharps through Sharps Kiosk

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Drop-Off Sites Through this program, large quantities of pharmaceutical waste and sharps have been diverted from improper waste disposal channels such as the sewer systems and storm drains.

The District also utilizes Facebook and Twitter to provide outreach and education to the public. All the pollution prevention public outreach information is available on the District's Website: https://sccsd.wpcomstaging.com/environmental/

"Flushable" wipes continue to be problematic in our collection system and pump stations. To address this public issue, the District placed two, full-page "Think Before You Flush" ads in local "Best of Santa Cruz" and "Home and Garden" magazines. Additionally, the District partnered with the City of Santa Cruz and contracted Goldstreet Design to design two, 15-second, "Don't Flush Wipes" videos in English and Spanish (see picture below). These videos are posted on the District's website and Public Works Facebook page. During the weeks of April 15 – April 29, the District placed radio ads of the video narratives in English and Spanish on KSES, KSCO and KWAV. This radio ad campaign to educate the public about the hazards of flushing "disposable" wipes was done in conjunction with the City of Santa Cruz.



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Summary of Sludge Disposal Methods- N/A

Conclusion

The District continues to monitor all existing and potential commercial and industrial users by questionnaire, inspection, surveillance monitoring, and compliance sampling when necessary. There were several light industry violations such as improper grease management in restaurants and non-compliant stormwater discharges. There were five LOVs issued this year and one Administrative Citation. Two food service facilities were issued LOVs for failure to provide grease trap maintenance records, two residential users were issued LOVs for private lateral sanitary sewer overflows. One SIU was issued a LOV for a pH violation. One property manager was issued an Administrative Citation for repeated failure to mitigate storm water issues emanating from a garbage/recycling enclosure area that serves many food service facilities.

No SIUs were in Significant Non-Compliance during this reporting period.

District personnel continue to educate light industries operating in Santa Cruz County on process-specific pollution prevention and waste minimization opportunities. During inspections, BMP pamphlets and demonstrations for each particular industry are provided to business owners, managers, and employees.

Finally, the District's Environmental Programs Coordinator and the Environmental Compliance Inspectors keep apprised of the developments of the pretreatment industry in order to effectively administer State and Federally mandated programs. This includes staff attendance at the annual CWEA Pretreatment, Pollution Prevention, and Stormwater (P3S) Conference where industry leaders gather to learn about all things relating to the pretreatment world. Topics include new laws and regulations, new technologies, and in-depth learning opportunities regarding up-and-coming industries. Staff also regularly attended CWEA P3S Environmental Compliance Inspector “Toolbelt Training” webinars and utilize several online industry communities to keep up to date with the most current information pertaining to pretreatment programs.

DEFINITION LIST FOR TABLE 2.2

Inspections and Sampling:

Scheduled: Scheduled inspections and monitoring are planned in advance with prior notice to the industry. The purpose of scheduled inspections and monitoring are: to collect information and obtain samples to evaluate industry compliance with wastewater discharge requirements; to identify changes in industrial processes that may affect the quality of the discharges and permit limitations; to maintain a cooperative, as well as regulatory, presence with the industrial community; to ensure that self-monitoring sample collection and preservation techniques are correct; and to verify self-monitoring report data.

Unscheduled: Unscheduled monitoring and inspections represent a random spot check to evaluate industry compliance. No advance notice is given. Unscheduled inspections are performed the same day as a discrete composite sample is collected and any operational changes or unusual incidents may be noted, if appropriate, in the field-sampling logbook. Unscheduled sampling may occur whenever an industrial user is suspected of having difficulties maintaining consistent compliance.

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Demand: Demand monitoring and inspections are usually performed in response to a complaint or emergency situation. Most often these complaints are from POTW Laboratory or Operations personnel who notice a change in the influent wastewater characteristics. Monitoring and inspections of this type are used to determine the nature, duration, and hazard of the discharge, obtain samples to verify the source and constituents of the discharge, ascertain the necessary corrective actions needed to control or halt the discharge, initiate corrective actions, if needed, and document information for follow-up compliance or enforcement activities.

Industrial User Self-Monitoring: Industrial users are required, as part of their wastewater discharge permit, to perform self-monitoring of the wastewater discharged to the POTW. Frequency of self-monitoring is determined by considering the industry's past performance and compliance, the flow and constituents of the IU's discharge, the extent and number of problems in the POTW as a result of industrial discharges, new or additional pretreatment standards and requirements, and the seasonal production schedules at an industry.

Compliance: A minor violation is a violation by an industrial discharger which exceeds the specific limitations for wastewater discharges set forth in the sewer use code or the applicable categorical pretreatment standard, but does not cause or create hazardous conditions for line maintenance or POTW personnel; does not cause an upset of the treatment processes, an interference with treatment processes, or a pass-through of pollutants to the receiving waters; does not damage the sewer collection or treatment system; and does not cause the POTW to violate its NPDES permit.

Enforcement: Enforcement procedures include a written/verbal warning, written letter of violation, administrative infraction citation with fines, administrative order from the District Engineer, civil action, and criminal action. Chain of authority regarding enforcement procedures: The Environmental Compliance Inspector samples industrial dischargers and investigates citizen complaints, and then reports the results of analyses or investigative findings to the Environmental Programs Coordinator. The Environmental Programs Coordinator then selects the appropriate enforcement in accordance with the District's Enforcement Response Plan. Actions brought before the District's Board are initiated by the Environmental Programs Coordinator. The Board and the District Engineer, as the Administrative Authority, make final decisions regarding fines and/or sewer service termination. The Santa Cruz County Sanitation District Code gives the District authority to implement enforcement response procedures. Title 7 Section 7.04.545 “Enforcement Response and Fines” details the enforcement procedures implemented by the District.

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PRETREATMENT ANNUAL REPORT

PCS Data Entry Form

POTW Name: SANTA CRUZ COUNTY SANITATION DISTRICT

NPDES Permit #: CA0048194

Period Covered By This Report: 1-1-21 (PSSD) 12-31-21 (PSED)
Start Date End Date

Number of Significant Industrial Users in SNC with Pretreatment Compliance Schedule: 0 (SSNC)

Number of Letters of Violation and Administrative Orders Issued Against Significant Industrial Users: 1 (FENF)

Number of Civil & Criminal Judicial Actions Against Significant Industrial Users: 0 (JUDI)

Number of Significant Industrial Users with Significant Violations Published: 0 (SVPU)

Number of Industrial Users from Which Penalties Have Been Collected: 0 (IUPN)

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TABLE 1.1
INDUSTRIAL USER REPORT

Industrial Username & Address	Applicable Federal Categorical Limits	Subject to Local limits Noncategorical	Local limits More Stringent than Federal limits	Notified BMR	BMR Rec'd	Compliance Status (See key below) Federal	Local	Quarter	Remarks
CABRILLO COLLEGE 6500 SOQUEL DR APTOS, CA	NONE	YES	N/A	NO	NO		A1 A3 A3 A2	1 2 3 4	
SANTA CRUZ CITY WATER TREATMENT PL 3701 ROLAND AVE SANTA CRUZ, CA	NONE	YES	N/A	NO	NO		A1 A3 A3 A2	1 2 3 4	
MILLS PENNINSULA HEALTH SERVICES 2025 SOQUEL DR SANTA CRUZ, CA	NONE	YES	N/A	NO	NO		A1 A3 A3 A2	1 2 3 4	
DOMINICAN HOSPITAL 1555 SOQUEL DR SANTA CRUZ, CA	NONE	YES	N/A	NO	NO		A1 A3 A3 A2	1 2 3 4	
				TOTAL 0	TOTAL 0				

Compliance Status Key
A) Consistently achieving compliance
B) Inconsistently achieving compliance
C) Significantly violating compliance
D) Compliance status unknown

Compliance Determination Key
1) POTW compliance sampling only
2) IU Self-Monitoring Only
3) Both 1 & 2
4) Other (see Footnote)
N/A: Not applicable

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

TABLE 1.1
INDUSTRIAL USER REPORT

Industrial Username & Address	Applicable Federal Categorical Limits	Subject to Local limits Noncategorical	Local Limits More Stringent than Federal Limits	Notified BMR	BMR Rec'd	Compliance Status (See key below) Federal	Compliance Status (See key below) Local	Quarter	Remarks
BARGETTO WINERY 3535 N. MAIN ST SOQUEL, CA	NONE	YES	N/A	NO	NO		A1 A3 B1 A2	1 2 3 4	
SOQUEL CREEK WATER PO BOX 158 SOQUEL, CA	NONE	YES	N/A	NO	NO		A1 A3 A3 A2	1 2 3 4	
				TOTAL 0	TOTAL 0				

Compliance Status Key
A) Consistently achieving compliance
B) Inconsistently achieving compliance
C) Significantly violating compliance
D) Compliance status unknown

Compliance Determination Key
1) POTW compliance sampling only
2) IU self-monitoring only
3) Both 1& 2
4) Other
N/A: Not applicable

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TABLE 1.2
SANTA CRUZ COUNTY SANITATION DISTRICT
WASTEWATER DISCHARGE LIMITATIONS

Pollutant	Concentration, (mg/L)
Arsenic	0.21
Cadmium	1.57
Total Chromium	35.65
Chromium Hexavalent	5.26
Copper	2.17
Cyanide	0.08
Lead	6.04
Mercury	0.32
Nickel	1.15
Silver	0.70
Sulfide (dissolved)	0.2 (Monthly average, 1.0 Maximum)
Suspended Solids	3,000
Zinc	25.23
pH, units	5.0 to 10
Temperature Not over 104ºF (except where higher temperatures are permitted by law) except in no case shall the temperature of the wastewater influent at the treatment plant exceed 104ºF.	
Oil or Grease of animal or vegetable Origin	300
Total petroleum hydrocarbons (TPH)	50
Methyl-t-butyl Ether (MTBE)	1.0
* Total toxic organics (TTO)	1.0
**Phenolics, Total	150
***Phenolics, chlorinated	0.6
Chlordane	1.48×10^{-5}
DDT, o,p'	0.011
dieldrin	9.40×10^{-5}
endosulfan I	0.006
endrin	0.002
heptachlor	0.00014
heptachlor epoxide	1.39×10^{-5}
hexachlorobenzene	23.50
Naphthalene	2350
Phenanthrene/Anthracene, C1 -	2349.99
Anthracene	2422.68
Fluoranthene	123.38
8 - PCB	0.000138859
2,3,7,8-TCDD	2.53×10^{-9}

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*TTO is defined as the sum of all individual compounds listed in the Code of Federal Regulations (CFR) at 40 CFR 433.11e with quantifiable concentrations greater than 0.01 mg/L when measured using test methods approved under 40 CFR 136 or other methods approved for NPDES monitoring, and other toxic organic compounds as determined by the Director.

**Phenols, total, by EPA Method 420.1.

***Phenols, chlorinated, is defined as the sum of 2-chlorophenol, 2,4-dichlorophenol, pentachlorophenol, 2,4,6-trichlorophenol and 4-chloro-3-methylphenol (p-choloro-m-cresol).

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TABLE 1.3
Additional Pure Water Soquel Parameters

Compound	Analytical Method	Max. Conc. (mg/L)
Acetone	EPA 8620D	N/A
Boron	EPA 200.7	N/A
1,4-Dioxane	EPA 624	0.0032
Formaldehyde	EPA 8315A	0.1

TABLE 1.4

INDUSTRIES REMOVED FROM MONITORING BY THE DISTRICT

Company Name	Company Address	Company Contact	Telephone	Permit Type
None				

TABLE 1.5

INDUSTRIES ADDED TO MONITORING SCHEDULE BY THE DISTRICT

Company Name	Company Address	Company Contact	Telephone	Permit Type
None				

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

TABLE 2.1

ANNUAL INSPECTIONS COMPLETED

Industries	Inspections Completed 2019	Inspections Completed 2020	Inspections Completed 2021
Food Service Establishments	276	281	321
Light Industries (including vehicles service, dry cleaners, machine shops, car washes)	106	119	133
Other Miscellaneous (including re-inspections, plan reviews, new installs)	57	31	58
Total	**439**	**439**	**512**

NOTE: Inspections consisted of full facility inspection, partial facility inspection (in order to alleviate a specific problem on a certain date), plan reviews and new installs, and re-inspections.

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TABLE 2.2
MONITORING AND COMPLIANCE / ENFORCEMENT STATUS REPORT

Industrial Users Name & Address	QTR	District Planned Sample	District Actual Sample	District Planned Inspect	District Actual Inspect	IU Sample	Spill Emergency Inspect/ Sample	Conclusions/ Results	Compliance/Enforcement					
									QTR	LOV	ADMIN ORDER	CIV ACT	CRIM ACT	FINE
BARGETTO WINERY 3535 N. MAIN ST. SOQUEL, CA	1	1	1	0	0	0	0/0	Inconsistently achieving compliance.	1					
	2	1	1	0	0	1	0/0		2					
	3	1	1	1	1	0	0/0		3	1				
	4	0	0	0	0	1	0/0		4					
	TOTAL	**3**	**3**	**1**	**1**	**2**	**0/0**							
CABRILLO COLLEGE 6500 SOQUEL DR APTOS, CA	1	1	1	0	1	0	0/0	Consistently achieving compliance.	1					
	2	1	1	0	0	1	0/0		2					
	3	0	0	0	0	0	0/0		3					
	4	0	0	1	1	1	0/0		4					
	TOTAL	**2**	**2**	**1**	**1**	**2**	**0/0**							
MILLS PENNINSULA SERVICES 2025 SOQUEL DR. SANTA CRUZ, CA	1	1	1	0	0	0	0/0	Consistently achieving compliance.	1					
	2	1	1	0	0	1	0/0		2					
	3	0	0	0	0	0	0/0		3					
	4	0	0	1	1	1	0/0		4					
	TOTAL	**2**	**2**	**1**	**1**	**2**	**0/0**							

Notes & Remarks:

(L) Regarding Violation of Local Stnd.
(F) Regarding Violation of Federal Stnd.
(B) Regarding Violation of Both
(SNC) Regarding Significant Non-compliance
(P) Regarding Violation of Permit Conditions

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TABLE 2.2

MONITORING AND COMPLIANCE / ENFORCEMENT STATUS REPORT

Industrial Users Name & Address	QTR	District Planned Sample	District Actual Sample	District Planned Inspect	District Actual Inspect	IU Sample	Spill Emergency Inspect/ Sample	Conclusions/ Results	Compliance/Enforcement					
									QTR	LOV	ADMIN ORDER	CIV ACT	CRIM ACT	FINE
SANTA CRUZ WATER TREATMENT PLANT 3701 ROLAND AVE SANTA CRUZ, CA	1	1	1	0	0	0	0/0	Consistently achieving compliance	1					
	2	1	1	1	1	1	0/0		2					
	3	0	0	0	0	0	0/0		3					
	4	0	0	0	0	1	0/0		4					
	TOTAL	**2**	**2**	**1**	**1**	**2**	**0/0**							
DOMINICAN HOSPITAL 1555 SOQUEL DR. SANTA CRUZ, CA	1	1	1	0	0	0	0/0	Consistently achieving compliance	1					
	2	1	1	0	0	1	0/0		2					
	3	0	0	1	1	0	0/0		3					
	4	0	0	0	0	1	0/0		4					
	TOTAL	**2**	**2**	**1**	**1**	**2**	**0/0**							
SOQUEL CREEK WATER TREATMEI PLANTS PO BOX 158 SOQUEL, CA	1	1	1	0	0	0	0/0	Consistently achieving compliance	1					
	2	1	1	1	1	1	0/0		2					
	3	0	0	0	0	0	0/0		3					
	4	0	0	0	0	1	0/0		4					
	TOTAL	**2**	**2**	**1**	**1**	**2**	**0/0**							

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TABLE 2.3 SUMMARY OF PRETREATMENT BUDGET

	Source Control	Public Outreach	Source Control Lab Work	Green Business
Budget Year 2021-22	$506,389	$55,700	$35,000	$120,000
Budget Year 2020-21	$496,460	$54,608	$26,250	$120,000
Budget Year 2019-20	$482,000	$52,008	$26,000	$124,508

TABLE 3.1 SUMMARY OF PRETREATMENT EQUIPMENT PURCHASES

This Reporting Year

Equipment	Cost
Miscellaneous sampling and auditing tools	$7,000
Lab Analysis and supplies	$14,000
TOTAL	**$21,000**

Current Equipment

(2) Isco Portable samplers	Portable Analyzer	Computer Software
Sample bottles	Educational Videos	Wastewater Gas Analyzer
(2) pH Meters	(3) Cell Phones	Various Subscription Services
Harness and safety vests	Sludge Judge	2 Samplers and Related Equipment
Hard hats	Refrigerator	Misc. Sampling/auditing tools
Safety goggles	DI Water System	(3) Samsung Tablets
Steel toed shoes	Manhole Fall Guard	O2 Sensor
Traffic cones	Various hand tools	2 - 2 drawer files
First Aid Kit	Mini Refrigerator	VOC Meter
Swing Sampler	(3) Computers	Membrane Filtration Manifold
Water Bath	Dishwasher and Racks	H2S Meter
DO Meter/Probe	Incubators	Misc. lab equipment
Reference Thermometers		(3) Vehicles

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ATTACHMENT A

Fourth Quarter Monitoring Results

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4th QUARTER STATUS REPORT 2021

Industrial Users Name and Address	Compliance Status	Previous Quarters Not in Compliance	Parameter	Reported Level	Limit Violated	Flow	Corrective/ Enforcement Actions
No Violations							

Comment Section

Flow Key

A. 0-10,000 gpd
B. 10,000-30,000 gpd
C. 30,000-50,000 gpd
D. 50,000-100,000 gpd
E. >100,000 gpd

Compliance Status Key

A. In compliance with Baseline Monitoring Report requirements
B. Consistently achieving compliance
C. Inconsistently achieving compliance
D. Significantly violated applicable pretreatment requirements as defined by 40 CFR 403.8(f) (2) (vii)
E. On a compliance schedule to achieve compliance
F. Not achieving compliance and not on a compliance schedule
G. The District does not know the industrial user's compliance status

Compliance Determination

1.) POTW sampling
2.) IU self-monitoring
3.) Combination of 1 and 2
4.) Other (explain)

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ATTACHMENT B

Restaurant and Light Industry Inspections

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Industrial Pretreatment Facility Inspection Summary Report

1/14/2022
3:05:58PM

Facility Number:	Facility Name:	Address:	City:	Inspector:	Inspection Type:	Facility Contact:	Contact Phone:	Insp. Date:
1025	SANTA CRUZ POST ACU	1115 CAPITOLA RD	Santa Cruz	Pretreatment Group	Annual Inspection	Maria Romandia	475-4055	12/8/2021
1058	MOORE & SONS OUTBO	21431 CLIFF DR	Santa Cruz	Marisol Goulett	Annual Inspection	Jim		12/7/2021
1059	SEACLIFF SERVICE INC.	201 SEARIDGE RD	Aptos	Leslie Rios	Annual Inspection	Chris	688-7600	12/28/2021
1063	PLAZA SHELL 41ST	1649 41ST AVE	Capitola	Pretreatment Group	Annual Inspection	Victor	475-9645	12/8/2021
1066	APTOS VILLAGE GARAG	8026 SOQUEL DR	Aptos	Marisol Goulett	Annual Inspection	John		12/8/2021
1068	AJ's FUEL MARKET	5955 SOQUEL DR	Soquel	Marisol Goulett	Annual Inspection	Donna		12/15/2021
1071	GLENN P DAVIS AUTO RI	3503 PORTOLA DR	Santa Cruz	Marisol Goulett	Annual Inspection	Meagan		12/15/2021
1072	AUTO SPA	720 CAPITOLA AVE	Capitola	Marisol Goulett	Annual Inspection	Manuel		12/15/2021
1073	SANTA CRUZ SUBARU	4100 AUTO PLAZA DR	Capitola	Marisol Goulett	Annual Inspection	Terry		12/15/2021
1074	MASTER CAR WASH	2110 41ST AVE	Capitola	Monica Tomlinson	Annual Inspection			12/28/2021
1075	MID-COUNTY AUTO SUP	4310 CAPITOLA RD	Capitola	Pretreatment Group	Annual Inspection	Polo	476-3600	12/28/2021
1076	SANTA CRUZ TIRE AND A	2840 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/3/2021
1080	AUTO EXPRESS	2842 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Paul		12/3/2021
1081	EMILE'S SPORTS CAR PI	3501 PORTOLA DR	Santa Cruz	Marisol Goulett	Annual Inspection	Emile		12/15/2021
1083	GOODYEAR TIRE CENTE	3800 CAPITOLA RD	Capitola	Marisol Goulett	Annual Inspection	Cristal		12/15/2021
1084	MID COUNTY HONDA AC	1521 COMMERCIAL WAY	Santa Cruz	Marisol Goulett	Annual Inspection	Mark		12/15/2021
1085	CALIBER COLLISION	1650 MANSFIELD ST	Santa Cruz	Marisol Goulett	Annual Inspection	Fernando		12/17/2021
1091	CRUZ CAR WASH	2731 41ST AVE	Soquel	Marisol Goulett	Annual Inspection	Ashish		12/17/2021
1094	STUART AUTOMOTIVE	4003 CORDELIA LN	Soquel	Marisol Goulett	Annual Inspection	Doug		12/17/2021
1095	D & K VW SERVICE	2551 RODEO GULCH RD	Soquel	Marisol Goulett	Annual Inspection	David		12/17/2021
1096	TIGER MOTORS	2810 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Garret		12/17/2021
1098	FEDERAL EXPRESS	2660 RESEARCH PARK DR	Soquel	Marisol Goulett	Facility Inspection	James		2/1/2021
1098	FEDERAL EXPRESS	2660 RESEARCH PARK DR	Soquel	Marisol Goulett	Annual Inspection	James		12/21/2021
1100	FIX AUTO CAPITOLA	2850 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Brian		12/21/2021
1101	SANTA CRUZ TOYOTA	4200 AUTO PLAZA DR	Capitola	Leslie Rios	Annual Inspection	Phil LoPresti	408-316-0323	12/27/2021
1105	BAY AVE CAR WASH	821 BAY AVE	Capitola	Marisol Goulett	Annual Inspection			12/17/2021
1108	UNITED RENTALS	1835 SOQUEL DR	Santa Cruz	Marisol Goulett	Annual Inspection	Joe		12/30/2021
1110	IO MOTORS	2852 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/9/2021
1111	CIRCLE STAR MOTORS	2750 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Max		12/8/2021
1112	ALAN RICE AUTOMOTIVE	3545 SOQUEL DR	Soquel	Pretreatment Group	Annual Inspection	Alan Rice		12/27/2021
1113	SOQUEL AUTO REPAIR	3621 SOQUEL DR	Soquel	Leslie Rios	Annual Inspection	Fardad	476-1411	12/26/2021
1114	FAST LANE PORSCHE RI	2831 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Mario		12/8/2021
1118	NORAM AUTO SERVICE	2615 RODEO GULCH RD	Soquel	Marisol Goulett	Annual Inspection	Jim		12/13/2021
1119	AA AUTO COLLISION CEI	1240 THOMPSON AVE	Santa Cruz	Leslie Rios	Annual Inspection	Brian	476-7725	12/27/2021
1123	CATALPA ST GARAGE	2844 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/3/2021

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Industrial Pretreatment Facility Inspection Summary Report

1/14/2022
3:05:58PM

Facility Number:	Facility Name:	Address:	City:	Inspector:	Inspection Type:	Facility Contact:	Contact Phone:	Insp. Date:
1125	A TOOL SHED	3700 SOQUEL AVE	Santa Cruz	Leslie Rios	Annual Inspection	David	454-8331	12/27/2021
1127	KEN'S AUTO BODY	1226 BROMMER ST	Santa Cruz	Monica Tomlinson	Annual Inspection	Ken Heredia		12/28/2021
1130	CABRILLO COLLEGE FLE	6500 SOQUEL DR	Aptos	Pretreatment Group	Annual Inspection	Tom		12/16/2021
1131	CHANDLER AUTOMOTIVI	2831 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Mark		12/8/2021
1132	HAYES EUROPEAN	1010 17TH AVE	Santa Cruz	Pretreatment Group	Annual Inspection	Kyle	540-2067	12/27/2021
1137	HARBOR SERVICE STATI	2848 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Scott		12/30/2021
1178	CABRILLO COLLEGE ANI	6500 SOQUEL DR	APTOS	Pretreatment Group	Annual Inspection	Tom		12/16/2021
1220	NIEBANK TOOLING CON	2829 RODEO GULCH RD	Soquel	Marisol Goulett	Annual Inspection			12/29/2021
1221	CONCEPTS 2	2829 RODEO GULCH RD	Soquel	Marisol Goulett	Annual Inspection			12/29/2021
1223	BRYAN AUTOMOTIVE	2846 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Glenn		12/9/2021
1228	PRUNELLA MACHINE	986 TOWER PL	Santa Cruz	Leslie Rios	Annual Inspection	Scott		12/28/2021
1230	CLASSIC CLEANERS	809 BAY AVE	Capitola	Pretreatment Group	Annual Inspection			12/27/2021
1231	CAPITOLA CLEANERS	1820 41ST AVE	Capitola	Leslie Rios	Annual Inspection	Tong	476-2635	12/28/2021
1232	MASTER CLEANERS	2660 41ST AVE	Soquel	Monica Tomlinson	Annual Inspection	Jung		12/28/2021
1233	KINGS CLEANERS	3908 CAPITOLA RD	Capitola	Monica Tomlinson	Annual Inspection			12/28/2021
1234	EAST CLIFF ONE HOUR I	21503 CLIFF DR	Santa Cruz	Leslie Rios	Annual Inspection	Johan	475-7997	12/28/2021
1236	DEL MAR CLEANERS AP	2 RANCHO DEL MAR	Aptos	Leslie Rios	Annual Inspection	He	688-6135	12/28/2021
1238	SEASCAPE CLEANERS	13 SEASCAPE VILLAGE	Aptos	Leslie Rios	Annual Inspection		685-3731	12/8/2021
1241	SOQUEL H20 TANNERY	5735 SOQUEL DR	Soquel	Pretreatment Group	Annual Inspection			8/17/2021
1241	SOQUEL H20 TANNERY	5735 SOQUEL DR	Soquel	Pretreatment Group	Scheduled Sampling			8/17/2021
1247	ALPHA MACHINE	933 CHITTENDEN LN	Capitola	Pretreatment Group	Annual Inspection			12/27/2021
1250	GARLAND PRECISION	4000 CORDELIA LN	Soquel	Marisol Goulett	Annual Inspection	Glenn		12/21/2021
1254	PG&E	615 7TH AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Polo Gonzalez	707-338-4957	2/17/2021
1268	SOQUEL H20 MAIN	3325 N MAIN ST	Soquel	Marisol Goulett	Annual Inspection			8/11/2021
1268	SOQUEL H20 MAIN	3325 N MAIN ST	Soquel	Marisol Goulett	Scheduled Sampling	Greg Wilson		8/11/2021
1270	SOQUEL H20 ESTATES	0 ESTATES DR	Soquel	Marisol Goulett	Annual Inspection	Greg		9/1/2021
1270	SOQUEL H20 ESTATES	0 ESTATES DR	Soquel	Marisol Goulett	Scheduled Sampling	Greg		9/1/2021
1284	SANTA CRUZ CITY WATE	3701 ROLAND DR	Santa Cruz	Marisol Goulett	Annual Inspection			2/3/2021
1284	SANTA CRUZ CITY WATE	3701 ROLAND DR	Santa Cruz	Marisol Goulett	Scheduled Sampling	Dustin		2/3/2021
1284	SANTA CRUZ CITY WATE	3701 ROLAND DR	Santa Cruz	Leslie Rios	Scheduled Sampling			6/22/2021
1286	SANTA CRUZ METAL POL	2535 7TH AVE	Santa Cruz	Leslie Rios	Annual Inspection			12/27/2021
1288	SOQUEL H20 GARNET	307 GARNET ST	Capitola	Marisol Goulett	Annual Inspection	Greg		2/2/2021
1288	SOQUEL H20 GARNET	307 GARNET ST	Capitola	Marisol Goulett	Scheduled Sampling	Greg		2/2/2021
1288	SOQUEL H20 GARNET	307 GARNET ST	Capitola	Marisol Goulett	Scheduled Sampling	Greg		6/2/2021
1296	CENTRAL COAST FOUR	2852 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Greg		12/20/2021

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Industrial Pretreatment Facility Inspection Summary Report

1/14/2022
3:05:58PM

Facility Number:	Facility Name:	Address:	City:	Inspector:	Inspection Type:	Facility Contact:	Contact Phone:	Insp. Date:
1456	BARGETTO	3535 N MAIN ST	Soquel	Marisol Goulett	Scheduled Sampling			2/17/2021
1456	BARGETTO	3535 N MAIN ST	Soquel	Marisol Goulett	Scheduled Sampling			4/27/2021
1456	BARGETTO	3535 N MAIN ST	Soquel	Pretreatment Group	Annual Inspection	Bobby Graviano		9/21/2021
1456	BARGETTO	3535 N MAIN ST	Soquel	Pretreatment Group	Scheduled Sampling	Bobby Graviano		9/21/2021
1456	BARGETTO	3535 N MAIN ST	Soquel	Monica Tomlinson	Follow Up	Keegan		12/16/2021
1457	DMV CLINIC AUTO REPA	2335 SOQUEL DR	Santa Cruz	Monica Tomlinson	Follow Up	Nathan Sparks		2/9/2021
1457	DMV CLINIC AUTO REPA	2335 SOQUEL DR	Santa Cruz	Monica Tomlinson	Annual Inspection	Nathan Sparks		12/28/2021
1461	DOS AMIGOS AUTO REP/	2964 SOQUEL AVE	Santa Cruz	Pretreatment Group	Annual Inspection	Saul		12/27/2021
1464	RICK'S AUTO SHOP	1050 17TH AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
1466	EBERTS VW REPAIR	2670 17TH AVE	Santa Cruz	Marisol Goulett	Annual Inspection	David		12/21/2021
1467	SPECIALIZED AUTO	2415 CHANTICLEER AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Larry		12/30/2021
1468	GULUARTE'S AUTO	980 17TH AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
1470	B&B SMALL ENGINE REF	1700 COMMERCIAL WAY	Santa Cruz	Pretreatment Group	Annual Inspection	Dan		12/27/2021
1472	GINO'S AUTO RECYCLIN	3315 PORTOLA DR	Santa Cruz	Marisol Goulett	Annual Inspection	Gino		12/21/2021
1473	AUTO MOTIVES	3098 WINKLE AVE	Santa Cruz	Pretreatment Group	Annual Inspection			12/27/2021
1474	OLD VOLKS HOME	3921 SOQUEL DR	Soquel	Marisol Goulett	Annual Inspection			12/20/2021
1476	KRAFT'S BODY SHOP	6100 SOQUEL AVE	Santa Cruz	Monica Tomlinson	Annual Inspection	Chris		12/28/2021
1485	BRANCIFORTE AUTOMO	10105 SOQUEL DR	Aptos	Pretreatment Group	Annual Inspection	Margaret	685--2886	12/28/2021
1486	WILSON'S TIRE SERVICE	4665 SOQUEL DR	Soquel	Marisol Goulett	Annual Inspection	Juan		12/3/2021
1488	SMOG CHECK	3921 SOQUEL DR	Santa Cruz	Leslie Rios	Annual Inspection	Dennis	462-0355	12/27/2021
1517	DOERKSEN PRECISION	2725 CHANTICLEER AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Dan		12/29/2021
1540	SAABORAMA	2335 SOQUEL DR	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
1541	DESIGN OCTAVES	2701 RESEARCH PARK DR	Soquel	Pretreatment Group	Annual Inspection	Terri	464-8500	12/27/2021
1545	BOBBY'S PIT STOP	1655 COMMERCIAL WAY	Santa Cruz	Pretreatment Group	Annual Inspection			12/29/2021
1567	NATE SMITH OPTIMAL AU	2335 SOQUEL DR	Santa Cruz	Monica Tomlinson	Annual Inspection	Nate		12/28/2021
1569	PHIL'S AUTO BODY & CO	2750 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
1570	SANTA CRUZ MOTORCY(	1700 COMMERCIAL WAY	Santa Cruz	Pretreatment Group	Annual Inspection			12/28/2021
1571	ROSSI'S TOWING BODY	203 CAPITOLA RD EXT	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
1573	TFR MOTORSPORTS	1125 17TH AVE	Santa Cruz	Leslie Rios	Annual Inspection	David Funk	426-2204	12/26/2021
1574	MICK'S AUTOMOTIVE	1257 THOMPSON AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Tracy		12/30/2021
1577	PEARCE EUROPEAN & J	7000 SOQUEL AVE	Santa Cruz	Marisol Goulett	Facility Inspection	Chris		2/1/2021
1577	PEARCE EUROPEAN & J	7000 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Chris		12/13/2021
1578	R&D MOTORSPORTS	3301 PORTOLA DR	Santa Cruz	Leslie Rios	Annual Inspection	Jamie	462-3195	12/26/2021
1601	CITY AUTO BODY	976 17TH AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Marco		12/21/2021
1620	CITY OF CAPITOLA P.W. `	430 KENNEDY DR	Capitola	Leslie Rios	Annual Inspection	Matt	212-4058	12/28/2021

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Industrial Pretreatment Facility Inspection Summary Report

1/14/2022
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Facility Number:	Facility Name:	Address:	City:	Inspector:	Inspection Type:	Facility Contact:	Contact Phone:	Insp. Date:
1622	EARTHWORKS	310 KENNEDY DR	Capitola	Pretreatment Group	Annual Inspection			12/30/2021
1623	BROMMER YARD	2700 BROMMER ST	Santa Cruz	Pretreatment Group	Annual Inspection	James Smrt		12/28/2021
1627	MATHER MACHINING	933 CHITTENDEN LN	Capitola	Marisol Goulett	Annual Inspection			12/29/2021
1642	STRITE MACHINING	1257 THOMPSON AVE	Santa Cruz	Marisol Goulett	Annual Inspection			12/29/2021
1643	R. F. JOHNSON MANUFA	1257 THOMPSON AVE	Santa Cruz	Leslie Rios	Annual Inspection			12/27/2021
1653	SHELL GAS AND CARWA	2700 SOQUEL AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Tommie		12/8/2021
1688	OCEAN HONDA	3801 SOQUEL DR	Soquel	Marisol Goulett	Annual Inspection	Theresa		12/13/2021
1696	SOQUEL H20 APTOS JR I	1001 HUNTINGTON DR	Aptos	Marisol Goulett	Annual Inspection	Greg		2/23/2021
1696	SOQUEL H20 APTOS JR I	1001 HUNTINGTON DR	Aptos	Marisol Goulett	Scheduled Sampling	Greg		2/23/2021
1696	SOQUEL H20 APTOS JR I	1001 HUNTINGTON DR	Aptos	Marisol Goulett	Scheduled Sampling	Greg		4/28/2021
1697	SOQUEL H2O POLO GRC	2255 HUNTINGTON DR	Aptos	Marisol Goulett	Annual Inspection	Greg		7/15/2021
1697	SOQUEL H2O POLO GRC	2255 HUNTINGTON DR	Aptos	Marisol Goulett	Scheduled Sampling	Greg		7/15/2021
2878	VALVOLINE INSTANT OIL	2878 RODEO GULCH RD	Santa Cruz	Marisol Goulett	Annual Inspection			12/30/2021
01-552	POWDER COAT IT	7000 SOQUEL AVE	SOQUEL	Marisol Goulett	Facility Inspection	Jeremy		2/1/2021
01-552	POWDER COAT IT	7000 SOQUEL AVE	SOQUEL	Marisol Goulett	Annual Inspection	Jeremy		12/13/2021
22111	APTOS TIRE & AUTO CAI	8028 SOQUEL DR	APTOS	Marisol Goulett	Annual Inspection			12/8/2021
2335-4	ROC AUTO	2335 SOQUEL DR	SANTA CRUZ	Monica Tomlinson	Follow Up	Marcos Adan, Sr		2/9/2021
2335-4	ROC AUTO	2335 SOQUEL DR	SANTA CRUZ	Monica Tomlinson	Annual Inspection	Marcos Adan Jr		12/28/2021
DWD001	CAPITOLA DRY WEATHE	420 CAPITOLA AVE	Capitola	Pretreatment Group	Scheduled Sampling	Matt Kotila		8/25/2021
1001	TOYOTA (was FIX AUTO)	4400 AUTO PLAZA DR	CAPITOLA	Marisol Goulett	Annual Inspection	Anthony		12/21/2021
54801	INDEPENDENT TIRES	2335 SOQUEL DR	SANTA CRUZ	Monica Tomlinson	Annual Inspection	Frank Arana, owner		12/28/2021
2720	CENTRAL COAST INDUS	2720 RODEO GULCH RD	Soquel	Marisol Goulett	Annual Inspection	Kelly		12/20/2021
2001	CENTRAL FIRE FLEET SI	410 KENNEDY DR	CAPITOLA	Marisol Goulett	Annual Inspection	Lisa		12/21/2021
1420	DOMINICAN HOSPITAL -	1555 SOQUEL DR	SANTA CRUZ	Marisol Goulett	Annual Inspection	Rachel Howley		7/15/2021
1438	SUTTER MATERNITY - SI	2900 CHANTICLEER AVE	Santa Cruz	Marisol Goulett	Annual Inspection	Nicole		11/4/2021
456	PASATIEMPO GOLF COU		Santa Cruz	Pretreatment Group	Annual Inspection	Justin		8/19/2021
844	BLUE WATER SEDANS A	844 17TH AVE B	SANTA CRUZ	Marisol Goulett	Annual Inspection	Mike		7/21/2021
844	BLUE WATER SEDANS A	844 17TH AVE B	SANTA CRUZ	Marisol Goulett	Follow Up	Mike		8/13/2021

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
TOGOS	1955 41ST AVE	CAPITOLA	Pretreatment Group	12/28/2021	12/28/2022
BURGER	7941 SOQUEL DR	Aptos	Pretreatment Group	11/29/2021	11/29/2022
CAPITOLA DINER	1900 41ST AVE	Capitola	Marisol Goulett	8/23/2021	8/23/2022
SEASCAPE GOLF COURSE	610 CLUB HOUSE DR	APTOS	Monica Tomlinson	12/8/2021	12/8/2022
DAVENPORT ROADHOUSE	1 DAVENPORT AVE	Davenport	Leslie Rios	11/9/2021	11/9/2022
BITTERSWEET BISTRO	787 RIO DEL MAR BLVD	Aptos	Monica Tomlinson	2/26/2021	2/26/2022
DOMINICAN OAKS	3400 PAUL SWEET RD	Santa Cruz	Pretreatment Group	12/7/2021	12/7/2022
PARADISE BEACH GRILLE	215 ESPLANADE	CAPITOLA	Pretreatment Group	12/8/2021	12/8/2022
SAND BAR	211 ESPLANADE	Capitola	Monica Tomlinson	12/9/2021	12/9/2022
UNCIE RO'S	2901 RESEARCH PARK DR A	Soquel	Leslie Rios	11/8/2021	11/8/2022
CARPO'S	2400 PORTER ST	Soquel	Pretreatment Group	12/7/2021	12/7/2022
CARRIED AWAY	7486 SOQUEL DR	Aptos	Pretreatment Group	12/1/2021	12/15/2022
CARRIED AWAY	7486 SOQUEL DR	Aptos	Marisol Goulett	12/15/2021	12/15/2022
LAGO DI COMO	21490 E CLIFF DR	Santa Cruz	Pretreatment Group	12/7/2021	12/7/2022
SEASCAPE RESORT&CONFERENCE CTR	112 SEASCAPE BLVD	Aptos	Marisol Goulett	4/14/2021	4/14/2022
PALAPA'S RESTAURANT & CANTINA	21 SEASCAPE VILLAGE	Aptos	Pretreatment Group	12/1/2021	12/1/2022
SHADOWBROOK	1750 WHARF RD	Capitola	Pretreatment Group	6/1/2021	6/1/2022
IHOP	1549 41ST AVE	Capitola	Marisol Goulett	7/6/2021	7/6/2022
ZELDA'S	203 ESPLANADE	Capitola	Marisol Goulett	4/19/2021	4/19/2022
BASKIN ROBBINS 41ST	1601 41ST AVE	Capitola	Pretreatment Group	12/20/2021	12/20/2022
MY THAI BEACH	207 ESPLANADE	Capitola	Pretreatment Group	12/16/2021	12/16/2022
BOULDER CREEK COUNTRY CLUB	16901 BIG BASIN HWY	Boulder Creek	Marisol Goulett	4/8/2021	4/8/2022
BRITANNIA ARMS	110 MONTEREY AVE	Capitola	Monica Tomlinson	1/20/2021	7/15/2022
BRITANNIA ARMS	110 MONTEREY AVE	Capitola	Leslie Rios	7/15/2021	7/15/2022
CAFE SPARROW	8042 SOQUEL DR	Aptos	Pretreatment Group	12/7/2021	12/7/2022
VILLAGE GRILL AND CREAMERY	104 STOCKTON AVE	Capitola	Pretreatment Group	12/6/2021	12/6/2022
FAST EDDYS	4300 CAPITOLA RD	Capitola	Monica Tomlinson	12/14/2021	12/14/2022
LA PATRONA TAQUERIA	500 HWY 1	Davenport	Leslie Rios	10/15/2021	10/15/2022
OLIVE GARDEN	3400 CLARES ST	Capitola	Pretreatment Group	11/17/2021	10/13/2012

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
CHILL OUT CAFE	860 41ST AVE	Santa Cruz	Leslie Rios	7/22/2021	7/22/2022
EL CHIPOTLE	4724 SOQUEL DR	Soquel	Pretreatment Group	11/29/2021	11/29/2022
SESNON HOUSE	6500 SOQUEL DR	Aptos	Pretreatment Group	12/14/2021	12/14/2022
CHILI'S RESTAURANT	1855 41ST AVE	Capitola	Pretreatment Group	11/29/2021	11/29/2022
PRETTY GOOD ADVICE	3070 PORTER ST	Soquel	Marisol Goulett	9/1/2021	9/1/2022
ZIZZO'S COFFEE	3555 CLARES ST	Capitola	Marisol Goulett	8/23/2021	8/23/2022
PEET'S COFFEE	819 BAY AVE	Capitola	Pretreatment Group	11/18/2021	11/18/2022
STARBUCKS APTOS	105 POST OFFICE DR B	Aptos	Pretreatment Group	12/14/2021	12/14/2022
CAPITOLA WINE BAR & MERCHANTS	115 SAN JOSE AVE	Capitola	Leslie Rios	7/29/2021	7/29/2022
PEOPLE'S COFFEE	1200 17TH AVE	Santa Cruz	Pretreatment Group	12/8/2021	12/8/2022
STARBUCK'S 41ST & SOQUEL DR.	2740 41ST AVE	Soquel	Leslie Rios	7/9/2021	12/9/2022
STARBUCK'S 41ST & SOQUEL DR.	2740 41ST AVE	Soquel	Monica Tomlinson	12/9/2021	12/9/2022
PENNY ICE CREAMERY - 41ST	820 41ST AVE	Capitola	Pretreatment Group	11/16/2021	11/16/2022
CASTAGNOLA DELI AND CAFE	201 MONTEREY AVE C-D	Capitola	Pretreatment Group	12/7/2021	12/7/2022
AVENUE CAFE	427 CAPITOLA AVE	Capitola	Pretreatment Group	12/9/2021	12/9/2022
BEST IN DOGS	2600 41ST AVE	Soquel	Pretreatment Group	12/28/2021	12/28/2022
APTOS GRANGE	2555 MAR VISTA CT	Aptos	Pretreatment Group	12/1/2021	12/1/2022
MICHAEL'S ON MAIN	2591 S MAIN ST	Soquel	Marisol Goulett	6/16/2021	6/16/2022
TACOS MORENO Esplanade	201 ESPLANADE	Capitola	Leslie Rios	6/29/2021	6/29/2022
TRESTLES	316 CAPITOLA AVE A	Capitola	Marisol Goulett	7/7/2021	7/8/2022
TRESTLES	316 CAPITOLA AVE A	Capitola	Marisol Goulett	7/8/2021	7/8/2022
EVARISTA'S COMAL	1245 E CLIFF DR	Santa Cruz	Leslie Rios	7/21/2021	10/21/2022
EVARISTA'S COMAL	1245 E CLIFF DR	Santa Cruz	Marisol Goulett	10/14/2021	10/21/2022
EVARISTA'S COMAL	1245 E CLIFF DR	Santa Cruz	Marisol Goulett	10/21/2021	10/21/2022
SEVERINOS RESTAURANT	7500 OLD DOMINION CT	APTOS	Pretreatment Group	12/10/2021	12/10/2022
El JARDIN	655 CAPITOLA RD	Santa Cruz	Pretreatment Group	11/24/2021	11/24/2022
CASA ROSSY	257 CENTER AVE	Aptos	Pretreatment Group	12/10/2021	12/10/2022
PARISH PUBLICK HOUSE	8017 SOQUEL DR	Aptos	Pretreatment Group	11/17/2021	11/17/2022

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
J.J.'S SALOON (SOCIAL GRUB)	4714 SOQUEL DR	Soquel	Pretreatment Group	12/28/2021	12/28/2022
THE POINT KITCHEN AND BAR	3326 PORTOLA DR	SANTA CRUZ	Pretreatment Group	12/15/2021	12/15/2022
COLE'S BAR-B-Q	2590 PORTOLA DR	Santa Cruz	Leslie Rios	6/17/2021	6/17/2022
PIZZA MY HEART 41st	2180 41ST AVE	CAPITOLA	Leslie Rios	7/9/2021	7/9/2022
CAFE CRUZ	2621 41ST AVE	Soquel	Marisol Goulett	5/3/2021	11/16/2022
CAFE CRUZ	2621 41ST AVE	Soquel	Marisol Goulett	5/19/2021	11/16/2022
CAFE CRUZ	2621 41ST AVE	Soquel	Marisol Goulett	7/21/2021	11/16/2022
CAFE CRUZ	2621 41ST AVE	Soquel	Pretreatment Group	11/16/2021	11/16/2022
APTOS ST BBQ	8059 APTOS ST	Aptos	Pretreatment Group	12/7/2021	12/7/2022
CAPITOLA BAR AND GRILL	231 ESPLANADE	Capitola	Marisol Goulett	9/23/2021	9/23/2022
CAFE RIO	131 ESPLANADE	Aptos	Leslie Rios	11/2/2021	11/2/2022
FISH LADY MARKET	700 BAY AVE	Capitola	Leslie Rios	10/26/2021	10/26/2022
SUDA	3910 PORTOLA DR	Santa Cruz	Leslie Rios	9/8/2021	9/8/2022
POINT MARKET AND CAFE	23040 E CLIFF DR	Santa Cruz	Marisol Goulett	3/25/2021	3/25/2022
MING'S	4720 SOQUEL DR	Soquel	Marisol Goulett	12/3/2021	12/3/2022
GEISHA	200 MONTEREY AVE	Capitola	Leslie Rios	10/14/2021	10/14/2022
SOUL SALAD	7957 SOQUEL DR	Aptos	Pretreatment Group	12/28/2021	12/28/2022
MIYAKO JAPANESE RESTAURANT	1820 41ST AVE	Capitola	Pretreatment Group	12/16/2021	12/16/2022
GOLDEN FU WAH	4610 SOQUEL DR	Soquel	Leslie Rios	9/22/2021	9/22/2022
PANDA INN	783 RIO DEL MAR BLVD	Aptos	Marisol Goulett	2/26/2021	2/26/2022
WASABI TAPAS SUSHI	3555 CLARES ST	Capitola	Leslie Rios	9/22/2021	9/22/2022
THAI BASIL	210 MONTEREY AVE	Capitola	Leslie Rios	11/2/2021	11/2/2022
STAR OF SIAM	3005 PORTER ST	SOQUEL	Leslie Rios	9/29/2021	9/29/2022
ZAMEEN RESTAURANT 41ST	851 41ST AVE	Santa Cruz	Leslie Rios	11/2/2021	11/2/2022
UNCLE KWOK'S	7960 SOQUEL DR	APTOS	Pretreatment Group	12/13/2021	12/13/2022
SUSHI GARDEN - BAY	820 BAY AVE	Capitola	Pretreatment Group	12/28/2021	12/28/2022
BANGKOK WEST	2505 CABRILLO COLLEGE DR	Aptos	Marisol Goulett	4/14/2021	4/14/2022
DYNASTY RESTAURANT	3601 PORTOLA DR	Santa Cruz	Marisol Goulett	8/25/2021	8/25/2022
MAYFLOWER	3555 CLARES ST	Capitola	Leslie Rios	9/9/2021	9/9/2022
HONG KONG GARDEN RESTAURANT	14 SEASCAPE VILLAGE	Aptos	Leslie Rios	9/23/2021	9/23/2022

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
CHINESE VILLAGE	3780 CAPITOLA RD	Santa Cruz	Leslie Rios	9/23/2021	9/23/2022
PONO	3744 CAPITOLA RD	Santa Cruz	Pretreatment Group	12/29/2021	12/29/2022
PANDA EXPRESS	2740 41ST AVE	Soquel	Leslie Rios	9/27/2021	9/27/2022
CANTON ASIAN CUISINE	900 41ST AVE	Capitola	Leslie Rios	10/6/2021	10/6/2022
MICHOACAN TAQUERIA	21401 E CLIFF DR	Santa Cruz	Monica Tomlinson	12/16/2021	12/16/2022
LITTLE TAMPICO	2605 S MAIN ST	SOQUEL	Leslie Rios	9/23/2021	9/23/2022
SAWASDEE	5050 SOQUEL DR	SOQUEL	Leslie Rios	10/21/2021	10/21/2022
TACO BELL 41ST	2730 41ST AVE	SOQUEL	Leslie Rios	10/15/2021	10/15/2022
MANUEL'S MEXICAN RESTAURANT	261 CENTER AVE	Aptos	Leslie Rios	9/9/2021	9/9/2022
MARGARITAVILLE	231 ESPLANADE	Capitola	Leslie Rios	9/23/2021	9/23/2022
EL CHINO	2525 SOQUEL DR	Santa Cruz	Leslie Rios	9/29/2021	9/29/2022
EL TORO BRAVO	123 MONTEREY AVE	Capitola	Leslie Rios	9/30/2021	9/30/2022
TAQUERIA VALLARTA 2	893 41ST AVE	Santa Cruz	Leslie Rios	9/2/2021	9/2/2022
TAQUERIA TEPEQUE	3555 CLARES ST	Capitola	Leslie Rios	10/21/2021	10/21/2022
CASA ROSITA'S MEXICAN REST.	2608 PORTOLA DR	Santa Cruz	Marisol Goulett	8/24/2021	9/15/2022
CASA ROSITA'S MEXICAN REST.	2608 PORTOLA DR	Santa Cruz	Marisol Goulett	9/15/2021	9/15/2022
TORTILLA FLATS	4616 SOQUEL DR	Soquel	Leslie Rios	11/4/2021	11/4/2022
ASIAN EXPRESS	1955 41ST AVE	Capitola	Leslie Rios	11/9/2021	11/9/2022
AMBROSIA	207 SEARIDGE RD	Aptos	Leslie Rios	8/23/2021	9/27/2022
AMBROSIA	207 SEARIDGE RD	Aptos	Leslie Rios	9/27/2021	9/27/2022
CHAMINADE CONFERENCE CENTER	1 CHAMINADE LN	Santa Cruz	Pretreatment Group	12/29/2021	12/29/2022
HOME	3101 N MAIN ST	Soquel	Leslie Rios	10/6/2021	10/6/2022
THE HIDEOUT	9051 SOQUEL DR	APTOS	Leslie Rios	10/18/2021	10/18/2022
PERSEPHONE	7945 SOQUEL DR	Aptos	Leslie Rios	10/20/2021	10/20/2022
UPPER CRUST PIZZA	2501 SOQUEL DR	Santa Cruz	Leslie Rios	10/26/2021	10/26/2022
PLEASURE PIZZA	4000 PORTOLA DR	Santa Cruz	Marisol Goulett	7/6/2021	7/6/2022
MANGIAMO	783 RIO DEL MAR BLVD	Aptos	Leslie Rios	11/4/2021	11/4/2022
EAST END GASTROPUB	1501 41ST AVE Ste I	Capitola	Leslie Rios	11/3/2021	11/3/2022
PIZZA MY HEART Esplanade	209 ESPLANADE	Capitola	Leslie Rios	10/6/2021	10/6/2022

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1/13/2022
10:07:17AM

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DOMINOS PIZZA	3555 CLARES ST	Capitola	Marisol Goulett	3/29/2021	3/29/2022
MOUNTAIN MIKE'S PIZZA - PORTOLA	3715 PORTOLA DR	Santa Cruz	Marisol Goulett	3/8/2021	3/16/2022
MOUNTAIN MIKE'S PIZZA - PORTOLA	3715 PORTOLA DR	Santa Cruz	Marisol Goulett	3/16/2021	3/16/2022
ROUND TABLE PIZZA	2690 41ST AVE	Soquel	Leslie Rios	10/6/2021	10/6/2022
PIZZA 1	253 CENTER ST	Aptos	Leslie Rios	9/8/2021	9/8/2022
SIDS SMOKEHOUSE & GRILL	10110 SOQUEL DR	Aptos	Marisol Goulett	5/13/2021	5/13/2022
VILLAGE HOST PIZZA & GRILL	4 SEASCAPE VILLAGE	Aptos	Leslie Rios	10/1/2021	10/1/2022
MR TOOT'S CAFE	231 ESPLANADE	Capitola	Leslie Rios	10/15/2021	10/15/2022
TAQUERIA LOS GORDOS	7488 SOQUEL DR	Aptos	Leslie Rios	9/29/2021	9/29/2022
RED APPLE CAFE	783 RIO DEL MAR BLVD	APTOS	Leslie Rios	10/15/2021	10/15/2022
SILVER SPUR	2650 SOQUEL DR	Santa Cruz	Leslie Rios	11/8/2021	11/8/2022
SUNRISE CAFE	4718 SOQUEL DR	Soquel	Leslie Rios	10/15/2021	10/15/2022
HARBOR CAFE	535 7TH AVE	Santa Cruz	Pretreatment Group	12/9/2021	12/9/2022
CLIFF CAFE	815 41ST AVE	Santa Cruz	Leslie Rios	10/27/2021	10/27/2022
COOK HOUSE	706 CAPITOLA AVE	Capitola	Leslie Rios	10/27/2021	10/27/2022
SURF CITY COFFEE	9105 SOQUEL DR	Aptos	Marisol Goulett	9/14/2021	9/14/2022
MCDONALD'S	1760 41ST AVE	Capitola	Leslie Rios	10/13/2021	10/13/2022
DAIRY QUEEN	816 BAY AVE	Capitola	Leslie Rios	10/19/2021	10/19/2022
BRUSTER'S REAL ICE CREAM	150 RANCHO DEL MAR	Aptos	Pretreatment Group	12/29/2021	12/29/2022
ALOHA ISLAND GRILL	1700 PORTOLA DR	Santa Cruz	Leslie Rios	11/15/2021	11/15/2022
SNO-WHITE DRIVE IN	223 STATE PARK DR	Aptos	Leslie Rios	11/9/2021	11/9/2022
7-ELEVEN PORTOLA	3036 PORTOLA DR	Santa Cruz	Marisol Goulett	3/8/2021	3/8/2022
BURGER KING	2001 41ST AVE	Capitola	Leslie Rios	11/10/2021	11/10/2022
7-ELEVEN SOQUEL DR	1875 SOQUEL DR	Santa Cruz	Leslie Rios	10/20/2021	10/20/2022
MIJOS TAQUERIA	200 MONTEREY AVE	Capitola	Leslie Rios	11/15/2021	11/15/2022
SEASCAPE SPORTSCLUB	1505 SEASCAPE BLVD	Aptos	Leslie Rios	11/12/2021	11/12/2022
ERIK'S DELI APTOS	102 RANCHO DEL MAR	Aptos	Leslie Rios	10/29/2021	10/29/2022
ERIK'S DELI 41ST	1475 41ST AVE	Capitola	Marisol Goulett	4/8/2021	4/8/2022
GARDEN LIQUORS & DELI	1815 SOQUEL DR	Santa Cruz	Pretreatment Group	12/20/2021	12/20/2022

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
L & L HAWAIIAN BARBECUE	460 7TH AVE	Santa Cruz	Leslie Rios	10/29/2021	10/29/2022
VINOCRUZ ENTREPRISES LLC	4901 SOQUEL DR	Soquel	Pretreatment Group	12/16/2021	12/16/2022
BAY BAR AND GRILL	110 ESPLANADE	Capitola	Leslie Rios	12/2/2021	12/2/2022
PIXIE DELI	111 VENETIAN RD	Aptos	Pretreatment Group	11/30/2021	11/30/2022
ROUX DAT	3555 CLARES ST	Capitola	Pretreatment Group	12/9/2021	12/9/2022
PACIFIC COFFEE ROASTING CO.	7554 SOQUEL DR	Aptos	Leslie Rios	7/1/2021	7/1/2022
SALSA'S TACO BAR	1710 BROMMER ST	Santa Cruz	Leslie Rios	10/21/2021	10/21/2022
WHALE CITY BAKERY	490 HWY 1	Davenport	Leslie Rios	10/28/2021	10/28/2022
WHARF HOUSE RESTAURANT	1400 WHARF RD	Capitola	Leslie Rios	10/28/2021	10/28/2022
BAGELRY	4763 SOQUEL DR	Soquel	Marisol Goulett	10/27/2021	10/27/2022
SWEET PEA CAFE AND CATERING	2121 41ST AVE	Capitola	Leslie Rios	10/29/2021	10/29/2022
OMI	2841 PORTER ST	Soquel	Pretreatment Group	12/29/2021	12/29/2022
ZAMEEN APTOS	7528 SOQUEL DR	Aptos	Pretreatment Group	12/9/2021	12/9/2022
NEW LEAF MARKET CAPITOLA	1210 41ST AVE	Capitola	Leslie Rios	10/28/2021	10/28/2022
ERIKS DELI SOQUEL	1664 SOQUEL DR	Santa Cruz	Leslie Rios	7/28/2021	7/28/2022
HERNANDEZ MARKET	3790 PORTOLA DR	Santa Cruz	Leslie Rios	10/14/2021	10/14/2022
SOUTH POINT	10 SEASCAPE VILLAGE	Aptos	Leslie Rios	10/14/2021	10/14/2022
AKIRA APTOS	105 POST OFFICE DR D	Aptos	Pretreatment Group	11/29/2021	11/29/2022
SUBWAY 2	2740 41ST AVE	Soquel	Marisol Goulett	4/12/2021	4/12/2022
LIVE OAK SUPER	1668 17TH AVE	Santa Cruz	Marisol Goulett	4/9/2021	4/9/2022
LUCKY	1475 41ST AVE	Capitola	Leslie Rios	10/18/2021	10/18/2022
NOB HILL FOODS	809 BAY AVE	Capitola	Leslie Rios	10/13/2021	10/13/2022
WHOLE FOODS	1710 41ST AVE	Capitola	Marisol Goulett	4/12/2021	4/12/2022
DELUXE FOODS	783 RIO DEL MAR BLVD	Aptos	Leslie Rios	10/18/2021	10/18/2022
FREEDOM MEAT LOCKER	160 HI GRADE LN	Freedom	Marisol Goulett	7/6/2021	7/6/2022
AUNT NETTIE`S KITCHEN	509 BAY AVE	Capitola	Marisol Goulett	10/27/2021	12/8/2022
AUNT NETTIE`S KITCHEN	509 BAY AVE	Capitola	Marisol Goulett	12/8/2021	12/8/2022
PALM DELI & MARKET	3000 VALENCIA AVE	Aptos	Leslie Rios	10/18/2021	10/18/2022
TRADER JOE'S	3555 CLARES ST	Capitola	Leslie Rios	10/1/2021	10/1/2022

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
SAFEWAY APTOS	16 RANCHO DEL MAR	Aptos	Marisol Goulett	5/3/2021	5/3/2022
SAFEWAY 41ST	2720 41ST AVE	Soquel	Marisol Goulett	5/3/2021	5/3/2022
DEKE'S MARKET AND DELI	334 7TH AVE	Santa Cruz	Marisol Goulett	3/25/2021	3/25/2022
SOUZA'S ICE CREAM	200 MONTEREY AVE	Capitola	Leslie Rios	11/1/2021	11/1/2022
ROBBIE'S SANDWICHES	3555 CLARES ST	Capitola	Pretreatment Group	11/30/2021	11/30/2022
CARUSO'S	115 SAN JOSE AVE	Capitola	Pretreatment Group	12/28/2021	8/10/2011
ALDO'S ITALIAN BAKERY	4628 SOQUEL DR	Soquel	Leslie Rios	11/2/2021	11/2/2022
SHERRI'S COOKIES	1855 41ST AVE	Capitola	Leslie Rios	10/29/2021	10/29/2022
DONUT STATION	715 CAPITOLA AVE	Capitola	Leslie Rios	10/19/2021	10/19/2022
DUNLAP'S DONUTS II	3791 PORTOLA DR	Santa Cruz	Pretreatment Group	12/28/2021	12/28/2022
FERRELL'S DONUTS	1761 17TH AVE	Santa Cruz	Leslie Rios	10/19/2021	10/19/2022
GAYLE'S BAKERY	504 BAY AVE	Capitola	Leslie Rios	10/7/2021	10/7/2022
COFFEETOPIA PORTOLA	3701 PORTOLA DR	Santa Cruz	Leslie Rios	7/14/2021	7/14/2022
PANADERIA EL ROSAL BAKERY	21501 CLIFF DR	Santa Cruz	Leslie Rios	10/13/2021	10/13/2022
UGLY MUG	4640 SOQUEL DR	Soquel	Leslie Rios	7/1/2021	7/1/2022
iCRAVE	1601 41ST AVE	Capitola	Leslie Rios	11/8/2021	11/8/2022
SEASCAPE FOODS	16 SEASCAPE VILLAGE	Aptos	Leslie Rios	10/26/2021	10/26/2022
THE INN AT DEPOT HILL	250 MONTEREY AVE	Capitola	Pretreatment Group	12/15/2021	9/9/2024
REEF DOG DELI	311 CAPITOLA AVE	Capitola	Marisol Goulett	3/11/2021	3/11/2022
PAULA'S BROOKLYN CAFE	3500 PORTOLA DR	Santa Cruz	Leslie Rios	11/2/2021	11/2/2022
NORMA JEANS COFFEE	8043 SOQUEL DR	Aptos	Leslie Rios	11/8/2021	11/8/2022
HOLY SMOKES BBQ	21505 E CLIFF DR	Santa Cruz	Marisol Goulett	5/3/2021	12/2/2022
HOLY SMOKES BBQ	21505 E CLIFF DR	Santa Cruz	Monica Tomlinson	12/2/2021	12/2/2022
THE FARM BAKERY	6790 SOQUEL DR	Aptos	Pretreatment Group	12/20/2021	12/20/2022
STARBUCKS 41ST AND CLARES	1955 41ST AVE Ste A1	Capitola	Marisol Goulett	10/27/2021	10/27/2022
COFFEETOPIA CAPITOLA	1443 CAPITOLA RD	Santa Cruz	Pretreatment Group	12/7/2021	12/7/2022
WINDMILL CAFE	21231 CLIFF DR	Santa Cruz	Pretreatment Group	12/9/2021	12/9/2022
GLORIA'S PANTRY	2551 RODEO GULCH RD Ste 2	Soquel	Leslie Rios	7/7/2021	7/7/2022
KITCHEN SPACE INC.	2431 CHANTICLEER AVE	Santa Cruz	Pretreatment Group	12/7/2021	12/7/2022
DHARMA'S	4250 CAPITOLA RD	Capitola	Monica Tomlinson	3/1/2021	3/1/2022

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
APTOS NATURAL FOODS	7506 SOQUEL DR	Aptos	Monica Tomlinson	2/25/2021	2/25/2022
HARVEST MOON MRKT	518 GREEN VALLEY RD	Freedom	Pretreatment Group	12/28/2021	12/28/2022
FLATS BISTRO	113 ESPLANADE	Aptos	Pretreatment Group	12/16/2021	12/16/2022
JAMBA JUICE	3555 CLARES ST	Capitola	Monica Tomlinson	3/1/2021	3/1/2022
QUIK STOP	5505 SOQUEL DR	Soquel	Leslie Rios	6/11/2021	6/11/2022
MID COUNTY SENIOR CENTER	829 BAY AVE	Capitola	Pretreatment Group	12/8/2021	12/8/2022
KENTUCKY FRIED CHICKEN no.7	2120 41ST AVE	Capitola	Monica Tomlinson	12/14/2021	12/14/2022
SHOWTIME PIZZA	7960 SOQUEL DR	Aptos	Marisol Goulett	4/8/2021	4/8/2022
GUANG ZHO	3150 PORTOLA DR	Santa Cruz	Leslie Rios	10/29/2021	10/29/2022
COMPANION BAKESHOP	7486 SOQUEL DR	Aptos	Pretreatment Group	12/9/2021	12/9/2022
EASTSIDE EATERY	800 41ST AVE	Santa Cruz	Marisol Goulett	8/23/2021	8/23/2022
MELINDAS GLUTEN FREE BAKERY	1420 41ST AVE	Capitola	Pretreatment Group	11/18/2021	11/18/2022
VILLAGE HOST PIZZA - BAY AVE	819 BAY AVE	Capitola	Pretreatment Group	6/30/2021	12/30/2022
VILLAGE HOST PIZZA - BAY AVE	819 BAY AVE	Capitola	Leslie Rios	7/27/2021	12/30/2022
VILLAGE HOST PIZZA - BAY AVE	819 BAY AVE	Capitola	Pretreatment Group	11/29/2021	12/30/2022
VILLAGE HOST PIZZA - BAY AVE	819 BAY AVE	Capitola	Marisol Goulett	12/30/2021	12/30/2022
MAIN STREET BAGELS	1475 41ST AVE	Capitola	Pretreatment Group	11/30/2021	11/30/2022
BETTY BURGERS 41ST	1000 41ST AVE	Santa Cruz	Pretreatment Group	12/14/2021	12/14/2022
MEL'S MARKET	2425 SOQUEL DR	Santa Cruz	Pretreatment Group	11/18/2021	11/18/2022
TACOS MORENO	1601 41ST AVE	Capitola	Leslie Rios	6/24/2021	6/24/2022
VILLAGE KITCHEN/FOOD SMITH	2800 RODEO GULCH RD	Soquel	Marisol Goulett	2/9/2021	2/9/2022
YOGURTLAND	1955 41ST AVE	Capitola	Pretreatment Group	12/28/2021	12/28/2022
DOMINICAN HOSPITAL	1555 SOQUEL DR	Santa Cruz	Monica Tomlinson	3/1/2021	3/1/2022
SUTTER MATERNITY	2900 CHANTICLEER AVE	Santa Cruz	Marisol Goulett	11/4/2021	11/4/2022
CHIPOTLE	1955 41ST AVE	Capitola	Leslie Rios	6/10/2021	6/10/2022
DISCRETION BREWERY KITCHEN	2701 41ST AVE A	Soquel	Pretreatment Group	12/10/2021	12/10/2022
AMAZON JUICE	1066 41ST AVE	Santa Cruz	Pretreatment Group	12/1/2021	12/1/2022

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
STARBUCKS TARGET	1825 41ST AVE	Capitola	Marisol Goulett	5/10/2021	5/10/2022
MARIANNE'S ICE CREAM STATE PARK	218 STATE PARK DR	Aptos	Leslie Rios	7/14/2021	7/14/2022
SURF CITY SANDWICH	4101 SOQUEL DR B-1	Soquel	Marisol Goulett	5/13/2021	6/23/2022
SURF CITY SANDWICH	4101 SOQUEL DR B-1	Soquel	Marisol Goulett	6/9/2021	6/23/2022
SURF CITY SANDWICH	4101 SOQUEL DR B-1	Soquel	Marisol Goulett	6/23/2021	6/23/2022
LITTLE CAESAR'S PIZZA	1701 PORTOLA DR	Santa Cruz	Pretreatment Group	12/8/2021	12/8/2022
SOQUEL QUALITY MEAT	4623 SOQUEL DR	Soquel	Leslie Rios	10/1/2021	10/1/2022
FRIEND IN CHEESES JAM	2901 RESEARCH PARK DR B	Soquel	Pretreatment Group	12/10/2021	12/10/2022
CANTINE WINEPUB	8050 SOQUEL DR	Aptos	Pretreatment Group	12/15/2021	12/15/2022
NEW BOHEMIA BREWING COMPANY	1030 41ST AVE	Santa Cruz	Marisol Goulett	3/3/2021	6/17/2022
NEW BOHEMIA BREWING COMPANY	1030 41ST AVE	Santa Cruz	Marisol Goulett	6/2/2021	6/17/2022
NEW BOHEMIA BREWING COMPANY	1030 41ST AVE	Santa Cruz	Marisol Goulett	6/17/2021	6/17/2022
SAPPORO RAMEN	1200 41ST AVE	Capitola	Pretreatment Group	12/10/2021	12/10/2022
STARBUCKS EAST CLIFF	21620 E CLIFF DR	Santa Cruz	Pretreatment Group	12/8/2021	12/8/2022
VERVE COFFEE ROASTERS	816 41ST AVE	Santa Cruz	Leslie Rios	6/11/2021	6/11/2022
SANDCASTLE CAFE	110 STOCKTON AVE	CAPITOLA	Pretreatment Group	12/10/2021	12/10/2022
FIVE GUYS BURGERS AND FRIES	1855 41ST AVE	Capitola	Leslie Rios	6/16/2021	6/16/2022
CINELUX THEATRES	1475 41ST AVE	Capitola	Pretreatment Group	12/6/2021	12/6/2022
SWEET BLOSSOM	2890 SOQUEL AVE	Santa Cruz	Leslie Rios	6/16/2021	
SORABOL	1855 41ST AVE	Capitola	Monica Tomlinson	2/18/2021	2/18/2022
SUBWAY 3	1855 41ST AVE	CAPITOLA	Monica Tomlinson	2/18/2021	2/18/2022
WETZELS PRETZELS	1855 41ST AVE	CAPITOLA	Leslie Rios	7/15/2021	7/15/2022
DRIP COFFEE (CABRILLO COLLEGE)	6500 SOQUEL DR	Aptos	Leslie Rios	10/21/2021	10/21/2022
CAT & CLOUD PORTOLA	3600 PORTOLA DR	Santa Cruz	Marisol Goulett	10/14/2021	10/14/2022
LOS PERICOS MARKET	21400 E CLIFF DR	Santa Cruz	Pretreatment Group	12/6/2021	12/30/2022
LOS PERICOS MARKET	21400 E CLIFF DR	Santa Cruz	Marisol Goulett	12/30/2021	12/30/2022
MR Z'S CREPES & TEAS	7518 SOQUEL DR	Aptos	Pretreatment Group	12/16/2021	12/16/2022
7TH AVENUE CENTER	1171 7TH AVE	Santa Cruz	Pretreatment Group	12/6/2021	12/6/2022

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
AEGIS ASSISTED LIVING	125 HEATHER TER	Aptos	Pretreatment Group	11/18/2021	11/18/2022
CABRILLO COLLEGE - FOOD SERVICES	6500 SOQUEL DR	Aptos	Leslie Rios	11/1/2021	11/1/2022
CHATEAU GUEST HOME	1340 17TH AVE	Santa Cruz	Pretreatment Group	12/9/2021	12/9/2022
DRIFTWOOD CONV HOSPITAL	675 24TH AVE	Santa Cruz	Marisol Goulett	8/23/2021	8/23/2022
HEARTS AND HANDS REHAB CENTER	2990 SOQUEL AVE	Santa Cruz	Pretreatment Group	12/7/2021	12/7/2022
MAPLE HOUSE	2000 BROMMER ST	Santa Cruz	Pretreatment Group	11/24/2021	11/24/2022
EL DORADO CENTER	941 EL DORADO AVE	Santa Cruz	Pretreatment Group	11/30/2021	11/30/2022
OHLSEN FOODS	2880 RESEARCH PARK DR	Soquel	Leslie Rios	7/26/2021	7/26/2022
PACIFIC COAST MANOR/ROSSCARE	1935 WHARF RD	Capitola	Pretreatment Group	12/8/2021	12/8/2022
PARADISE VILLA	2177 17TH AVE	Santa Cruz	Pretreatment Group	12/6/2021	12/6/2022
SOQUEL LEISURE VILLA	4101 FAIRWAY DR	Soquel	Pretreatment Group	12/8/2021	12/8/2022
VALLEY HAVEN	2266 CHANTICLEER AVE	SANTA CRUZ	Leslie Rios	10/18/2021	10/18/2022
NAKA SUSHI	1200 41ST AVE	Capitola	Pretreatment Group	12/6/2021	12/6/2022
AJ'S FUEL MARKET	5955 SOQUEL DR	Soquel	Pretreatment Group	11/12/2021	11/12/2022
SHORELIFE COMMUNITY CHURCH	875 MONTEREY AVE	Capitola	Pretreatment Group	11/30/2021	11/30/2022
TWIN LAKES BAPTIST CHURCH	2701 CABRILLO COLLEGE DR	APTOS	Pretreatment Group	12/28/2021	12/28/2022
CAMP ST. FRANCIS	2320 SUMNER AVE	Aptos	Pretreatment Group	12/1/2021	12/1/2022
COASTLANDS CHURCH	280 STATE PARK DR	Aptos	Pretreatment Group	11/18/2021	11/18/2022
RESURRECTION CHURCH	7600 SOQUEL DR	Aptos	Marisol Goulett	9/22/2021	9/22/2022
TEMPLE BETH EL	3055 PORTER GULCH RD	Aptos	Pretreatment Group	12/14/2021	12/14/2022
SANTA CRUZ POST ACUTE	1115 CAPITOLA RD	Santa Cruz	Pretreatment Group	12/8/2021	12/8/2022
LIVE OAK Senior Center - Meals on Wheels	1777 CAPITOLA RD	Santa Cruz	Pretreatment Group	12/8/2021	12/8/2022
SAN MARCOS CHARQUITO	718 CAPITOLA AVE	Capitola	Leslie Rios	10/20/2021	10/20/2022
CORK AND FORK	312 CAPITOLA AVE	Capitola	Pretreatment Group	12/28/2021	12/28/2022
LITTLEKOE'S BEACH BITES	115 SAN JOSE AVE H	Capitola	Pretreatment Group	12/10/2021	12/10/2022
CHEVRON	1650 41ST AVE	Capitola	Pretreatment Group	11/17/2021	11/17/2022
LEFT COAST SAUSAGE WORX	107 SAN JOSE AVE	Capitola	Pretreatment Group	12/10/2021	12/10/2022
NOTHING BUNDT CAKES	3555 CLARES ST	CAPITOLA	Marisol Goulett	2/10/2021	12/1/2022

DocuSign Envelope ID: D5C9F482-77EA-4B82-9B7F-525D062DA179

Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
NOTHING BUNDT CAKES	3555 CLARES ST	CAPITOLA	Monica Tomlinson	12/1/2021	12/1/2022
JANUS OF SANTA CRUZ	200 7TH AVE 150	SANTA CRUZ	Marisol Goulett	9/1/2021	
OFF THE HOOK DELI	743 41ST AVE	Santa Cruz	Monica Tomlinson	11/30/2021	11/30/2022
SUBWAY APTOS	7887 SOQUEL DR G	APTOS	Pretreatment Group	11/24/2021	11/24/2022
BEAUREGARD VINEYARDS	450 HWY 1	DAVENPORT	Leslie Rios	10/19/2021	10/19/2022
CAT & CLOUD APTOS	10 PARADE ST A	APTOS	Marisol Goulett	2/24/2021	12/8/2022
CAT & CLOUD APTOS	10 PARADE ST A	APTOS	Monica Tomlinson	12/8/2021	12/8/2022
CAPITOLA SHELL 41st	1649 41ST AVE	CAPITOLA	Pretreatment Group	12/8/2021	12/8/2022
PENNY ICE CREAMERY - APTOS	141 APTOS VILLAGE WAY	APTOS	Marisol Goulett	2/11/2021	12/8/2022
PENNY ICE CREAMERY - APTOS	141 APTOS VILLAGE WAY	APTOS	Monica Tomlinson	12/8/2021	12/8/2022
BIG PETE'S TREATS	1560 MANSFIELD ST	SANTA CRUZ	Marisol Goulett	2/10/2021	12/2/2022
BIG PETE'S TREATS	1560 MANSFIELD ST	SANTA CRUZ	Monica Tomlinson	12/2/2021	12/2/2022
UTOPIA FARMS	3921 SOQUEL DR D	SOQUEL	Monica Tomlinson	2/26/2021	2/26/2022
NEW LEAF MARKET APTOS	161 APTOS VILLAGE WAY	Aptos	Marisol Goulett	7/6/2021	7/6/2022
PEET'S COFFEE - RDM	50 RANCHO DEL MAR	Aptos	Pretreatment Group	12/14/2021	
MOUNTAIN MIKES PIZZA - RDM	121 RANCHO DEL MAR	APTOS	Marisol Goulett	2/18/2021	
BETTY BURGERS APTOS	415 TROUT GULCH RD	APTOS	Marisol Goulett	2/18/2021	
BETTY BURGERS APTOS	415 TROUT GULCH RD	APTOS	Monica Tomlinson	12/8/2021	
CHEESE SHOP 831	3555 CLARES ST V	CAPITOLA	Marisol Goulett	2/26/2021	12/1/2022
CHEESE SHOP 831	3555 CLARES ST V	CAPITOLA	Marisol Goulett	6/9/2021	12/1/2022
CHEESE SHOP 831	3555 CLARES ST V	CAPITOLA	Marisol Goulett	7/1/2021	12/1/2022
CHEESE SHOP 831	3555 CLARES ST V	CAPITOLA	Monica Tomlinson	12/1/2021	12/1/2022
SUSHI GARDEN - RDM	38 RANCHO DEL MAR	APTOS	Marisol Goulett	10/28/2021	11/16/2022
SUSHI GARDEN - RDM	38 RANCHO DEL MAR	APTOS	Marisol Goulett	11/3/2021	11/16/2022
SUSHI GARDEN - RDM	38 RANCHO DEL MAR	APTOS	Marisol Goulett	11/16/2021	11/16/2022
CLEAN JUICE - RDM	100 RANCHO DEL MAR	APTOS	Monica Tomlinson	3/1/2021	3/1/2022
POKI BOWL - RDM	98 RANCHO DEL MAR	Aptos	Marisol Goulett	2/24/2021	2/24/2022
PLEASURE POINT JUICE	3520 PORTOLA DR	Santa Cruz	Pretreatment Group	12/28/2021	12/28/2022
PESCAVORE SEAFOOD	1035 17TH AVE	Santa Cruz	Marisol Goulett	12/31/2021	
MENTONE	174 APTOS VILLAGE WAY	APTOS	Marisol Goulett	2/25/2021	2/25/2022

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Facility Inspection Summary Report

1/13/2022
10:07:17AM

Facility Name:	Address:	City:	Inspector:	Inspection Date:	Next Inspection:
CAPITOLA CANDY CAFE	205 CAPITOLA AVE	Capitola	Monica Tomlinson	3/30/2021	3/30/2022
KAITO	1855 41ST AVE	CAPITOLA	Leslie Rios	11/12/2021	
POINT BUTCHER SHOP	3615 PORTOLA DR	SANTA CRUZ	Marisol Goulett	7/14/2021	7/14/2022
BUZZO'S PIZZA	2510 MAIN ST	SOQUEL	Marisol Goulett	10/20/2021	12/1/2022
BUZZO'S PIZZA	2510 MAIN ST	SOQUEL	Leslie Rios	12/1/2021	12/1/2022

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ATTACHMENT C

Enforcement Response and Fines

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ENFORCEMENT RESPONSE AND FINES

I. SIGNIFICANT INDUSTRIAL USERS: SAMPLING, MONITORING, AND REPORTING

Nature of Non-Compliance	Circumstance	Time Frame	Response
A. Failure of permitted discharger to notify of effluent limit violation or slug discharge	Not verbally reported.	24 hours after knowledge of violation or discharge	Letter of Violation (LOV): The SIU must correct problem immediately. The user must resample within 30 days and report on Self-Monitoring Report (provided by District) to demonstrate return to compliance. If a slug discharge occurs, then it is the responsibility of the business to resample to assure a return to compliance. Provide notice to the District within 15 days of measures taken.
	No notification to District	15 days	Administrative Order for the following: Require immediate response and return to compliance.
	No sample results	30 days	$500 fine per each day of violation at the Board's discretion.
		60 days	Significant non-compliance. $500 fine per each day of violation at the Board's discretion. Publication of violation in local newspaper.
	Known environmental or POTW damage	Anytime	Sewer service termination and recovery of estimated costs of remediation at the discretion of the Board of Directors of the District.
B. Minor sampling, monitoring, or reporting deficiencies (non-negligent, minor omissions of required attachments and data, computational, or other errors)	First Offense, submitted report by the deadline	Upon discovery	Phone call from Environmental Compliance Inspector instructing the following: submit report in its entirety with the errors corrected within 30 days after the initial due date of the report.
	Corrected report not received.	30 days after phone call	Letter of violation for the following: submit report in its entirety with the errors corrected within 30 days.
		60 days after report is due	Administrative order requiring corrections within 15 days of notification.
		90 days after report is due	$200 fine per day until correct report is received at the Board's discretion.
C. Major or gross sampling, monitoring or reporting deficiencies (missing critical information) and any other deficiency deemed major by the District or its Board	First Offense, submitted report by the deadline	Upon discovery	Letter of Violation requiring the following: submit report in its entirety with the errors corrected within 30 days of the date of issuance of the Letter of Violation.
	Corrected report not received.	30 days after LOV date	$200 fine per day until correct report is received at the Board's discretion.
	Corrected report not received.	60 days after LOV date	$200 fine per day until correct report is received at the Board's discretion. Publication of the violation in local newspaper.
	Corrected report not received.	90 days after LOV date	Sewer Service Termination and Permit Revocation at the Board's discretion.

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I. SIGNIFICANT INDUSTRIAL USERS AND SPECIAL DISCHARGE PERMITS: SAMPLING, MONITORING, AND REPORTING (continued)

Nature of Non-Compliance	Circumstance	Time Frame	Response
D. Failure of discharger to timely sample, monitor, or submit self-monitoring discharge report	First offense within 1 year	No later than 5 days after required submittal date	Letter of Violation instruction the following: submit required report within 15 days of the date of this letter
	Report still not received.	15 days after required submittal date	Administrative Order: require the report within 10 days.
	Report still not received.	45 days after required submittal	Significant Noncompliance. Publication in newspaper. Require report within 10 days.
	Report still not received.	60 days after required submittal	Administrative Order: require the report within 10 days. $200 fine per day that the report is not received, at the Board's discretion.
	Report still not received.	90 days after required submittal	Sewer Service Termination and Permit Revocation at the Board's discretion.
	Second offense within 1 year	<1 year	Administrative Order: require the report within 10 days. Follow the steps starting at 45 days for the first offense above.
	Report still not received.	10 days	Follow the steps starting at 45 days for the first offense above.
E. Discharge without a permit or District approval.	1st offense, *no environmental damage*	Upon discovery	Administrative Order requiring permit application, baseline monitoring report, and approval prior to further discharge.
	2nd and subsequent offenses without permit application, no environmental damage	30 days	Significant Noncompliance. Administrative Order requiring permit application and approval prior to further discharge, $500 fine per day of violation and publication in newspaper at Board's discretion.
	1st offense, *environmental damage*	Upon discovery	Significant Noncompliance. Administrative Order requiring permit application and approval prior to future discharges, $500 fine + recovery of cost for remediation at the Board's discretion, publication in newspaper.
	Subsequent discharges, environmental damage	30 days	Significant Noncompliance. Administrative Order requiring permit application and approval prior to future discharges, $1000 fine + recovery of cost for remediation and sewer service termination at the Board's discretion, publication in newspaper.

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II. EFFLUENT LIMIT VIOLATIONS

Nature of Non-Compliance	Circumstance	Time Frame	Response
A. Failure to meet final effluent limits or failure to meet interim limits(categorical, local, or prohibited limits)	First exceedance or less than TRC exceedance.	Immediately upon notification of exceedance.	Letter of Violation instructing the following: correct the problem causing the exceedance and resample and report sample results on Self-Monitoring Report within 30 days. If done on District's sampling period, District will resample within 30 days.
	Second exceedance	Immediately upon notification of exceedance.	Compliance Schedule to be determined by the District Engineer.
	Major violation that exceeds the limits by Technical Review Criteria (TRC-see definitions) of a single effluent limit	Immediately upon notification of exceedance.	Significant Noncompliance. Administrative Order to correct the problem(s) causing the exceedance and resample and report sample results on Self-Monitoring Report within 30 days. Publication in a local newspaper. If there is environmental damage, $1000 fine per day of exceedance. The District can recoup the costs for environmental remediation, at the Board's discretion.
	Chronic violations: 66% or more of all the measurements taken for the same pollutant parameter exceed the same daily maximum limit or the same average limit in a six-month period (any magnitude of concentration over the most stringent limit), a numeric pretreatment standard or requirement, including instantaneous limits.		Significant Noncompliance. Administrative Order to correct the problem(s) causing the exceedance and resample and report sample results on Self-Monitoring Report within 30 days. Publication in a local newspaper. If there is environmental damage, $1000 fine per day of exceedance. The District can recoup the costs for environmental remediation, and terminate sewer service at the Board's discretion.
	Additional Self-Monitoring Report still not received.	30 days after required submittal	Administrative Order: require the report within 15 days.
	Additional Self-Monitoring Report still not received.	45 days after required submittal	Significant Noncompliance. Publication in newspaper. Require report within 10 days.
	Additional Self-Monitoring Report still not received.	55 days after required submittal	Administrative Order: require the report within 10 days. $500 fine per day that the report is not received, at the Board's discretion.
	Additional Self-Monitoring Report still not received.	65 days after required submittal	Sewer Service Termination and Permit Revocation at the Board's discretion.

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II. EFFLUENT LIMIT VIOLATIONS (continued)

Nature of Non-Compliance	Circumstance	Time Frame	Response
B. Reported slug discharge	First offense, reported immediately, *no environmental damage*.	Immediate report upon knowledge of slug discharge	Letter of Violation: correct problem causing slug discharge, sample discharge and report sample results on Self-Monitoring Report within 30 days of slug.
	Second offense within 1 year, *no environmental damage*	<1 year	Administrative Order: cease slug discharges immediately and prevent future slug discharges. Sample discharge and report sample results on Self-Monitoring Report within 30 days of slug.
	Third and subsequent offenses, *no environmental damage*	<1 year	Significant noncompliance. Sewer service termination at Board's discretion, $1000 fine per day of violation, and publication of violation in a newspaper.
	First offense: *interferance, pass-through, or damage*	Immediate report upon knowledge of slug discharge	Significant Noncompliance- Administrative Order specifying the following: correct problem causing slug discharge, sample discharge and report sample results on Self-Monitoring Report within 30 days of slug. Publication in local newspaper. Board may recoup costs for any environmental remediation, damage to infrastructure, or any fines levied as a result of the slug.
	Second offense within 1 year: *interferance, pass-through, or damage*	<1 year	Significant Noncompliance. $1000 fine per day of slug discharge. Publication in newspaper. Sewer service termination at Board's discretion.
	Subsequent offenses with *interferance, pass-through, or damage*	<1 year	Significant noncompliance. Sewer service termination at Board's discretion, $1000 fine per day of violation, and publication of violation in a newspaper.

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III. SIGNIFICANT INDUSTRIAL USERS AND SPECIAL DISHCARGE PERMITS: NONCOMPLIANCE DETECTED THROUGH INSPECTION OR FIELD INVESTIGATION

Nature of Non-Compliance	Circumstance	Time Frame	Response
A. Minor violation of sampling or analytical procedure	No evidence of intent or neglect. First offense within a year.	Upon Discovery	Letter of Violation (LOV) for the following: Correct problem during next sampling event. If sampling or analysis led to faulty results, must resample within 30 days.
	No evidence of intent or neglect. Second offense within a year.	<1 year repeat	Administrative Order for the following: Resample and analyze using correct procedure within 30 days.
	Resample for either circumstance not done within 30 days or third offense within a year	30 days, <1 year 3rd repeat	Significant Noncompliance, Administrative Order for the following: Resample within 30 days, $500 fine per each day of violation at the Board's discretion, publication in a newspaper.
	More than 3 offenses in a year or resample not done within 60 days	60 days, <1 year 4th repeat	Sewer service termination and recovery of estimated costs of remediation at the Board's discretion.
B. Minor violation of permit conditions (Any violation not listed as major or deemed minor violation by the District or its Board)	No evidence of intent or neglect. First offense within a year.	Upon Discovery	Letter of Violation (LOV) for the following: Correct problem immediately.
	No evidence of intent or neglect. Second offense within a year.	<1 year repeat	Administrative Order for the following: Correct problem immediately.
	Problem not corrected within 30 days or third offense within a year	30 days, <1 year 3rd repeat	Significant Noncompliance, Administrative Order for the following: Correct problem within 30 days, $500 fine per each day of violation at the Board's discretion, publication in a newspaper.
	More than 3 offenses in a year or problem not corrected within 60 days	60 days, <1 year 4th repeat	Sewer service termination and recovery of estimated costs of remediation at the Board's discretion.

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III. SIGNIFICANT INDUSTRIAL USERS AND SPECIAL DISCHARGE PERMITS: NONCOMPLIANCE DETECTED THROUGH INSPECTION OR FIELD INVESTIGATION (continued)

Nature of Non-Compliance	Circumstance	Time Frame	Response
C. Major violation of permit condition (Improper disposal of waste or product, tampering with monitoring equipment, diluting effluent, not reporting a slug or accidental discharge, not having a spill prevention plan when a spill has occurred, and any other violation deemed major by the District or its Board).	No evidence of intent or neglect. First offense within a year.	Upon Discovery	Letter of Violation (LOV) for the following: Correct problem immediately.
	No evidence of intent or neglect. Problem not corrected within 30 days or second offense within a year.	<1 year repeat, 30 days	Significant Noncompliance. Administrative Order for the following: Correct problem immediately, $1000 fine per each day of violation at the Board's discretion, publication in a newspaper.
	Problem not corrected within 60 days or third offense within a year	60 days, <1 year 3rd repeat	Sewer service termination and recovery of estimated costs of remediation at the Board's discretion.

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IV. SIGNIFICANT INDUSTRIAL USERS AND SPECIAL DISCHARGE PERMITS: COMPLIANCE SCHEDULES

Nature of Non-Compliance	Circumstance	Time Frame	Response
A. Reporting false information during compliance schedule.	Any instance	Immediately upon discovery	Significant noncompliance – request for criminal investigation. Judicial action, fines, and/or sewer service termination. Fine of $1000 per offense. Publication in local newspaper.
B. Missed interim date.	Will not cause late final date or affect other interim dates.	15 days after due date	Letter of Violation: resume compliance schedule and do not miss future dates. Submit report within 10 days.
	Will result in other missed interim dates	15 days after due date	Significant noncompliance- Administrative Order requiring compliance of all other dates 10 days after previous dates set and submission of written progress report within 10 days. Publication in newspaper.
	No response.	10 days	$500 fine per day of noncompliance, publication in a newspaper.
		90 days or more outstanding	$500 fine per day of noncompliance, publication in a newspaper, sewer service termination at the Board's discretion.
C. Missed final date with no valid cause.	1st offense	15 days after deadline	Significant noncompliance. Administrative Order to begin monitoring within 30 days. Publication in newspaper.
		30 days after deadline	Significant noncompliance. Administrative Order and/or judicial action. $500 fine per day of noncompliance.
	2nd offense or no action	60 days after deadline	Significant noncompliance. $1000 fine per day of noncompliance.
	3rd offense or no action	90 days after deadline	Sewer Service termination at Board's discretion.

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V. LIGHT INDUSTRY NONCOMPLIANCE

Nature of Non-Compliance	Circumstance	Time Frame	Response
A. Failure of discharger to timely submit receipt/manifest or proof of grease trap, grease interceptor, or clarifier cleaning.	Light industry has not cleaned pretreatment device or has not provided proof of cleaning to the District	30 days past required pump date.	Phone call and/or verbal notification during site visit.
		60 days	Letter of Violation requiring proof of cleaning within 15 days.
		75 days	Administrative Order requiring proof of cleaning within 10 days.
		85 days	Significant non-compliance: require proof of cleaning within 10 days. $500 fine per each day of violation at the Board's discretion. Publication of violation in local newspaper.
		95 days	Sewer service termination, at the Board's discretion.
		Anytime a grease removal device is past the District required pumping date.	Recovery of estimated costs of from any adverse effects of grease in the District's sewer line attributable to a light industry or any fines levied against the District from sanitary sewer overflows due to grease, at the Board's discretion.
B. Violation of required Best Environmental Management Practices (per District Code)	No evidence of intent or neglect. First offense within a year.	Upon Discovery	Phone call and/or verbal notification during site visit.
	No evidence of intent or neglect. Problem not corrected within 30 days or second offense within a year.	<1 year repeat	Corrective Action Letter: Correct problem immediately.
	Problem not corrected within 60 days or third offense within a year	30 days, <1 year 3rd repeat	Administrative Order for the following: Correct problem immediately.
	More than 3 offenses in a year or problem not corrected within 90 days	60 days, <1 year 4th repeat	Significant Noncompliance, Administrative Order for the following: Correct problem within 30 days, $500 fine per each day of violation at the Board's discretion, publication in a newspaper.
	Problem ongoing or chronic	Chronic violation	Sewer service termination and recovery of estimated costs of remediation at the Board's discretion.

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V. LIGHT INDUSTRY NONCOMPLIANCE (continued)

Nature of Non-Compliance	Circumstance	Time Frame	Response
C. Faulty pretreatment device, improper best management practices, or minor deficiencies discovered during inspections	No evidence of intent or neglect.	Upon Discovery	Written notification during site visit on inspection form.
	Not Corrected.	30 days	Corrective Action Notice: correct the problem immediately.
	Not Corrected.	60 days	Letter of Violation: Correct problem immediately.
	Not Corrected.	90 days	Administrative Order for the following: Correct problem within 30 days.
	Chronic Violation	Chronic, recurring	Significant Noncompliance: $500 fine per each day of violation at the Board's discretion, publication in a newspaper.
D. Sanitary sewer overflow on private property that impacts the public, public property, public right-of-way, or a water body.	1st offense reported to District, overflow stopped in a timely manner.	Immediately.	Letter of Violation instructing the following: correct the problem causing the overflow immediately or cease discharging. Submit a written report to the District within 15 days stating a corrective action plan, and the means to prevent repeat occurrences.
		15 days, no report received.	Letter of Violation requiring written report within 15 days.
		30 days, no report received.	Administrative Order requiring written report within 10 days.
		60 days, no report	Significant non-compliance: require written report within 10 days. $500 fine per each day of violation at the Board's discretion. Publication of violation in local newspaper.
		90 days, no report	Sewer service termination, at the Board's discretion.
	1st offense reported to District, overflow not stopped in a timely manner	Immediately.	Letter of Violation instructing the following: correct the problem causing the overflow immediately or cease discharging. Submit a written report to the District within 15 days stating a corrective action plan, and the means to prevent repeat occurrences and state a means to respond to overflows in a timely manner.
		No report received.	Follow enforcement path above, starting at 15 days, no report received.
	2rd offense in either case (stopped in timely manner or not)	<1 year	Significant non-compliance: require written report within 15 days. $500 fine per each day of violation at the Board's discretion. Publication of violation in local newspaper.
	3rd offense in either case (stopped in a timely manner or not)	<1 year	$1000 fine per day of overflow. Sewer service termination at the Board's discretion.
	Environmental Damage, District resources used, fines levied	Anytime	District will reserve the right to recoup costs of using District resources, to remediate any environmental damage, or any fines levied against the District as a result of the overflow.

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Appendix C: Process Flow Diagrams and Process and Instrumentation Diagrams

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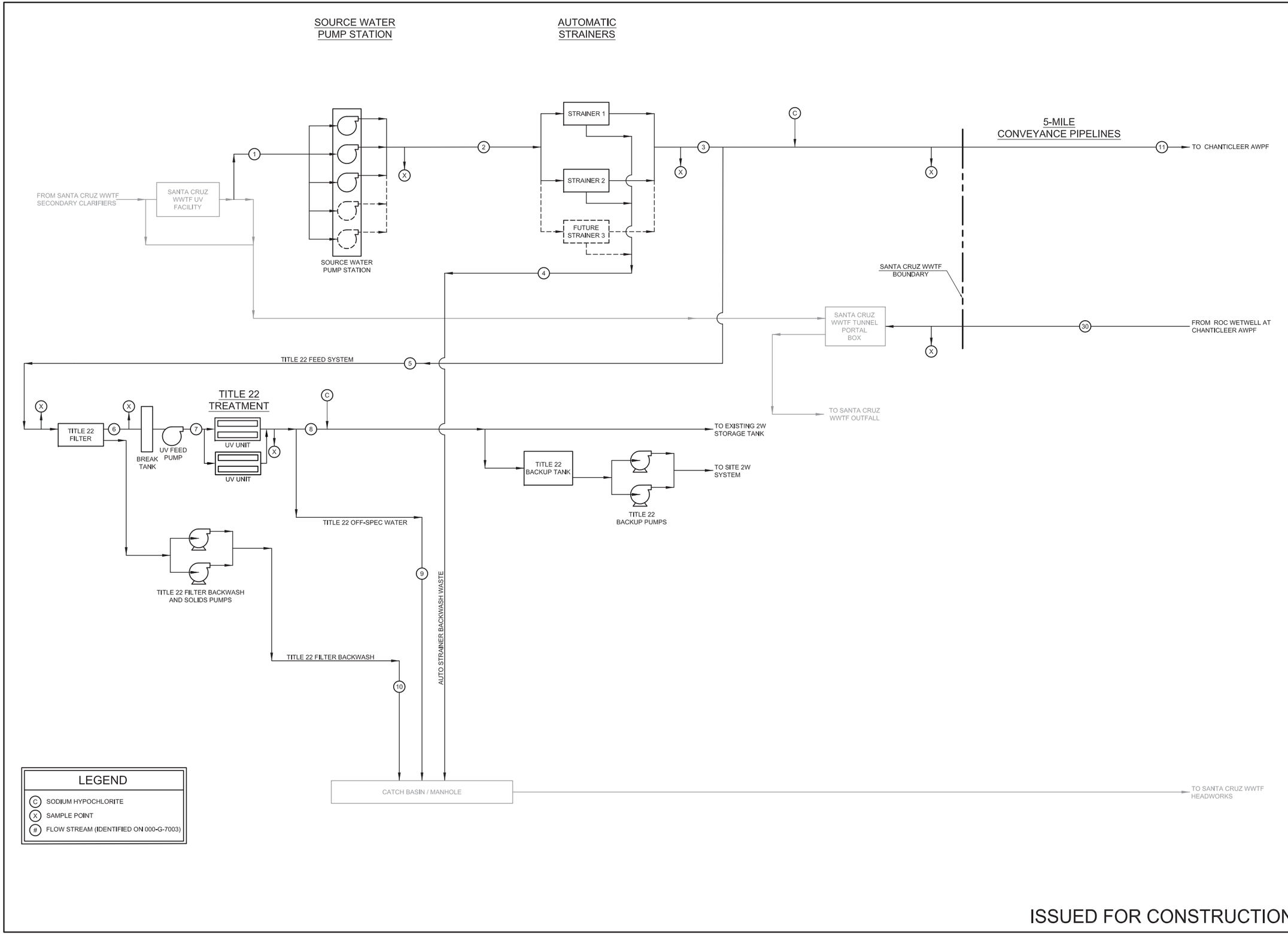


ISSUED FOR CONSTRUCTION

BLACK & VEATCH

Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER ASHUTOSH S. SHIRDLKAR No. C-06849 CIVIL STATE OF CALIFORNIA

2021.08.26 09:04:52-07'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: RY
DRAWN: MAK
CHECKED: BDS
CHECKED: RWF / JML
APPROVED: AS

FILENAME

BV PROJECT NUMBER
404790

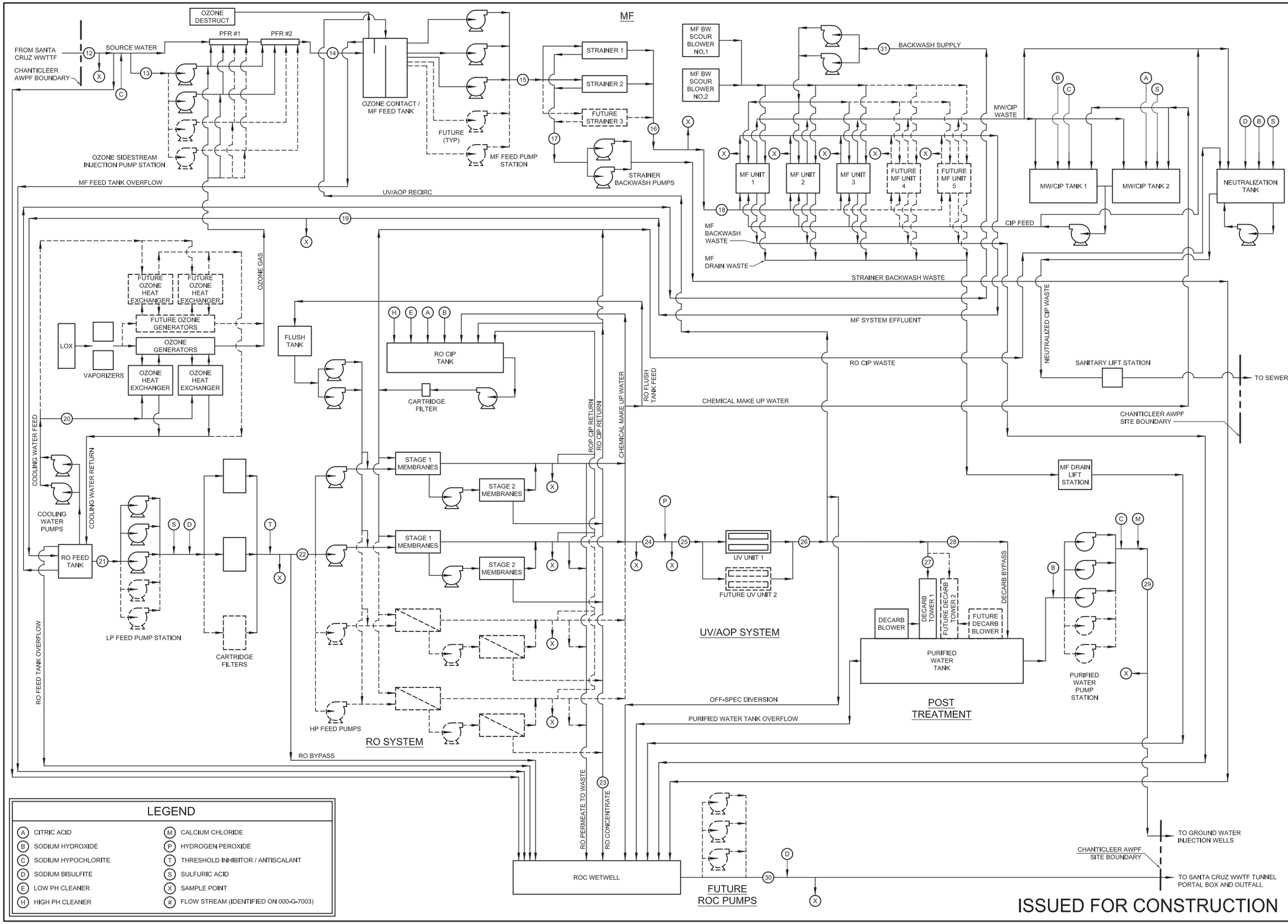
CLIENT PROJECT NUMBER

GENERAL TTF
SANTA CRUZ
PROCESS FLOW DIAGRAM

DRAWING NUMBER
000-G-7001

SHEET NUMBER
6 OF 370

PLOTTED: 8/20/2021 11:47 AM
D10000



LEGEND

A	CITRIC ACID	M	CALCIUM CHLORIDE
B	SODIUM HYDROXIDE	P	HYDROGEN PEROXIDE
C	SODIUM HYPOCHLORITE	T	THRESHOLD INHIBITOR / ANTISCALANT
D	SODIUM BISULFITE	S	SULFURIC ACID
E	LOW PH CLEANER	X	SAMPLE POINT
H	HIGH PH CLEANER	#	FLOW STREAM (IDENTIFIED ON 000-G-7003)

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REGISTERED PROFESSIONAL ENGINEER ASHUTOSH S. SHIRULKAR CIVIL STATE OF CALIFORNIA

2021.08.26 09:05:45-07'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	RY
DRAWN:	MAK
CHECKED:	BDS
CHECKED:	RWF / JML
APPROVED:	AS

FILENAME

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

GENERAL CHANTICLEER AWPF PROCESS FLOW DIAGRAM

DRAWING NUMBER
000-G-7002

SHEET NUMBER
7 OF 370

PLOTTED: 8/23/2021 6:08 PM
D10000

FLOW STREAM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESCRIPTION	Source Water Pump Station Feed	SC Strainer Feed	SC Strainer Total Effluent	Strainer Backwash Waste	T22 Filter Feed	T22 Filter Effluent	T22 UV Feed	T22 UV Effluent	T22 Offspec Flow	T22 Backwash Waste	Source Water to AWPF	Source Water to AWPF	03 Side Stream Flow	Ozonated MF Feed Tank Influent	MF Feed Pump Flow	MF Strainer Effluent
From	Existing UV Channel	Source Water Pump Station	SC Strainer	SC Strainer	Source Water Pump Station and Title 22 Filter Splitter	T22 Filter	T22 Effluent Break Tank	T22 UV	T22 UV Effluent	T22 Filter	Source Water Pump Station and Title 22 Filter Splitter	AWPF Feed	Ozone System Feed	Ozone Flash Reactors	MF Feed Tank	MF Feed Pump Station Effluent
To	Source Water Pump Station	SC Strainer	AWPF and Title 22 Filter Splitter	Storm Drain	T22 Filter	T22 Effluent Break Tank	T22 UV	Plant Uses or Off-spec	Storm Drain	Storm Drain	AWPF Feed	Ozone System Feed	Ozone Flash Reactors	MF Feed Tank	MF Strainers	MF Feed Strainers
Phase 1 Avg Da:ly Design Flow (gpm)	1922	1922	1883	220	236	224	224	224	224	130	1647	1647	274	1647	1647	1647
Instantaneous Phase 1 Max Flow (gpm)	1922	1922	1883	220	236	224	224	224	112	130	1647	1647	274	1647	1850	1850
Phase 2 Avg Da:ly Design Flow (gpm)	3603	3603	3531	220	236	224	224	224	224	130	3295	3295	548	3295	3295	3295
Instantaneous Phase 2 Max Flow (gpm)	3603	3603	3531	220	236	224	224	224	224	130	3295	3295	548	3295	3295	3700
Flow Type	C	C	C	I	C	C	C	C	I	I	C	C	C	C	C	C
Temperature (deg C)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
pH (S.U.)	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22
Turbidity (NTU,	5	5	5	5	5	2	2	2	2	2	5	5	5	5	5	5
TSS (mg/L)	11	11	11	11	11	4	4	4	4	4	11	11	11	11	11	11
Alkalinity (mg\L as CaCO3)	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Bicarbonate (mç/L)	366	366	366	366	366	366	366	366	366	366	366	366	366	366	366	366
Total Inorganic Nitrogen (mg/L as N)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Ammonia (mg/L ɛs N)	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Nitrite (mg/L ɛs N)	3	3	3	3	3	3	3	3	3	3	3	3	3	0.05	0.05	0.05
Nitrate (mg/L ɛs N)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	8.75	8.75	8.75
Chloride (mg/L,	354	354	354	354	354	354	354	354	354	354	354	354	354	354	354	354
TDS (mg/L)	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430
Aluminum (mg/L,	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Total Iron (mg\L)	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Manganese (mg/L)	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
NDMA (ng/L)																
TOC (mg/l)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
UVT (%)	54%	54%	54%	54%	54%	55%	55%	55%	55%	55%	54%	54%	54%	54%	54%	54%
1,4 Dioxane (nç/L)																
Sodium (mg/L)	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230
Boron (mg/L)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Calcium (mg/L)	76	76	76	76	76	76.0	76	76	76	76	76.0	76	76	76	76	76

FLOW STREAM	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DESCRIPTION	Strainer Backwash Waste	MF Feed	MF Filtrate Flow to RO Tank	03 Generator Cooling Water Flow	RO Low Pressure Pump Flow	RO HP Pump Flow	RO Concentrate	RO Permeate	AOP Feed	AOP Effluent	Decarb Feed	Decarb Bypass	AWPF Purified Water	ROC Wetwell Return Flow	MF Backwash Flow
From	MF Strainers	MF Strainers	MF System	RO Feed Tank	RO Feed Tank	RO Cartridge Filters	RO	RO	RO	UV/AOP	Decarb Tower and Bypass Flow Splitter	Decarb Tower and Bypass Flow Splitter	Purified Water Pump Station	ROC Wetwell	MF System
To	ROC Wetwell	MF System	RO Feed Tank	RO Feed Tank	RO Cartridge Filters	RO	ROC Wetwell	UV/AOP	UV/AOP	Decarb Tower and Bypass Flow Splitter	Decarb Tower	Purified Water Storage Tank	Groundwater Injection Wells	SC WWTF Outfall	ROC Wetwell
Phase 1 Avg Daily Design Flow (gpm)	33	1614	1541	60	1453	1453	291	1162	1162	1162	581	581	1162	485	93
Instantaneous Phase 1 Max Flow (gpm)	TBD based on supplier	1850	1850	60	1453	1453	291	1162	1162	1162	1162	1162	1162	1647	2035
Phase 2 Avg Daily Design Flow (gpm)	66	3229	3082	120	2906	2906	581	2325	2325	2325	1162	1162	2325	970	93
Instantaneous Phase 2 Max Flow (gpm)	TBD based on supplier	3229	3082	120	2906	2906	581	2325	2325	2325	1162	1162	2325	3295	2035
Flow Type	I	C	C	C	C	C	C	C	C	C	C	C	C	C	I
Temperature (deg C)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
pH (s.u.)	7.22	7.22	7.22	7.22	7.22	6.70	7.33	5.44	5.44	5.44	5.97	5.97	7.50	7.33	7.22
Turbidity (NTU)	5	5	0.15	0.15	0.15	0.15	0.75	0.01	0.01	0.01	0.01	0.01	0.01	17.0	48.7
TSS (mg/L)	11	11	0.33	0.33	0.33	0.33	1.65	0.0	0	0	0	0	0	37.3	107
Alkalinity (mg/L as CaCO3)	300	300	300	300	300	300	1500	11.7	11.67	11.67	11.67	11.67	40	1019	300
Bicarbonate (mg/L)	366	366	366	366	366	366	1830	14	14	14	14	14	49	1243	366
as N)	50	50	50	50	50	50	250	5	5	5	5	5	5	170	50
Ammonia (mg/L as N)	41.2	41.2	41.2	41.2	41.2	41.2	206	2.85	2.85	2.85	2.85	2.85	2.85	140	41.2
Nitrite (mg/L as N)	0.05	0.05	0.05	0.05	0.05	0.05	0.25	0.05	0.05	0	0	0	0	0.2	0.05
Nitrate (mg/L as N)	8.75	8.75	8.75	8.75	8.75	8.75	44	1.67	1.67	1.67	1.67	1.67	1.67	29.7	8.75
Chloride (mg/L)	354	354	354	354	354	354	1770	10.1	10.1	10.1	10.1	10.1	10.1	1202	354
TDS (mg/L)	1430	1430	1430	1430	1430	1430	7150	42.7	42.7	42.7	42.7	42.7	101	4856	1430
Aluminum (mg/L)	0.14	0.14	0.060	0.060	0.060	0.060	0.30							0.5	0.83
Total Iron (mg/L)	0.54	0.54	0.130	0.130	0.130	0.130	0.65	0.01	0.01					1.8	4.17
Manganese (mg/L)	0.23	0.23	0.16	0.16	0.16	0.16	0.78	0.01	0.01					0.8	0.81
NDMA (ng/L)									1000	10			10		
TOC (mg/l)	20	20	20	20	20	20	100	0.25	0.25	0.25	0.25	0.25	0.25	67.9	20
UVT (%)		54%	54%	54%	54%	54%		95%	95%	95%	95%	95%	95%		
1,4 Dioxane (ng/L)									3.2	1.0			1.0		
Sodium (mg/L)	230	230	230	230	230	230	1150	8.4	8.4	8.4	8.4	8.4	20	781	230
Boron (mg/L)	0.45	0.45	0.45	0.45	0.45	0.45	2.25	0.427	0.427	0.427	0.427	0.427	0.427	1.53	0.45
Calcium (mg/L)	76	76	76	76	76	76	380	0.053	0.053	0.053	0.053	0.053	13	258	76

NOTES:

1. SOURCE WATER QUALITY IS BASED ON 95TH PERCENTILE HISTORICAL CONCENTRATIONS FOR AMMONIA (WITH CONCENTRATIONS OF pH, ALKALINITY, BICARBONATE, AND NITRATE BASED ON THEIR RELATIONSHIP WITH AMMONIA), AND DESIGN CONCENTRATIONS FOR ALL OTHER CONSTITUENTS.
2. FLOW TYPE ABBREVIATIONS:
   C = CONTINUOUS
   I = INTERMITTENT

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:52 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
GORDON S. SHEBELSKIE
No. C 71 Civil
STATE OF CALIFORNIA
2021.08.26 09:06:12-07'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
A	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	RY
DRAWN:	MAK
CHECKED:	BDS
CHECKED:	RWF / JML
APPROVED:	AS

FILENAME

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

GENERAL
PROCESS FLOW DIAGRAM
MASS BALANCE

DRAWING NUMBER
000-G-7003

SHEET NUMBER
8 OF 370

EQUIPMENT IDENTIFICATION DESCRIPTION

T - AAA - BBBB XXX YYY Z

- AREA - DENOTES ASSOCIATED AREA
- PROCESS - DENOTES ASSOCIATED PROCESS
- EQUIPMENT PREFIX - DENOTES ASSOCIATED EQUIPMENT ABBREVIATION
- AREA NUMBER - DENOTES ASSOCIATED AREA UNIQUE NUMERIC IDENTIFIER
- SEQUENCE NUMBER - UNIQUE ALPHA-NUMERIC IDENTIFIER
- MODIFIER - UNIQUE ALPHABETICAL IDENTIFIER
- AAA-BBBBXXXYYYZ - DISPLAY TAG ON P&ID

PIPELINE IDENTIFICATION DESCRIPTION

SS - PPP - MMMM - XXXX

- PIPE SIZE - INCHES UNLESS OTHERWISE NOTED
- PROCESS CODE - DENOTES ASSOCIATED PROCESS STREAM
- MATERIAL CODE - DENOTES ASSOCIATED MATERIAL ABBREVIATION
- SEQUENCE CODE - UNIQUE NUMERIC IDENTIFIER

LINE SYMBOLS

- MAJOR PROCESS PIPING OR FLOW CHANNEL
- SECONDARY PROCESS PIPING
- MISCELLANEOUS PIPING
- SCREENED LINE DENOTES EXISTING PIPE OR EQUIPMENT
- DASHED LINE DENOTES FUTURE PIPE AND EQUIPMENT
- ELECTRIC SIGNAL
- HYDRAULIC SIGNAL
- PNEUMATIC SIGNAL
- SIGNAL CONNECTION POINT
- CONTROL SYSTEM BACKBONE NETWORK SIGNAL (ETHERNET)
- FIELD DEVICE NETWORK SIGNAL (ETHERNET)
- NON-STANDARD OR INDEPENDENT CONTROL SYSTEM NETWORK SIGNAL (AS NOTED ON DRAWINGS)

- X XXX-X-XXXX — SIGNAL LINE GOING TO ANOTHER SHEET
- X XXX-X-XXXX — SIGNAL LINE FROM ANOTHER SHEET (MATCH LETTERS)
- X XXX-X-XXXX — PROCESS LINE COMING/GOING TO/FROM ANOTHER SHEET
- MATCH SHEET NO. IDENTIFIER
- MATCH LINE NO.
- X — SIGNAL CONNECTION WITHIN THE SAME SHEET
- FLOW ARROW FOR PROCESS PIPING
- PROCESS LINES CROSSING (NOT CONNECTED)
- AG (ABOVE GROUND)
- BG (BELOW GROUND)
- SC2 — TERMINATION POINT; SC REFERS TO SANTA CRUZ TTF; C REFERS TO CHANTICLEER AWPF

MECHANICAL EQUIPMENT SYMBOLS

- VAPORIZER: AMBIENT
- PARTICULATE FILTER
- ROTARY SCROLL COMPRESSOR
- AIR FILTER
- WATER FILTER: CARTRIDGE TYPE
- WATER FILTER: MEMBRANE TYPE
- MIXER
- COMPRESSOR
- VALVE: MATERIAL HANDLING ROTARY
- STATIC MIXER
- HEAT EXCHANGER: TYPE 1
- HEAT EXCHANGER: TYPE 2
- HEAT EXCHANGER: FINNED TUBE
- HEAT EXCHANGER: SHELL & TUBE
- HEAT EXCHANGER: PLATE & FRAME
- HEAT EXCHANGER: SPIRAL
- HEAT EXCHANGER: DOUBLE PIPE
- HEAT EXCHANGER: AIR
- BOILER
- AFTERCOOLER
- FILTER SEPARATOR
- HYDROCYCLONE
- CARBON FILTER OR UNSPECIFIED FILTER
- AUTO STRAINER
- AIR REGULATOR

PUMP & BLOWER SYMBOLS

- CENTRIFUGAL PUMP OR OTHER TYPE NOT SPECIFIED
- SUBMERGED CENTRIFUGAL PUMP
- SCREW (LIFT) PUMP
- ROTARY PUMP
- PROGRESSING CAVITY PUMP
- POSITIVE DISPLACEMENT PUMP
- PLUNGER PUMP
- VERTICAL PUMP
- SUMP PUMP
- CENTRIFUGAL FAN
- CENTRIFUGAL BLOWER
- POSITIVE DISPLACEMENT BLOWER
- COMPRESSOR: RECIPROCATING
- COMPRESSOR: ROTARY SCREW
- COMPRESSOR: LIQUID RING
- MOTOR DRIVEN DIAPHRAGM METERING PUMP
- S — SOLENOID PUMP
- PERISTALTIC PUMP
- DRUM PUMP
- DOUBLE DIAPHRAGM PUMP
- ELECTRIC MOTOR

WATER & WASTEWATER SYMBOLS

- OZONE GENERATOR WITH POWER SUPPLY
- OZONE GENERATOR
- GRIT CONCENTRATOR & DEWATERING SCREW
- BAR SCREEN: MECHANICAL
- GRIT COLLECTOR: VORTEX TYPE
- RECTANGULAR BASIN
- SOLIDS COLLECTOR
- SOLIDS COLLECTOR W/SETTLING PLATES
- RECTANGULAR SEDIMENTATION BASIN
- UV HORIZONTAL BULBS
- MANUAL BAR SCREEN
- GAS FLARE
- GRIT CLASSIFIER
- GRAVITY FILTER
- GRAVITY THICKENER
- CIRCULAR SEDIMENTATION BASIN
- DAF
- BELT FILTER PRESS
- GRAVITY BELT THICKENER
- CENTRIFUGE
- RECTANGULAR SEDIMENTATION BASIN WITH SETTLING PLATES
- GRIT BASIN
- SLUDGE GRINDER: INLINE
- SLUDGE GRINDER: CHANNEL MOUNTED
- GRIT CONCENTRATOR

PRIMARY ELEMENT & FITTING SYMBOLS

- DIAPHRAGM SEAL
- PRIMARY FLOW ELEMENT: ORIFICE PLATE
- PRIMARY FLOW ELEMENT: FLUME
- PRIMARY FLOW ELEMENT: TURBINE OR PROPELLER-TYPE
- M — PRIMARY FLOW ELEMENT: ELECTROMAGNETIC
- ΔT — THERMAL DISPERSION OR THERMAL MASS TYPE FLOW ELEMENT
- PRIMARY FLOW ELEMENT: TRANSIT-TIME ULTRASONIC
- FLOW CONDITIONER
- LE CON — CONDUCTANCE TYPE LEVEL SENSOR
- LE RAD — RADAR TYPE LEVEL SENSOR
- LE GWR — GUIDED WAVE RADAR TYPE LEVEL SENSOR
- LE DP — PRESSURE SENSING LEVEL SENSOR
- ANNULAR TYPE DIAPHRAGM SEAL
- PRIMARY FLOW ELEMENT: POSITIVE DISPLACEMENT
- PRIMARY FLOW ELEMENT: VENTURI TUBE, FLOW NOZZLE, OR FLOW TUBE. * SEE MEASUREMENT SYMBOL NOTATIONS LIST
- PRIMARY FLOW ELEMENT: WEIR
- PRIMARY FLOW ELEMENT: PITOT TUBE
- PRIMARY FLOW ELEMENT: CORIOLIS
- HORN OR SIREN
- FG — ROTAMETER
- LE US — ULTRASONIC TYPE LEVEL SENSOR
- P — INSTRUMENT PURGE OR FLUSHING DEVICE
- UNION
- EXPANSION JOINT
- PILOT LIGHT
- REDUCER - CONCENTRIC
- REDUCER - ECCENTRIC
- FLANGE
- Y_D — DRAIN - BELL-UP
- D — DRAIN - FUNNEL
- FLEXIBLE CONNECTION
- D — CAP
- PLUG
- T — TRAP
- FLAME CHECK
- SURGE CHAMBER
- FLAME ARRESTER
- SEDIMENT TRAP
- S — SILENCER
- HOSE CONNECTION
- CONE STRAINER
- STRAINER - Y TYPE
- STRAINER - BASKET TYPE
- Q — QUICK CONNECT
- VENT
- VENT - SCREENED
- COUPLING
- LG — SIGHTGLASS
- FI — VISUAL FLOW INDICATOR
- MOISTURE SEPARATOR
- EXPANSION LOOP
- SUCTION DIFFUSER
- THERMOWELL

CHEMICAL FEED EQUIPMENT SYMBOLS

- DIFFUSER: TANK
- DIFFUSER: CHANNEL
- INJECTOR
- RUPTURE DISK
- PULSATION DAMPENER
- CHLORINE CYLINDER
- VAPOR SUPERHEATER
- PRESSURE BUILDING COIL
- SPECTACLE, BLIND, CLOSED
- SPECTACLE, BLIND, OPEN
- CALIBRATION COLUMN
- EXPANSION TANK OR FUNNEL
- WEIGH SCALE
- DRIP LEG HEATER
- TOTE
- AS — AUTOMATIC SWITCHOVER
- PASTE TYPE LIME SLAKER
- EDUCTOR
- GAS FEEDER
- EVAPORATOR
- DRY CHEMICAL FEEDER
- TON CONTAINER
- POLYMER BLENDER FEEDER
- S — POLYMER BLENDER FEEDER
- POLYMER INJECTION RING
- HTR — TANK HEATER
- DIFFUSER
- DIFFUSER - PLAN
- CO2 VAPORIZER
- COMBINATION SHOWER / EYEWASH FOUNTAIN
- EYEWASH FOUNTAIN
- SHOWER
- DOUBLE CONTAINMENT PIPE

VALVE & GATE SYMBOLS

- GATE: SLUICE OR SLIDE
- VALVE: GATE OR OTHER TWO-WAY TYPE NOT OTHERWISE IDENTIFIED
- VALVE: BALL
- VALVE: GLOBE
- VALVE: BUTTERFLY
- VALVE: ECCENTRIC PLUG
- VALVE: NON-ECCENTRIC PLUG
- VALVE: THREE WAY
- VALVE: FOUR WAY
- VALVE: CHECK
- VALVE: DIAPHRAGM
- VALVE: VPORT BALL
- VALVE: MUD
- VALVE: THERMAL SHUTOFF
- VALVE: NEEDLE
- VALVE: SLEEVE
- GATE: FLAP
- VALVE: VENTED BALL
- VALVE: DIVERTER
- 1/2" THREADED TAP WITH A 1/2" THREADED PLUG
- VALVE: PRESSURE REDUCING
- VALVE: PRESSURE SUSTAINING
- VALVE: PRESSURE REDUCING (SELF ACTUATING TYPE)
- VALVE: PRESSURE SUSTAINING (SELF ACTUATING TYPE)
- P — VALVE: PILOT ACTUATED RELIEF
- VALVE: VACUUM RELIEF
- VALVE: PRESSURE RELIEF
- VALVE: PRESSURE / VACUUM RELIEF
- VALVE: ANGLE
- VALVE: SET STOP
- VALVE: PINCH
- VALVE: STOP CHECK
- VALVE: TELESCOPING
- VALVE: COMBINATION AIR
- VALVE: AIR RELEASE
- VALVE: AIR VACUUM
- VALVE: CHLORINE WITH YOKE
- M — CHLORINE VACUUM REGULATOR
- VALVE: KNIFE GATE
- BACKFLOW PREVENTER
- VACUUM BREAKER
- EXPLOSION RELIEF
- VALVE: GENERIC ROTARY

VALVE AND GATE ACTUATOR SYMBOLS

- T — HANDWHEEL ACTUATOR
- S — SOLENOID
- S — SOLENOID - MANUAL RESET
- S — SOLENOID - REMOTE RESET
- PRESSURE BALANCED DIAPHRAGM
- M — INTELLIGENT ELECTRIC OR STANDARD ELECTRIC
- M SM — SMALL MOTOR ACTUATOR
- I/P — CURRENT - TO-PNEUMATIC ACTUATOR
- E/H — ELECTRIC-HYDRAULIC
- SPRING-DIAPHRAGM ACTUATOR OR OTHERWISE UNSPECIFIED
- P — PNEUMATIC ACTUATOR
- P DA — PNEUMATIC ACTUATOR DOUBLE ACTING
- P SC — PNEUMATIC ACTUATOR SPRING CLOSE
- P SO — PNEUMATIC ACTUATOR SPRING OPEN
- FLOAT OPERATED VALVE
- SPRING OR WEIGHT ACTUATED RELIEF OR SAFETY VALVE ACTUATOR LOADED VALVE
- QUICK OPENING VALVE
- QUICK CLOSING VALVE
- LOADING/BACK PRESSURE VALVE

MATERIAL HANDLING EQUIPMENT SYMBOLS

- CYCLONE SEPARATOR
- DUMPSTER
- BIN: LIVE BOTTOM
- BIN: SLIDING FRAME
- SCREEN: SINGLE VIBRATORY
- SCREEN: DOUBLE VIBRATORY
- GRINDER
- BIN - CLOSED TOP
- BIN - OPEN TOP
- HORIZONTAL BAR SCREEN
- MIXER: PUGMILL
- MIXER: BLENDER
- CONVEYOR: BELT
- CONVEYOR: VIBRATORY
- PISTON CAKE PUMP: SINGLE
- PISTON CAKE PUMP: DOUBLE
- CONVEYOR: SCREW
- HOPPER
- DUST HOPPER

GENERAL NOTES

1. IN GENERAL, THE P&ID SYMBOLS AND DEVICE IDENTIFICATIONS ARE BASED ON INTERNATIONAL SOCIETY OF AUTOMATION, STANDARD PRACTICE ANSI / ISA-5.1 (2009). SOME MODIFICATIONS, ADDITIONS AND ALTERATIONS HAVE BEEN MADE AS NEEDED TO ACCOMMODATE THE PROJECT REQUIREMENTS.
2. SOME CONTROL AND INTERLOCK REQUIREMENTS WHICH CAN BE MORE CLEARLY ILLUSTRATED ON SCHEMATIC DRAWINGS HAVE BEEN OMITTED FROM THE P&ID DRAWINGS.
3. THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
4. PIPING AND EQUIPMENT LEGEND APPLIES TO P&ID SHEETS ONLY AND MAY DIFFER FROM LEGENDS FOR OTHER SHEETS.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/23/2021 8:43:25 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — DAVID ANAEL BUTLER — NO. E 19568 — ELECTRICAL — STATE OF CALIFORNIA
2021.08.26 09:39:57-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 404790-000-X-PIDS
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

INSTRUMENTATION LEGEND AND ABBREVIATIONS SHEET 1 OF 3

DRAWING NUMBER
000-X-0001

SHEET NUMBER
293 OF 370

INSTRUMENT AND I/O ABBREVIATIONS
MEANINGS OF IDENTIFICATION LETTERS

LETTER	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	VARIABLE MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT OR ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL			DEVIATION
E	VOLTAGE (EMF)		SENSOR, PRIMARY ELEMENT		
F	FLOW, FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, GAUGE, VIEWING DEVICE		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER		SCAN		
K	TIME OR TIME-SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE	MOMENTARY			MIDDLE OR INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	TORQUE		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE	INTEGRATE OR TOTALIZE		
R	RADIATION		RECORD		RUN
S	SPEED OR FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	
V	VIBRATION OR MECHANICAL ANALYSIS			VALVE, DAMPER OR LOUVER	
W	WEIGHT OR FORCE		WELL, PROBE		
X	UNCLASSIFIED	X-AXIS	ACCESORY DEVICES OR UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, OR PRESENCE	Y-AXIS		AUXILIARY DEVICES	
Z	POSITION, DIMENSION	Z-AXIS		DRIVE, ACTUATOR OR FINAL CTRL ELEMENT	

GENERAL NOTES

1. IN GENERAL, THE P&ID SYMBOLS AND DEVICE IDENTIFICATIONS ARE BASED ON INTERNATIONAL SOCIETY OF AUTOMATION, STANDARD PRACTICE ANSI/ISA-5.1 (2009). SOME MODIFICATIONS, ADDITIONS AND ALTERATIONS HAVE BEEN MADE AS NEEDED TO ACCOMMODATE THE PROJECT REQUIREMENTS.
2. SOME CONTROL AND INTERLOCK REQUIREMENTS WHICH CAN BE MORE CLEARLY ILLUSTRATED ON SCHEMATIC DRAWINGS HAVE BEEN OMITTED FROM P&ID DRAWINGS.
3. THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT. PIPING AND EQUIPMENT LEGEND APPLIES TO P&ID SHEETS.
4. * INDICATES THE ITEM IS PART OF THE EQUIPMENT VENDOR'S SCOPE OF SUPPLY.
5. I/O'S FOR FUTURE EQUIPMENT SHOWN ON THE P&ID'S WILL BE PROVIDED AND INSTALLED IN THE FUTURE RIO PANELS. THE PLC PROCESSORS AND HMI SOFTWARE SHALL HAVE THE CAPACITY FOR FUTURE EXPANSION FOR ALL THE FUTURE I/O'S SHOWN ON THE DRAWINGS.

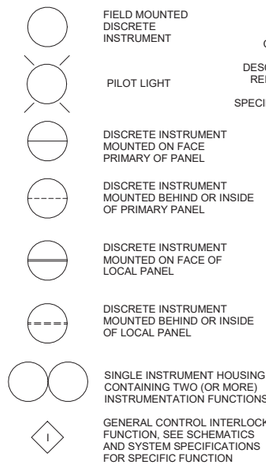
PIPELINE MATERIAL CODE ABBREVIATIONS

MATERIAL TYPE	P&ID MATERIAL CODE	SPECIFICATION REFERENCE
POLYVINYL CHLORIDE	PVC#	40 05 32, 2-2
CHLORINATED POLYVINYL CHLORIDE	CPVC#	40 05 32, 2-3
DUCTILE IRON	DIP	40 05 19, 2-2
STAINLESS STEEL	SS#	40 05 23, 2-1
GALVANIZED STEEL	CSG#	40 05 24.43, 2-1
CARBON STEEL	CS#	40 05 24.43, 2-2
POLYETHYLENE	PE#	40 05 32, 2-4
CAST IRON SOIL PIPE	CI	22 13 17, 2-1
COPPER TUBING	CU#	40 05 17, 2-1
TEFLON TUBING	TEFL#	40 05 32, 2-9
PRESSURIZED POLYVINYL CHLORIDE	PVCPP	40 05 31, 2-2
EPDM HOSE	EPDM#	40 05 32, 2-10
HIGH DENSITY POLYETHYLENE PIPE	HDPE	40 05 33.11, 2-2
CARPENTER 20	CRP#	40 05 23, 2-1
HASTELLOY	HST#	40 05 23, 2-1

INSTRUMENT AND I/O ABBREVIATION DEFINITIONS

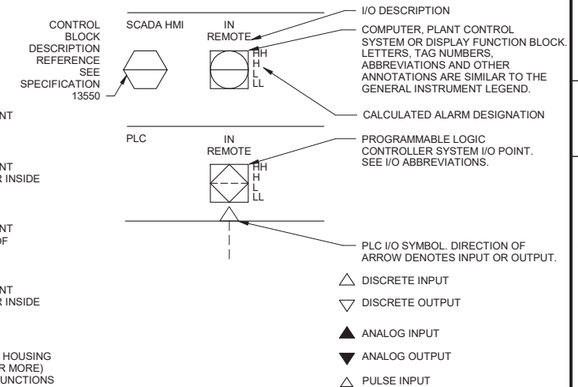
AAH	ANALYZER ALARM HIGH
AAHH	ANALYZER ALARM HIGH-HIGH
AAL	ANALYZER ALARM LOW
AAL	STROBE ALARM LIGHT
AALL	ANALYZER ALARM LOW-LOW
AAX	ALARM HORN
AE	ANALYZER SENSOR
AI	ANALYZER INDICATION
AIT	ANALYZER INDICATING TRANSMITTER
ASH	ANALYZER SWITCH HIGH
ASHH	ANALYZER SWITCH HIGH-HIGH
CB	CONTROL BLOCK REFERENCE (SCADA LEVEL)
FA	TROUBLE
FAH	FLOW ALARM HIGH
FAL	FLOW ALARM LOW
FC	FLOW CONTROLLER
FE	PRIMARY FLOW ELEMENT/SENSOR
FG	FLOW SIGHT GAUGE
FI	FLOW DIGITAL INDICATOR (LED OR SCREEN)
FIC	FLOW INDICATING CONTROLLER
FIT	FLOW INDICATING TRANSMITTER
FOG	FLOW TOTALIZING GAUGE
FQIT	FLOW TOTALIZING INDICATING TRANSMITTER
FSH	FLOW SWITCH HIGH
FSL	FLOW SWITCH LOW
FY	FLOW SIGNAL CONVERTER, REPEATER, OR ISOLATOR
HIC	HAND INDICATING CONTROLLER
HMS	MOMENTARY PUSHBUTTON OR SELECTOR SWITCH
HS	HAND SWITCH
IAH	CURRENT ALARM HIGH (MOTOR OVERLOAD)
IE	CURRENT ELEMENT/SENSOR
ISH	CURRENT SWITCH HIGH USED TO DETECT HIGH TORQUE
JA	POWER FAILURE ALARM
JI	POWER INDICATOR
JIT	POWER INDICATING TRANSMITTER
JL	POWER INDICATING LIGHT
KQI	TIME TOTALIZING INDICATOR
LAH	LEVEL ALARM HIGH
LAHH	LEVEL ALARM HIGH-HIGH
LAL	LEVEL ALARM LOW
LALL	LEVEL ALARM LOW-LOW
LE	PRIMARY LEVEL ELEMENT/SENSOR
LG	LEVEL SIGHT GAUGE
LI	LEVEL INDICATOR (LED OR SCREEN)
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH-HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOW LOW
LY	LEVEL SIGNAL CONVERTER, ISOLATOR, OR REPEATER
OAH	TORQUE ALARM HIGH
OAHH	TORQUE ALARM HIGH HIGH
OSH	TORQUE SWITCH HIGH
OSHH	TORQUE SWITCH HIGH-HIGH
PAH	PRESSURE ALARM HIGH
PAHH	PRESSURE ALARM HIGH-HIGH
PAL	PRESSURE ALARM LOW
PALL	PRESSURE ALARM LOW-LOW
PDG	DIFFERENTIAL PRESSURE GAUGE
PDI	DIFFERENTIAL PRESSURE INDICATOR (LED OR SCREEN)
PDAH	DIFFERENTIAL PRESSURE ALARM HIGGH
PDAHH	DIFFERENTIAL PRESSURE ALARM HIGH-HIGH
PDIT	DIFFERENTIAL PRESSURE INDICATING TRANSMITTER
PDSH	DIFFERENTIAL PRESSURE SWITCH HIGH
PDSHH	DIFFERENTIAL PRESSURE SWITCH HIGH-HIGH
PDSL	DIFFERENTIAL PRESSURE SWITCH LOW
PDSLL	DIFFERENTIAL PRESSURE SWITCH LOW-LOW
PE	PRESSURE SENSOR
PG	PRESSURE GAUGE
PI	PRESSURE INDICATOR (LED OR SCREEN)
PIT	PRESSURE INDICATING TRANSMITTER
PSH	PRESSURE SWITCH HIGH
PSL	PRESSURE SWITCH LOW
SC	SPEED CONTROL
SI	SPEED INDICATION (LED OR SCREEN)
SIT	SPEED INDICATING TRANSMITTER
SIT	SPEED INDICATING TRANSMITTER
SSL	SPEED SWITCH LOW
TAH	TEMPERATURE ALARM HIGH
TAHH	TEMPERATURE ALARM HIGH-HIGH
TAL	TEMPERATURE ALARM LOW
TDI	DIFFERENTIAL TEMPERATURE INDICATOR (LED OR SCREEN)
TDIT	DIFFERENTIAL TEMPERATURE TRANSMITTER
TE	TEMPERATURE SENSOR / RESISTANCE TEMPERATURE DETECTOR
TG	TEMPERATURE GAUGE
TI	TEMPERATURE INDICATOR (LED OR SCREEN)
TIT	TEMPERATURE INDICATING TRANSMITTER
TSH	TEMPERATURE SWITCH HIGH
TSHH	TEMPERATURE SWITCH HIGH HIGH
TSL	TEMPERATURE SWITCH LOW
UA	MULTIVARIABLE / COMMON ALARM / COMMON FAULT
UCA	ALARM CONDITION MODIFIED COMMAND
UCR	RUN / START COMMAND
UCS	STOP COMMAND
VAH	VIBRATION ALARM HIGH
WE	PRIMARY WEIGHT SENSOR / LOAD CELL
WG	WEIGHT GAUGE
WIT	WEIGHT INDICATING TRANSMITTER
YA	GENERAL ALARM EVENT
YI	EVENT INDICATION (LED OR SCREEN)
YIR	RUNNING INDICATION
YIS	STOPPED INDICATION
YL	EVENT INDICATING LIGHT
YLR	RUNNING INDICATING LIGHT
YLS	STOPPED INDICATING LIGHT
ZC	POSITION SET POINT
ZCC	CLOSE COMMAND
ZCO	OPEN COMMAND
ZI	POSITION INDICATOR
ZIC	CLOSED INDICATION
ZIO	OPEN INDICATION
ZIT	POSITION INDICATING TRANSMITTER
ZLC	CLOSED INDICATING LIGHT
ZLO	OPEN INDICATING LIGHT
ZSC	CLOSED POSITION SWITCH
ZSO	OPEN POSITION SWITCH
ZT	POSITION TRANSMITTER

GENERAL INSTRUMENT SYMBOLS



DIGITAL SYSTEMS INTERFACE SYMBOLS

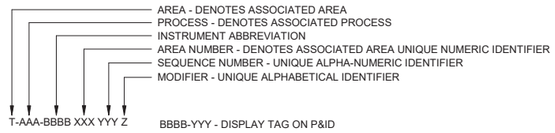
NOTE: REFER TO DETAILED SYSTEM SPECIFICATIONS FOR FUNCTIONAL DESCRIPTION. ALSO SEE I/O SCHEDULES FOR COMPLETE INPUT AND OUTPUT LISTINGS.



INSTRUMENTATION SYMBOLOGY AND DESIGNATIONS



INSTRUMENT IDENTIFICATION DESCRIPTION



FUNCTION DESIGNATIONS AND ABBREVIATIONS

MEASUREMENT PRINCIPLE NOTATIONS

CON	CONDUCTANCE
DP	DIFFERENTIAL PRESSURE SENSING
FLN	FLOW NOZZLE
FLT	FLOW TUBE
GWR	GUIDED WAVE RADAR
RAD	RADAR
US	ULTRASONIC
VENT	VENTURI TUBE

CALCULATED ALARM DESIGNATIONS

L	LOW
LL	LOW-LOW
H	HIGH
HH	HIGH-HIGH

INDICATING LIGHT/ALARM DESIGNATIONS

OVRLD	OVERLOAD
TRQ HI	TORQUE HIGH
TRQ HI-HI	TORQUE HIGH HIGH

INSTRUMENT FUNCTIONS

K	GAIN OR ATTENUATE (INPUT:OUTPUT)
-K	GAIN AND REVERSE
Σ	ADD OR SUM (ADD AND SUBTRACT)
Δ	SUBTRACT (DIFFERENCE)
√‾	EXTRACT SQUARE ROOT
÷	DIVIDE
F(X)	CHARACTERIZE SIGNAL
>	HIGH-SELECT
<	LOW-SELECT
×	MULTIPLY
∫	INTEGRATE (TIME INTEGRAL)
CH4	METHANE
CL2	CHLORINE RESIDUAL
CO2	CARBON DIOXIDE
DO	DISSOLVED OXYGEN
H2S	HYDROGEN SULFIDE
LEL	LOWER EXPLOSIVE LIMIT
MCC	MOTOR CONTROL CENTER
MLSS	MIXED LIQUOR SUSPENDED SOLIDS
NH3	AMMONIA
O2	OXYGEN (PURITY)
O3	OZONE
pH	pH
TURB	TURBIDITY
COND	CONDUCTIVITY

HAND SWITCH DESIGNATIONS

FR	FORWARD-REVERSE
OCA	OPEN-CLOSE-AUTO
OOR	ON-OFF-REMOTE
OOA	ON-OFF-AUTO
LOR	LOCAL-OFF-REMOTE
OO	ON-OFF
OC	OPEN-CLOSE
LR	LOCAL REMOTE
HOA	HAND-OFF-AUTO
LOA	LOCAL-OFF-AUTO
HOR	HAND-OFF-REMOTE
OSC	OPEN-STOP-CLOSE
FWD	FORWARD
REV	REVERSE
SS	START-STOP

TRANSDUCER & CONVERTER DESIGNATION

E	VOLTAGE
FSK	FREQUENCY SHIFT KEYING
H	HYDRAULIC
I	CURRENT
P	PNEUMATIC PULSE
PD	PULSE DURATION
PF	PULSE FREQUENCY
R	RESISTANCE (ELECTRICAL)

EXAMPLE: I/P = CURRENT TO PNEUMATIC TRANSDUCER

POWER SUPPLY ABBREVIATIONS

AS	AIR SUPPLY
ES	ELECTRIC SUPPLY
GS	GAS SUPPLY
HS	HYDRAULIC SUPPLY
NS	NITROGEN SUPPLY
SS	STEAM SUPPLY
WS	WATER SUPPLY
24V	24VDC
120V	120VAC
480V	480VAC

120V —— POWER SUPPLY SOURCE LABEL. USED ONLY WHERE NECESSARY TO HELP CLARIFY AN INSTRUMENT OR SYSTEM FUNCTION.

ISSUED FOR CONSTRUCTION

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2021.08.26 09:40:16-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-000-X-PIDS

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION LEGEND AND ABBREVIATIONS SHEET 2 OF 3

DRAWING NUMBER
000-X-0002

SHEET NUMBER
294 OF 370

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PROCESS CODE ABBREVIATIONS

AA	AIR-AERATION
AC	ACTIVATED CARBON
ACE	ACETIC ACID
ACT	ACETYLENE
AER	AERATION SYSTEM
AIR	PROCESS AIR
ALS	ALUMINUM SULFATE
ANTI	ANTI SCALANT
AO	ADVANCED OXIDATION
AP	AIR PURGE
ARG	ARGON
ARW	AIR WASH
AS	ANTI-SEALANT
ASH	ASH
BAL	BALLASTED FLOCCULATION
BIO	BIOSOLIDS
BIT	BIOTOWER
BLS	BLENDED SLUDGE
BNR	BNR
BRN	BRINE
BWH	BACKWASH - MEMBRANE/FILTER
BWW	BACKWASH WASTE
CA	CITRIC ACID
CACL	CALCIUM HYPOCHLORITE
CAH	CALCIUM HYDROXIDE
CAI	COMPRESSED AIR - INSTRUMENT
CAL	CALCITE
CAO	LIME - QUICKLIME
CAS	CARBON SLURRY
CATS	CALCIUM THIOSULFATE
CEB	CHEMICAL ENHANCED BACKWASH - MEMBRANE
CEN	CENTRATE
CF	CARTRIDGE FILTERS
CI	CORROSION INHIBITOR
CIP	CLEAN IN PLACE
CL	CONTROL
CL2	CHLORINE
CLO2	CHLORINE DIOXIDE
CMS	COMPRESSED AIR - SERVICE
CO2	CARBON DIOXIDE
COA	COAGULATION
CUS	COPPER SULFATE
CW	POTABLE WATER
CWR	COOLING WATER RETURN
CWS	COOLING WATER SUPPLY
DAF	DISSOLVED AIR FLOTATION
DC	DECARBONATER
DCB	DISINFECTION CONTACT BASIN
DCL	DECHLORINATION
DET	DETERGENT
DGA	DIGESTION - AEROBIC
DGG	DIGESTER GAS
DGM	DIGESTER GAS MIXING
DGS	DIGESTER SLUDGE
DIG	DIGESTION - ANAEROBIC
DRN	DRAINAGE
DWT	DEWATERING
EFP	EFFLUENT PUMPING
EL	ELECTRICAL
EP	EMERGENCY POWER GENERATION
EQB	EQUALIZATION BASIN
EXH	ENGINE EXHAUST

FBW	FILTER BACKWASH
FEC	FERRIC CHLORIDE
FES	FERRIC SULFATE
FIL	MF FILTRATE
FO	OIL - FUEL
FUE	DIESEL FUEL
FW	FIRE WATER
GEN	GENERATOR
GRS	GREASE
GRT	GRIT
GSL	GASOLINE
HCL	HYDROCHLORIC ACID
HCO3	CARBONIC ACID
HEL	HELIUM
HFL	HYDRAULIC FLUID
HFS	HYDROFLUOSILIC ACID (FLUORIDE)
HSO4	SULFURIC ACID
HYD	HYDROGEN
IA	AIR, INSTRUMENT
INC	INCINERATION
INFP	INFLUENT PUMPING
INT	INTAKE
KMN	POTASSIUM PERMANGANATE
LAG	LAGOON STORAGE
LAP	LAND APPLICATION
LAS	LIQUID AMMONIUM SULFATE
LIM	LIME STABILIZATION
LOX	LIQUID OXYGEN
LPG	LP GAS OR PROPANE GAS
MEG	METHANE GAS
MEM	MEMBRANE
MF	MEMBRANE FILTRATION
MFD	MF DRAIN
MFF	MF FEED
MGOH	MAGNESIUM HYDROXIDE
MTH	METHANOL
MXL	MIXED LIQUOR
NAC	SODA ASH
NOCL	SODIUM HYPOCHLORITE
NAF	SODIUM FLUORIDE
NAL	SODIUM ALUMINATE
NAM	SODIUM ALUMINATE
NAOH	SODIUM HYDROXIDE
NASF	SODIUM SILICOFLUORIDE
NAX	SODIUM HEXAMETAPHOSPHATE
nBAF	NITRIFYING BIOLOGICAL AERATED FILTRATION
NBC	SODIUM BICARBONATE
NCL	SODIUM CHLORIDE
NCL2	SODIUM CHLORITE
NG	NATURAL GAS
NH3	ANHYDROUS AMMONIA
NHOH	AQUA AMMONIA
NHS	SODIUM BISULFITE
NIO	NITROUS OXIDE
NIT	NITROGEN
NOCL	SODIUM HYPOCHLORITE
NPW	NON-POTABLE WATER
NSO4A	MMONIUM SULFATE

ODC	ODOR CONTROL
OF	OVERFLOW
OIL	OIL
OSW	OZONATED SOURCE WATER
OZ	OZONE
OZD	OZONE DESTRUCT
OTE	OZONATED TERTIARY EFFLUENT
PA	PHOSPHORIC ACID
PAC	POWDERED ACTIVATE CARBON
PAR	PRE-AERATION
PCL	POLYALUMINUM CHLORIDE
PER	HYDROGEN PEROXIDE
PO4	PHOSPHORIC ACID
POLF	POLYMER
POLY	POLYMER
PPP	PHOSPHATE
PRC	PRIMARY CLARIFICATION
PRS	PRIMARY SLUDGE
PRW	PLANT RECYCLED WATER
PSD	PRESEDIMENTATION
PT	POST TREATMENT
PW	PURIFIED WATER
RAS	RETURN ACTIVATED SLUDGE
RCS	RECIRCULATED SLUDGE
RCW	RECLAIMED WATER
REF	REFRIGERANT
RES	RESIDUALS
RO	REVERSE OSMOSIS
ROC	RO CONC
ROF	RO FEED
ROP	RO PERMEATE
RW	RECYCLED WATER
RWP	RAW WATER PUMPING
RWS	RAW WATER STORAGE
SAN	SANITARY SYSTEM
SBW	STRAINER BACKWASH WASTE
SCL	SECONDARY CLARIFICATION
SCM	SCUM
SCR	SCREENINGS
SE	SECONDARY EFFLUENT
SEP	SEPTAGE
SET	SETTLED WATER
SEW	SEWAGE
SO2	SULFUR DIOXIDE
SR	STRAINERS
SSF	SIDE STREAM FEED
STM	STEAM
STS	STORM SEWER
STW	STORM WATER
SW	SOURCE WATER
TE	TERTIARY EFFLUENT
TERT	TERTIARY TREATMENT
TF	TRICKLING FILTER
THCK	THICKENING
TPRS	THICKENED PRIMARY SLUDGE
TW	TREATED WATER
TWAS	THICKENED WASTE ACTIVATED SLUDGE

UV	ULTRAVIOLET
UV	UV DISINFECTION
UVE	UV EFFLUENT
VAC	VACUUM
WWP	RAW WASTEWATER PUMPING
2W	2-WATER

EQUIPMENT PREFIXES

A	AERATOR
AB	ALLEN BRADLEY
ACC	AIR CONDITIONING COIL (HEATING AND COOLING)
ACU	AIR CONDTIONING UNIT (SELF-CONTAINED)
AD	AIR DRYER
AF	AIR FILTER (VENTILATION AND AIR CONDITIONING ONLY)
AHC	AIR HANDLING UNIT WITH COIL
AHU	AIR HANDLING UNIT (SELF-CONTAINED)
ARV	AIR RELEASE VALVE
ASC	ADJUSTABLE SPEED CONTROLLER (ELECTRONIC)
ASD	ADJUSTABLE SPEED CONTROLLER (MECHANICAL)
ATS	AUTOMATIC TRANSFER SWITCH
AVRV	COMBINATION AIR RELEASE VALVE
B	BLOWER
BAF	BIOLOGICAL AERATED FILTRATION
BFU	BOILER FEEDWATER UNIT
BG	BUTTERFLY GATE
BOR	BOILER
BUR	BURNER (WASTE GAS, AFTERBURNER, INCINERATOR, ETC.)
BOX	HVAC BOX (MIXING, REHEAT, VARIABLE VOLUME)
BP	BACKFLOW PREVENTER
BSN	BAR SCREEN
C	COIL
CC	COOLING COOL
CDR	CONDENSER
CDU	CONDENSER UNIT
CFR	CHEMICAL FEEDER (LIME SLAKER, POLYERMER CHLORINATOR, SULFONATOR, ETC.)
CHR	CHILLER
CKV	CHECK VALVE
CLR	CHLORINATOR
COL	COLLECTOR
COM	COMMINUTOR
CON	CONVEYOR (BELT, BUCKET, ELEVATOR, SCREW, ETC.)
CP	COMPRESSOR (AIR, GAS, ETC.)
CPT	COMPACTOR (SCREENING, ETC.)
CPU	COMPUTER
CRN	CRANE (BRIDGE, JIB, ETC., PLUS HOIST-ENTIRE PACKAGE.)
CRU	CONDENSATE RETURN UNIT
CT	COOLING TOWER
CTF	CENTRIFUGE
CV	CONTROL VALVE
CYL	CYLINDER (HYDRAULIC, PNEUMATIC, CHLORINE SUPPLY, ETC.)
DA	DEAERATOR
DC	DECARBONATOR
DF	DRINKING FOUNTAIN
DFC	DIGESTER FLOATING COVER
DHU	DEHUMDIFIER
DIS	DISTRIBUTOR (EDUCTOR, EJECTOR, DIFFUSER, ETC.)
DPR	DAMPER
DU	DRIVE UNIT

E	ENGINE
EB	ENGINE-BLOWER MODULE
EC	EVAPORATIVE COOLER
EG	ENGINE-GENERATOR MODULE
EPR	EVAPORATOR
ESW	ETHERNET SWITCH
EWS	EYE WASH STATION
F	FAN
FCU	FAN COOL UNIT
FCV	FLOW CONTROL VALVE
FLC	FLOCCULATOR
FLT	FILTER (PIPELINE, ETC., OTHER THAN "AF")
FP	FILTER PRESS
FPP	FIBER PATCH PANEL
FPU	FLUID POWER UNIT (HYDRAULIC, ETC.) FURNACE
FUR	FLOW CONTROLLED VALVE (NON SELF-ACTING)
GDR	GRINDER
GEN	GENERATOR
GV	GRAVITY VENTILATOR
HC	HEATING COIL
HEX	HEAT EXCHANGER
HOP	HYDRAULIC OPERATOR
HP	HEAT PUMP
HST	HOIST
HTR	HEATER (BASEBOARD, DUCT, ETC.)
HTT	HEAT TRACE TAPE
HUM	HUMDIFIER
HV	HAND (MANUALLY OPERATED) VALVE
IMC	INDIVIDUAL MOTOR CONTROLLER
INJ	INJECTOR (INDUCTOR)
KV	TIME (K) CONTROLLED VALVE
LAB	LABORATORY EQUIPMENT
LCV	LEVEL CONTROL VALVE
LV	LEVEL CONTROLLED VALVE (NON SELF-ACTING)
LVR	LOUVER
LCP	LOCAL CONTROL PANEL
M	MOTOR (ELECTRIC, PNEUMATIC, HYDRAULIC, ETC.)
MCC	MOTOR CONTROL CENTER
MEE	MISCELLANEOUS ELECTRICAL EQUIPMENT
MFU	MICRO FILTRATION UNIT
MH	MANHOLE (ELECTRICAL)
MIE	MISCELLANEOUS INSTRUMENTATION EQUIPMENT
MME	MISCELLANEOUS MECHANICAL EQUIPMENT
MOP	MOTOR OPERATOR
MS	MOISTURE SEPARATOR
MTS	MANUAL TRANSFER SWITCH
MUX	MULTIPLEXER
MX	MIXER
MXS	STATIC MIXER
MZU	MULTIZONE UNIT
nBAF	NITRIFYING BIOLOGICAL AERATED FILTRATION

ORF	ODOR REMOVAL FILTER
ORT	ODOR REDUCTION TOWER
ORU	ODOR REDUCTION UNIT
P	PUMP
PC	PERSONAL COMPUTER
PB	PULL BOX (ELECTRICAL)
PBD	PANELBOARD
PCV	PRESSURE CONTROL VALVE (SELF-ACTING)
PDCV	PRESSURE DIFFERENTIAL CONTROL VALVE
PEJ	PNEUMATIC EJECTOR
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL (CONTROL, PURGE, CABINET, CONSOLE, ETC.)
POP	PNEUMATIC OPERATOR
PRV	PRESSURE REDUCING VALVE
PSV	PRESSURE SAFETY VALVE (VACUUM OR PRESSURE RELIEF)
PV	PRESSURE CONTROLLED VALVE (NON SELF-ACTING)
PVL	PRESSURE VESSEL (AIR RECEIVER, HYDRO-PNEUMATIC TANK, ETC.)
RAD	RADIO
REC	RECEIVER
RIO	REMOTE INPUT OUTPUT
ROU	REVERSE OSMOSIS UNIT
SCN	SCREEN (BAR, ROTARY, ETC.)
SCR	SCRUBBER
SEP	SEPARATOR (SEDIMENTATION TRAP, ORP TRAP, STEAM SEPARATOR, CYCLONE, STRAINER, ETC.)
SG	SLUICE GATE
SKD	SKID (EQUIPMENT)
SLG	SLIDE GATE
SLR	SILENCER
SMP	SAMPLER
SRV	SERVER
SRK	SERVER RACK
STP	SOUND TRAP
SUB	SUBSTATION (UNIT, SECONDARY, ETC.)
SV	SOLENOID VALVE
SWB	SWITCHBOARD (ELECTRICAL)
SWGR	SWITCHGEAR
SPL	SAMPLE PANEL
T	TANK (NON-PRESSURIZED TYPE, DIGESTER, STORAGE, ETC.)
TB	TERMINAL BOX, BOARD, OR CABINET (ELECTRICAL, INSTRUMENTATION, TELEPHONE)
TBN	TURBINE (STREAM, ETC.)
TCV	TEMPERATURE CONTROL VALVE (SELF-ACTING)
TEL	TELEPHONE EQUIPMENT
TFR	TRANSFORMER
TM	TIMER
TRS	TRANSFER SWITCH
TV	TEMPERATURE CONTROLLED VALVE (NON SELF-ACTING)

UH	UNIT HEATER
UPS	UNINTERRUPTIBLE POWER SUPPLY
US	UTILITY STATION
UV	MULTI-VARIABLE (U) CONTROLLED VALVE (NON SELF-ACTING)
UVU	ULTRAVIOLET UNIT
VWV	TERMINAL UNIT
VEN	VENTILATOR (POWERED, ETC.)
VFC	VARIABLE FREQUENCY CONTROLLER
VIB	VIBRATOR
VP	VACUUM PUMP
VPSV	VACUUM PRESSURE RELIEF VALVE
VSC	VARIABLE SPEED CONTROLLER
VSD	VARIABLE SPEED DRIVE
WH	WATER HEATER
WHR	WASHER (GRIT, ETC.)
WSU	WATER SOFTENER UNIT

AREA DESIGNATION CODE

001	SANTA CRUZ SITE (YARD AREA)
101	SC TTF
110	SOURCE WATER PUMP STATION
115	TTF AUTOMATIC STRAINERS
120	TUNNEL PORTAL BOX
130	SOURCE WATER SURGE TANK
140	TITLE 22 REUSE SYSTEM
181	SODIUM HYPOCHLORITE FEED SYSTEM
002	CHANTICLEER SITE (YARD AREA)
201	AWPF PROCESS BUILDING
210	MF PUMP STATION
220	MF AREA
230	RO AREA
240	UV / AOP AREA
250	DECARBONATOR / POST TREATMENT AREA
260	PURIFIED WATER PUMP STATION
270	OZONE
271	LOX AREA
272	OZONE GENERATION
273	OZONE OPEN LOOP COOLING WATER PUMPS
280	CHEMICAL STORAGE AREA
281	SODIUM HYPOCHLORITE STORAGE AND FEED SYSTEM
283	SODIUM HYDROXIDE STORAGE AND FEED SYSTEM
284	CITRIC ACID STORAGE AND FEED SYSTEM
285	SULFURIC ACID STORAGE AND FEED SYSTEM
286	CALCIUM CHLORIDE STORAGE AND FEED SYSTEM
287	HYDROGEN PEROXIDE STORAGE AND FEED SYSTEM
288	SODIUM BISULFITE STORAGE AND FEED SYSTEM
289	ANTISCALANT STORAGE AND FEED SYSTEM
290	SANITARY LIFT STATION
299	CHANTICLEER EMERGENCY GENERATOR

AREA ABBREVIATIONS CODE

A	CHANTICLEER ADVANCE WATER PURIFICATION FACILITY (AWPF)
T	SANTA CRUZ TERTIARY TREATMENT FACILITY (TTF)

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REGISTERED PROFESSIONAL ENGINEER
BRIANL. BUTLER
NO. E 18565
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:40:24-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-000-X-PIDS

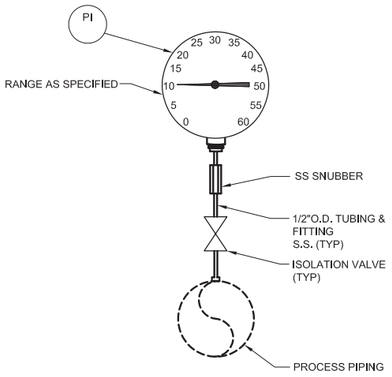
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

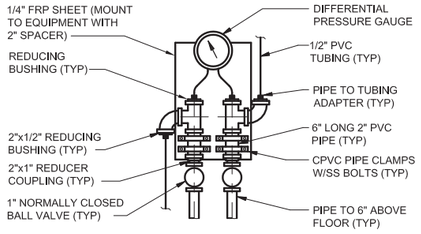
INSTRUMENTATION LEGEND AND ABBREVIATIONS SHEET 3 OF 3

DRAWING NUMBER
000-X-0003

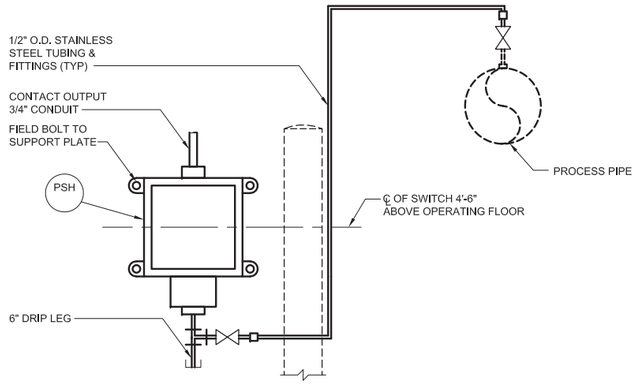
SHEET NUMBER
295 OF 370



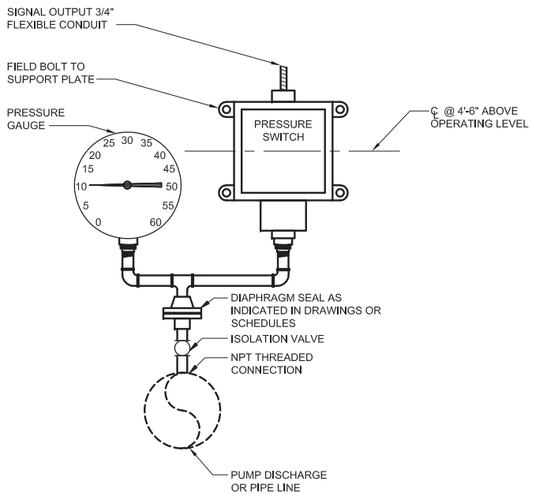
A PRESSURE GAUGE
NO SCALE



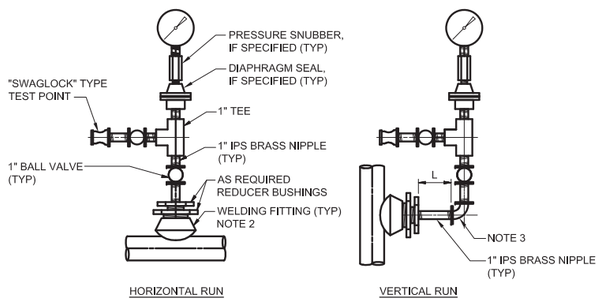
B PRESSURE DIFFERENTIAL INDICATOR
NO SCALE



C PRESSURE SWITCH
NO SCALE



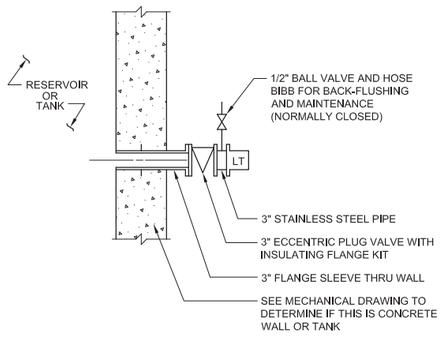
D PRESSURE SWITCH & GAUGE WITH DIAPHRAGM SEAL
NO SCALE



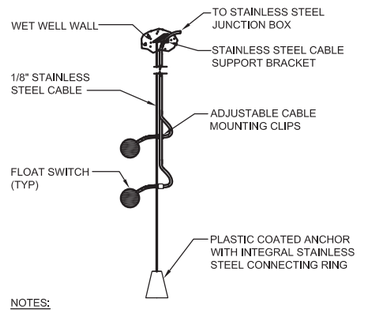
E PRESSURE GAUGE/TRANSMITTER/SWITCH
NO SCALE

NOTES:

1. THIS TYPICAL DETAIL APPLIES TO MOUNTING OF INDICATORS, SWITCHES AND TRANSMITTERS.
2. WELDING FITTING SHALL BE BONNEY FORGE "THEDOLETS", PORTER "W-S TEELETS", VOGT "WELD COUPLETS", OR EQUAL. FOR 2-INCH AND SMALLER STEEL PIPE, PROVIDE STD OR REDUCING TEE IN LIEU OF WELDED FITTING.
3. ANSI B16.15, CLASS 125 BRONZE THREADED FITTING.
4. DIMENSION "L" SHALL BE SUFFICIENT TO PREVENT CONTACT BETWEEN THE GAUGE CASE, DIAPHRAGM SEAL HOUSING, OR VALVE OPERATING LEVER AND ADJACENT PIPING OR INSULATION BUT SHALL NOT EXCEED 4 INCHES UNLESS OTHERWISE PERMITTED BY THE ENGINEER.
5. PROVIDE DIELECTRIC ISOLATION BUSHINGS OR FITTINGS ON ALL INSTRUMENT CONNECTIONS TO PIPE.
6. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.



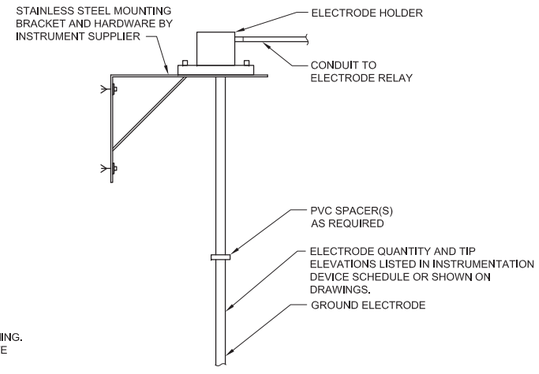
FLANGE MOUNTED PRESSURE SENSING
F LEVEL TRANSMITTER
NO SCALE



NOTES:

1. LEVEL FLOATS TO BE MOUNTED WITHIN 18" TO ONE SIDE OF ACCESS OPENING.
2. WHERE FLOATS ARE SET CLOSER THAN 18" OF LEVEL DIFFERENCE, ROTATE FLOATS AROUND PIP TO AVOID INTERFERENCE.

G WET WELL LEVEL FLOATS
NO SCALE



H ELECTRODE RELAY LEVEL SWITCH
NO SCALE

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 3:08 PM
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Black & Veatch Corporation
Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER No. E 16569 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:40:32-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

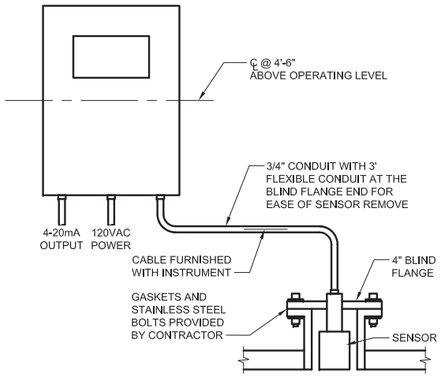
DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 001-X-5001
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

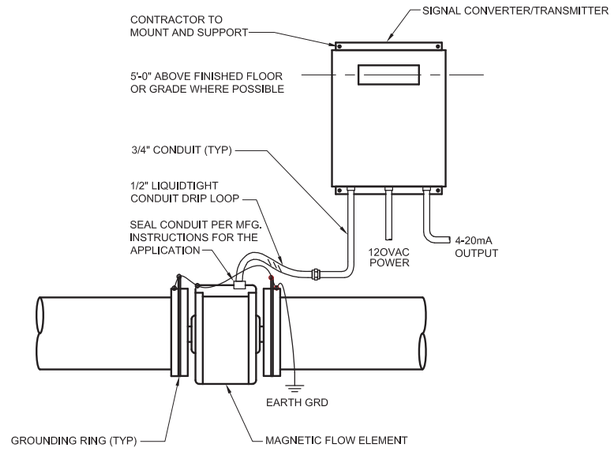
INSTRUMENTATION
TTF INSTRUMENTATION INSTALLATION DETAILS
SHEET 1 OF 5

DRAWING NUMBER
001-X-5001

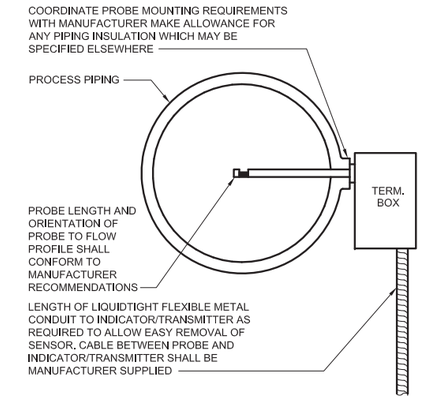
SHEET NUMBER
296 OF 370



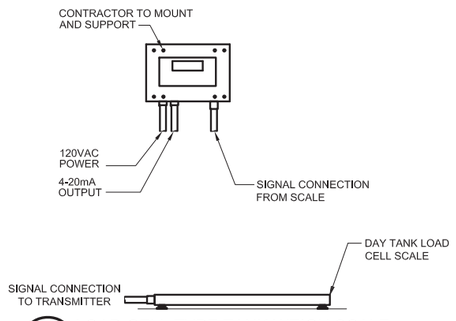
A ULTRASONIC LEVEL TRANSMITTER
NO SCALE



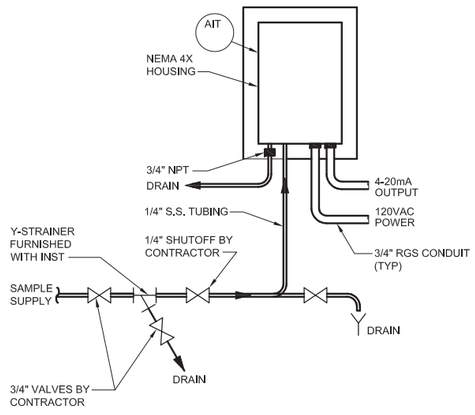
B MAGNETIC FLOWMETER
NO SCALE
NOTE: PIPE TO BE SUPPORTED ON BOTH SIDES OF METER.



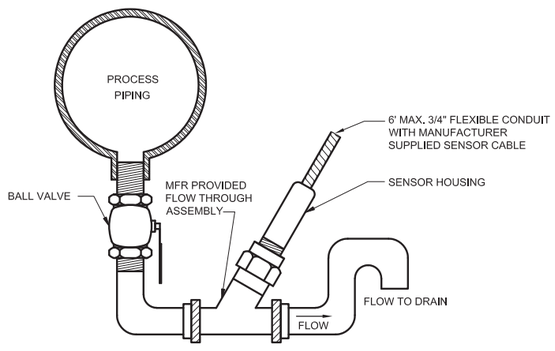
C THERMAL DISPERSION FLOWMETER SENSOR
NO SCALE



D LOAD CELL TYPE TANK WEIGH SCALE
NO SCALE



E RESIDUAL CHLORINE ANALYZER
NO SCALE



CONDUCTIVITY, pH AND ORP SENSOR
F FLOW-THROUGH CELL MOUNTED
NO SCALE

NOTE:

1. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16585
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:40:40-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-5002

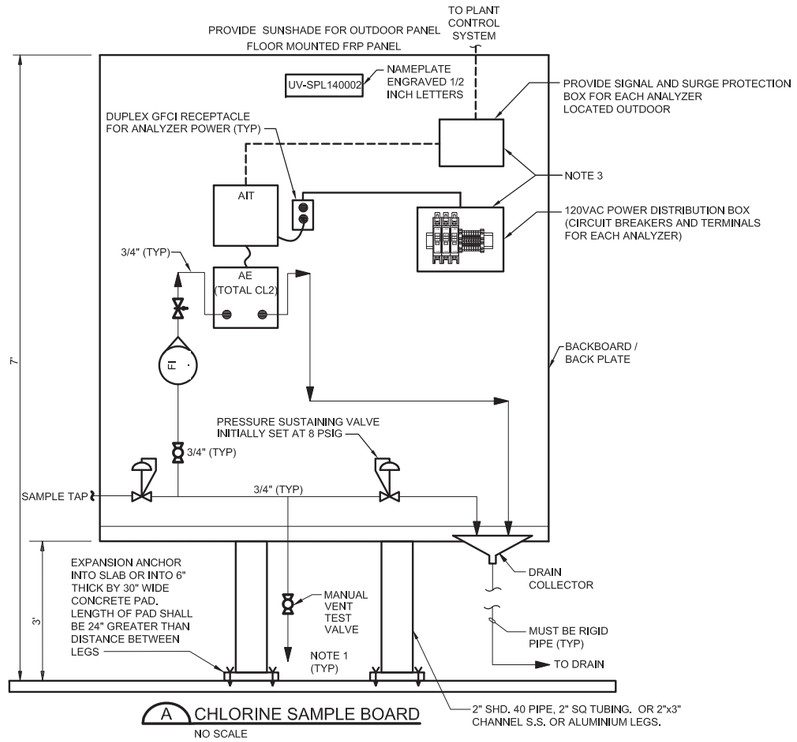
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

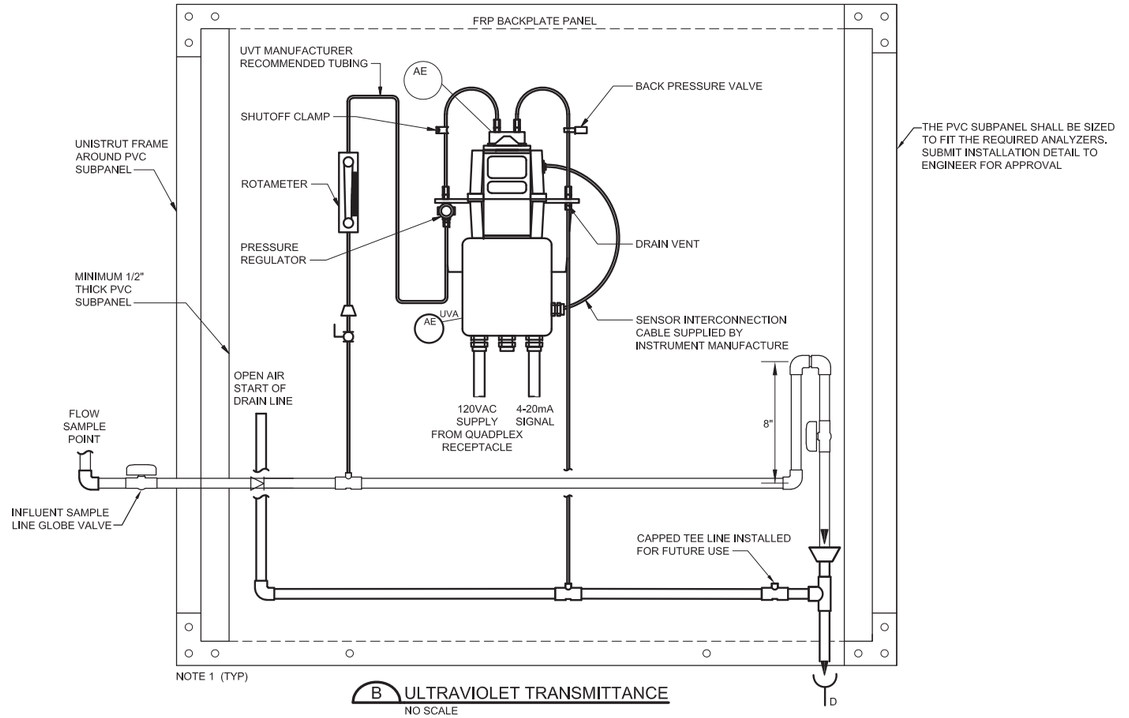
INSTRUMENTATION
TTF INSTRUMENTATION
INSTALLATION DETAILS
SHEET 2 OF 5

DRAWING NUMBER
001-X-5002

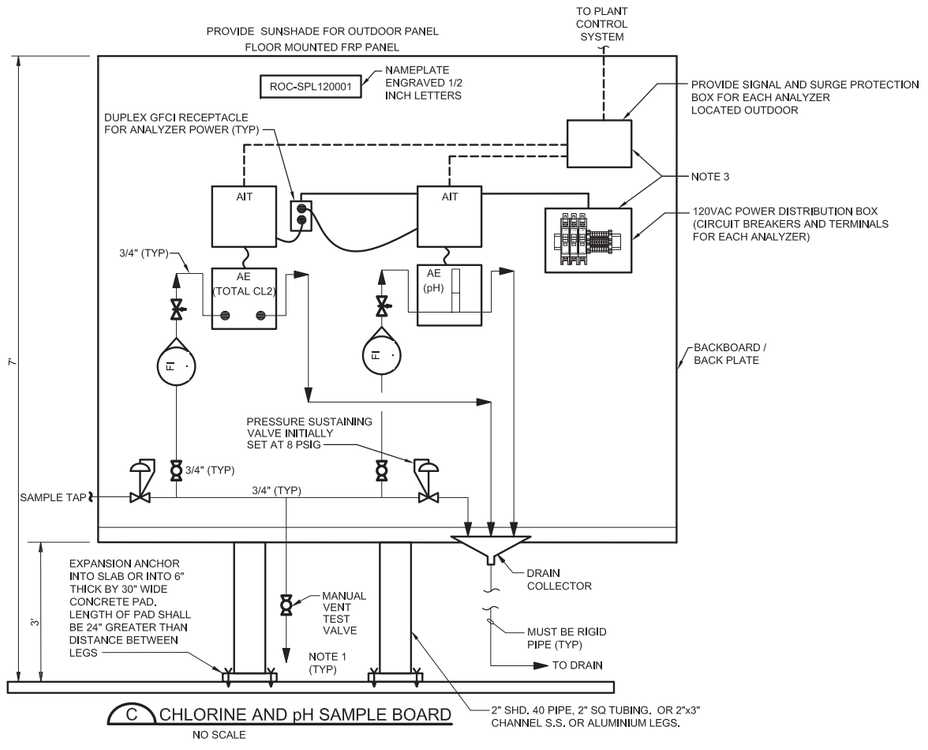
SHEET NUMBER
297 OF 370



A CHLORINE SAMPLE BOARD
NO SCALE



B ULTRAVIOLET TRANSMITTANCE
NO SCALE



C CHLORINE AND pH SAMPLE BOARD
NO SCALE

NOTES:

1. THE SAMPLE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
2. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.
3. POWER DISTRIBUTION BOX AND SIGNAL JUNCTION BOX SHALL BE NEMA 3R RATED FOR OUTDOOR, NEMA 12 RATED FOR INDOOR AND NEMA 4X RATED FOR CHEMICAL AREA.

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BRIAN L. BUTLER
No. E 16568
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:40:50-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-5003

BV PROJECT NUMBER
404790

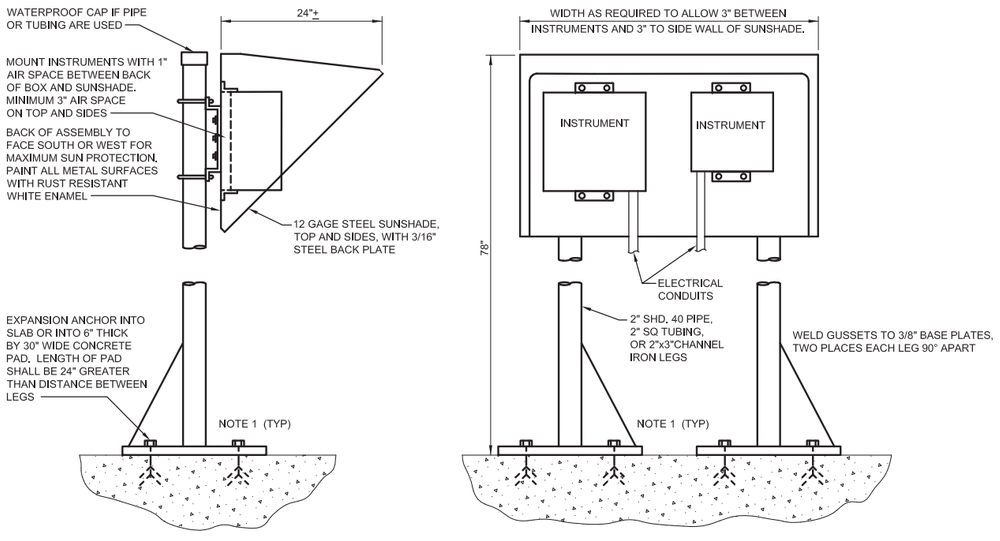
CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF INSTRUMENTATION
INSTALLATION DETAILS
SHEET 3 OF 5

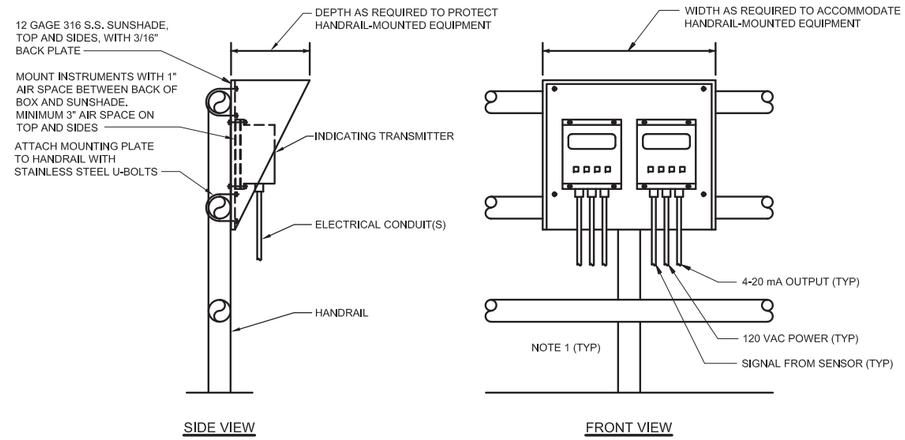
DRAWING NUMBER
001-X-5003

SHEET NUMBER
298 OF 370

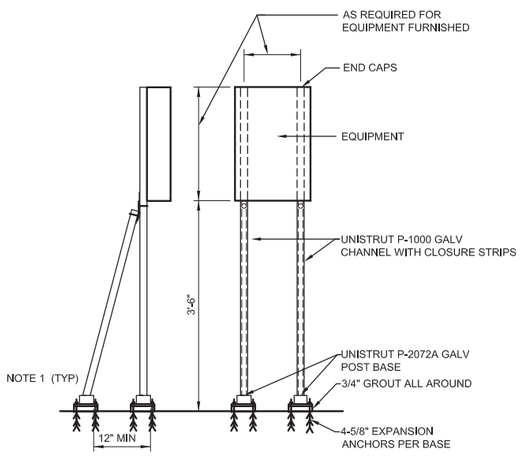
PLOTTED: 8/20/2021 3:08 PM
D10000



A OUTDOOR INSTRUMENT MOUNTING DETAIL
NO SCALE
(FOR INSTRUMENTS GREATER THAN 10" WIDE OR MULTIPLE INSTRUMENTS)



B HANDRAIL MOUNTING
NO SCALE



C TYPICAL EQUIPMENT MOUNTING DETAIL
NO SCALE

NOTE: IN OUTDOOR LOCATIONS, USE STAINLESS STEEL BOLTS, NUTS, WASHERS AND ANCHOR BOLTS.

NOTES:

1. THE SAMPLE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
2. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16585
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:40:59-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-5004

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF INSTRUMENTATION INSTALLATION DETAILS
SHEET 4 OF 5

DRAWING NUMBER
001-X-5004

SHEET NUMBER
299 OF 370

PLOTTED: 8/20/2021 3:09 PM
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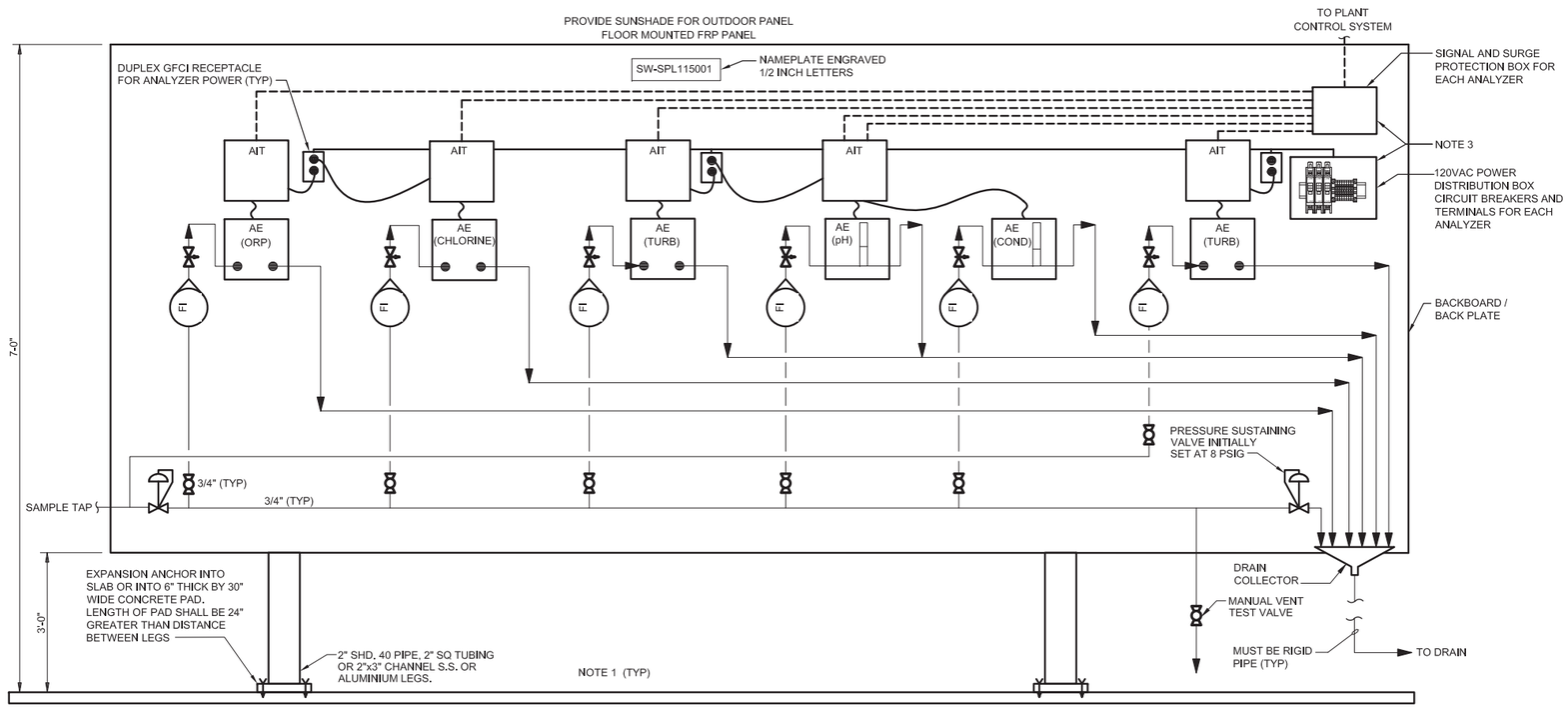

A ORP, CHLORINE, TURBIDITY, pH AND CONDUCTIVITY ANALYZER SAMPLE BOARD
NO SCALE

NOTES:

1. THE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
2. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.
3. POWER DISTRIBUTION BOX AND SIGNAL JUNCTION BOX SHALL BE NEMA 3R RATED FOR OUTDOOR, NEMA 12 RATED FOR INDOOR AND NEMA 4X RATED FOR CHEMICAL AREA.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 3:09 PM
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BRIAN L. BUTLER
No. E 16565
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:41:09-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-5005

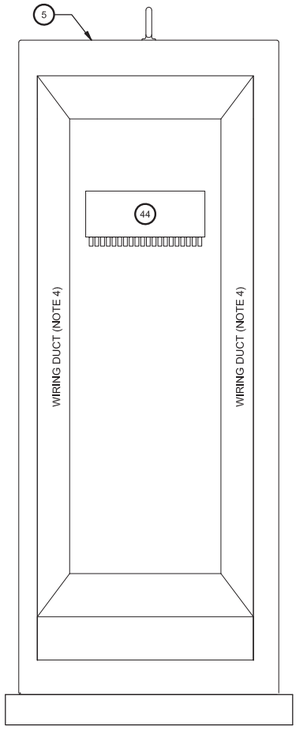
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

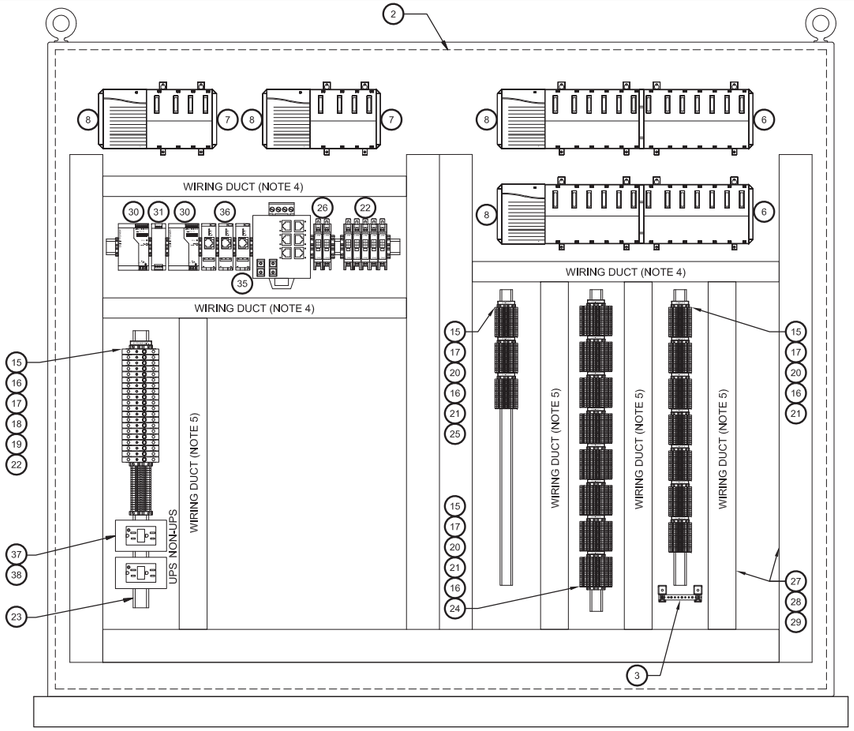
INSTRUMENTATION
TTF INSTRUMENTATION
INSTALLATION DETAILS
SHEET 5 OF 5

DRAWING NUMBER
001-X-5005

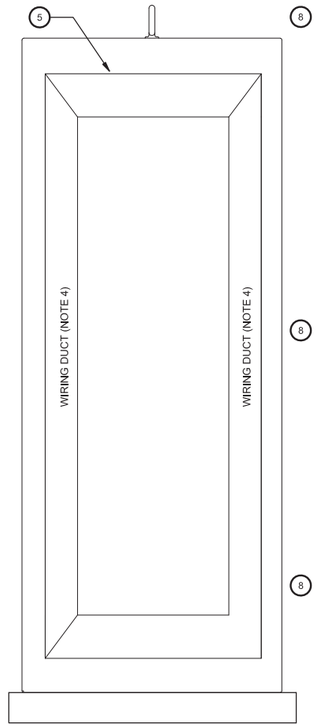
SHEET NUMBER
300 OF 370



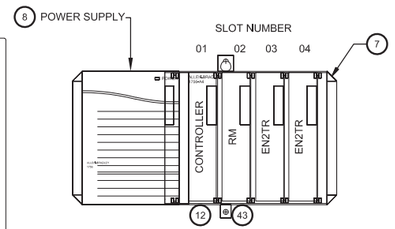
LEFT SIDE PANEL LAYOUT
PLC ENCLOSURE



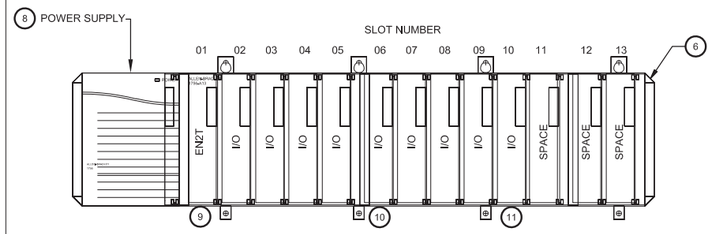
BACK PANEL LAYOUT
PLC ENCLOSURE

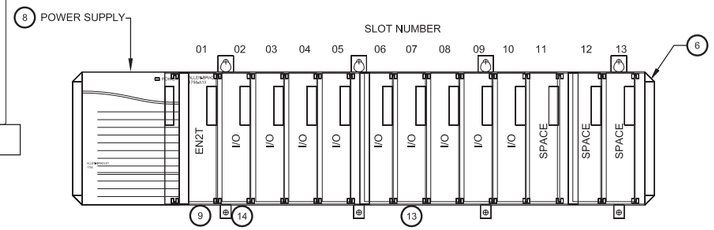


RIGHT SIDE PANEL LAYOUT
PLC ENCLOSURE

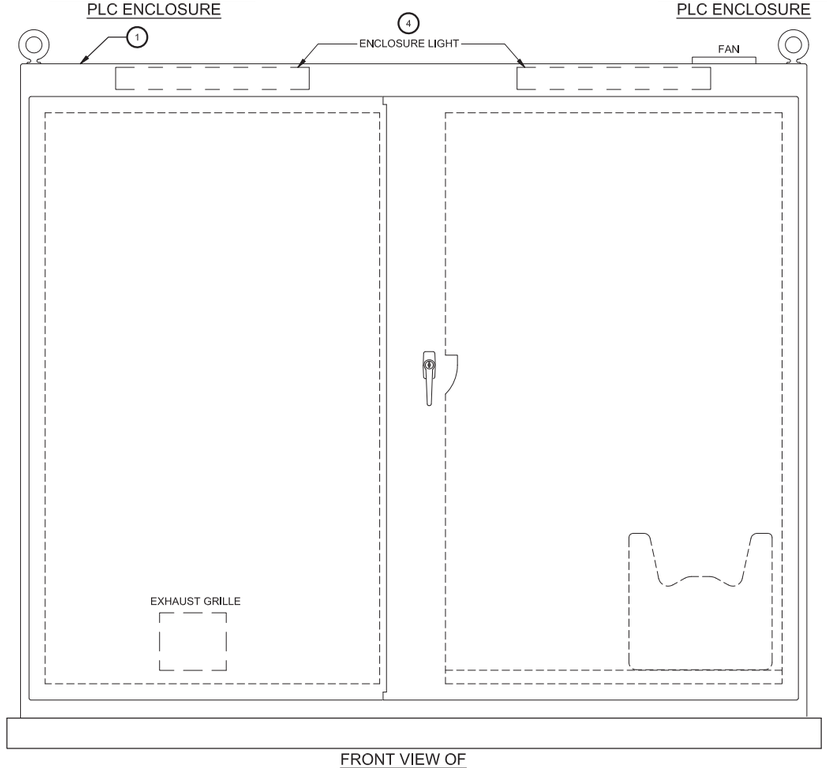


PLC MAIN RACK
SLOT LAYOUT AND ARRANGEMENT
(TYPICAL FOR TWO PLCS)





PLC RIO RACK
SLOT LAYOUT AND ARRANGEMENT



FRONT VIEW OF
PLC ENCLOSURE

REFERENCE PLC CONTROL PANEL BILL OF MATERIALS

ITEM	MANUFACTURER	DESCRIPTION
1		NEMA 12/4X ENCLOSURE, 84" x 72" x 24" OR (SEE NOTE 1,5)
2		SUB PANEL, 72" x 68" OR (SEE NOTE 5)
3		GROUNDING BAR, WITH A-GLK2 MOUNTING KIT
4		24" LED LIGHT PACKAGE
5		SIDE PANEL, 72" X 14" OR (SEE NOTE 5)
6	ALLEN-BRADLEY	CHASSIS, 13 SLOT
7	ALLEN-BRADLEY	CHASSIS, 4 SLOT
8	ALLEN-BRADLEY	120VAC POWER SUPPLY, 75W
9	ALLEN-BRADLEY	SINGLE PORT ETHERNET MODULE
10	ALLEN-BRADLEY	120VAC ISOLATED DIGITAL INPUT MODULE, 16 POINTS
11	ALLEN-BRADLEY	ANALOG INPUT MODULE, 16 SINGLE-ENDED/ 4-20mA POINTS
12	ALLEN-BRADLEY	CONTROLOGIX CONTROLLER WITH 3 MB USER MEMORY
13	ALLEN-BRADLEY	ANALOG OUTPUT MODULE, 8 OUTPUTS, 4-20mA
14	ALLEN-BRADLEY	120VAC DIGITAL OUTPUT MODULE, 16 OUTPUTS
15	ALLEN-BRADLEY	END ANCHOR
16	ALLEN-BRADLEY	END BARRIER FOR TERMINALS
17	ALLEN-BRADLEY	TERMINAL GROUP MARKER
18	ALLEN-BRADLEY	TERMINAL BLOCK, 20A (GREY)
19	ALLEN-BRADLEY	TERMINAL BLOCK, 30A (GREY)
20	ALLEN-BRADLEY	3-TIER TERMINAL BLOCK, 20A (GREY)
21	ALLEN-BRADLEY	END BARRIER FOR 3-TIER TERMINAL BLOCK
22	ALLEN-BRADLEY	CIRCUIT BREAKER, SINGLE POLE, 2AMP
23		DIN RAIL, HI-RISE
24	ALLEN-BRADLEY	2-TIER TERMINAL BLOCK, 20A (GREY)
25	ALLEN-BRADLEY	END BARRIER FOR 2-TIER TERMINAL BLOCK
26	ALLEN-BRADLEY	CIRCUIT BREAKER, SINGLE POLE, 20AMP
27		WIRE DUCT COVER, 3" (NOTE 4)
28		WIRE DUCT, 2" x 4" (NOTE 4)
29		WIRE DUCT COVER, 2" (NOTE 4)
30		24VDC POWER SUPPLY
31		DIODE MODULE
32		PREWIRED CABLE FOR 16 POINT ISOLATED I/O MODULES
33		PREWIRED CABLE FOR 1756 ANALOG INPUT MODULES
34		PREWIRED CABLE FOR 1756 ANALOG OUTPUT MODULES
35		ETHERNET SWITCH, 120VAC, (NOTE 6)
36	ALLEN-BRADLEY	1783-ETAP2F
37		DUPLEX RECEPTACLE COVER PLATE, IVORY
38		RECEPTACLE, 15 AMP, DUPLEX , GFCI
39		NIPPLE, 1/2"
40		LOCK NUT, 1/2"
41		PLASTIC BUSHING, 1/2"
42		STEEL, 4" x 2-1/8" x 1-7/8"
43	ALLEN-BRADLEY	REDUNDANCY MODULE
44		FIBER PATCH PANEL - 24 PORT

NOTES:

1. PLC ENCLOSURE SHALL BE A FREE STANDING NEMA 12 (INDOOR) OR NEMA 4X STAINLESS STEEL POWDER COATED WHITE (OUTDOOR).
2. ENCLOSURE FINISHED SHALL BE DONE BY MANUFACTURER: INTERIOR - STANDARD WHITE ENAMEL (INTERIOR) EXTERIOR - POLYESTER URETHANE POWDER.
3. ENCLOSURE BOTTOM SHALL BE PUNCHED FOR THE EXACT NUMBER OF CONDUITS STUBS TO BE USED. PUNCHED HOLE DIAMETER SHALL NOT EXCEED CONDUIT DIAMETER PLUS 1/2 INCH.
4. VERIFY EXACT SIZE OF ALL WIRING DUCTS. WIRING DUCTS SHALL BE SIZED WITH 30 PERCENT SPARE CAPACITY.
5. PLC ENCLOSURE EXACT DIMENSION SHALL DETERMINED BY THE CONTRACTOR.
6. ETHERNET SWITCH SHALL HAVE TWO SPARE COPPER PORTS.
7. FIBER PATCH PANEL INSIDE THE PLC ENCLOSURE SHALL BE PROVIDED FOR THE FIELD FIBER OPTIC CABLE. ALL FIBERS SHALL BE LANDED INSIDE THE FIBER PANEL. FIBER PATCH CABLES SHALL BE PROVIDED BY THE PLC SUPPLIER.
8. PANEL DRAWING LAYOUT AND DETAILS INDICATED FOR REFERENCE ONLY. CONTRACTOR SHALL DEVELOP ACTUAL LAYOUT, DETAILS AND WIRING AND SUBMIT FOR REVIEW.
9. FANS SHALL BE PROVIDED ONLY FOR NEMA 12 PANELS.
10. THE PLC PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
11. PROVIDE SUN/RAIN SHIELD FOR ANY OUTDOOR PANELS THAT ARE NOT UNDER ANY COVER. SEE ELECTRICAL DRAWINGS WHICH SHOW THE LOCATIONS OF THE PANELS.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-5011

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF PLANT PLC PANEL
LAYOUT

DRAWING NUMBER
001-X-5011

SHEET NUMBER
301 OF 370

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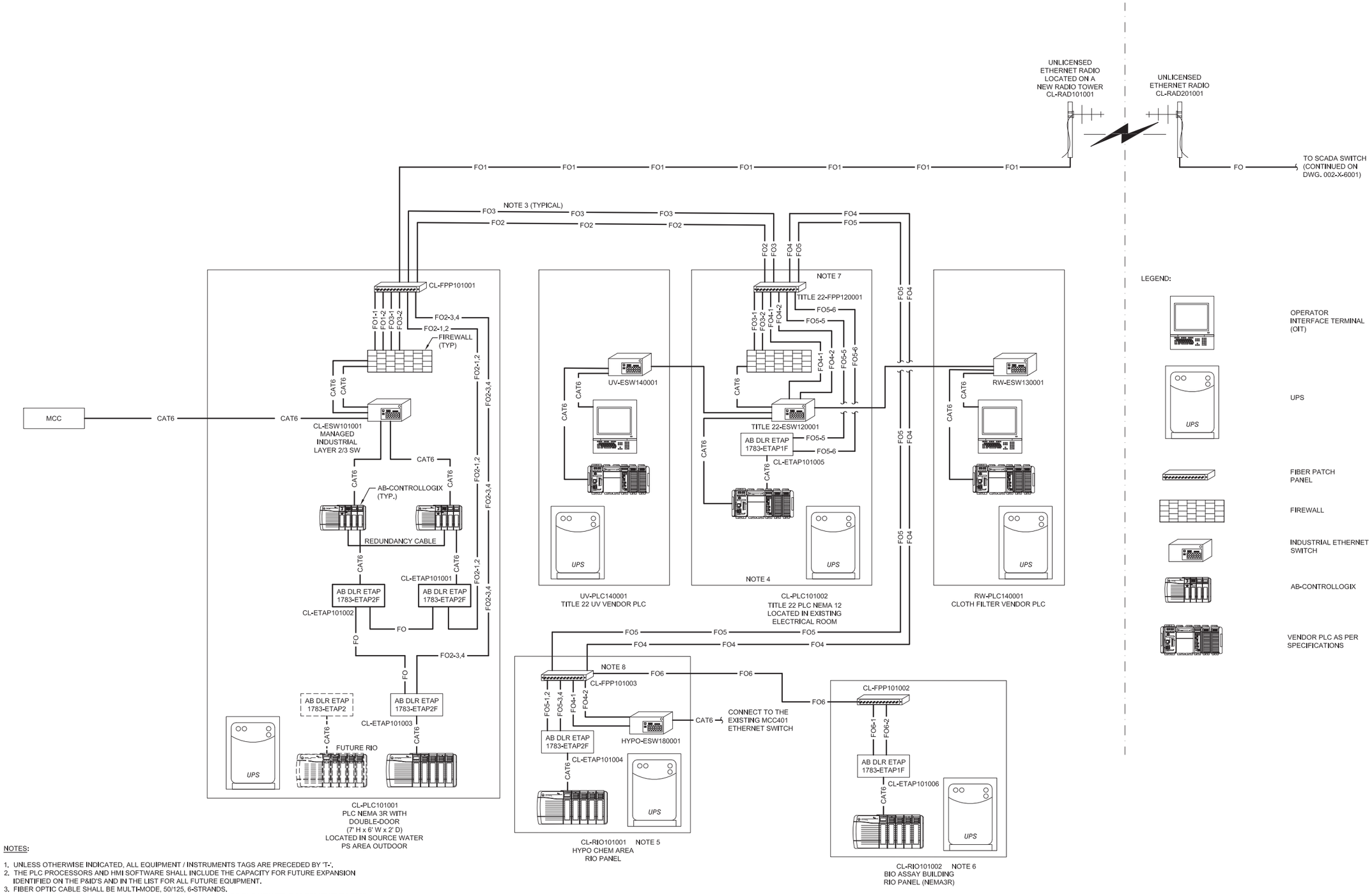
D10000

SANTA CRUZ TTF



NOTES:

1. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
2. THE PLC PROCESSORS AND HMI SOFTWARE SHALL INCLUDE THE CAPACITY FOR FUTURE EXPANSION IDENTIFIED ON THE P&ID'S AND IN THE LIST FOR ALL FUTURE EQUIPMENT.
3. FIBER OPTIC CABLE SHALL BE MULTI-MODE, 50/125, 6-STRANDS.
4. PROJECT TO MODIFY THE CITY'S EXISTING SCADA SCREEN TO ADD THE NEW TITLE 22 EQUIPMENT USING WONDERWARE SYSTEM PLATFORM 2017 UPDATE 3 AND MODIFY THE CITY'S HISTORIAN TO ADD THE NEW TITLE 22 I/O's IN THE HISTORIAN DATABASE.
5. CL-RIO101001 SHALL BE CONNECTED TO THE CL-PLC101001 THROUGH THE DLR RING NETWORK.
6. CL-RIO101002 SHALL BE CONNECTED TO THE CL-PLC101002 THROUGH THE DLR NETWORK.
7. PROVIDE FIBER JUMPERS: JUMPER FO2-1 TO FO5-1, FO2-2 TO FO5-2, FO2-3 TO FO5-3, FO2-4 TO FO5-4.
8. PROVIDE FIBER JUMPERS: JUMPER FO5-5 TO FO6-1, FO5-6 TO FO6-2.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/23/2021 8:38 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16568 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:41:27-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
001-X-6001

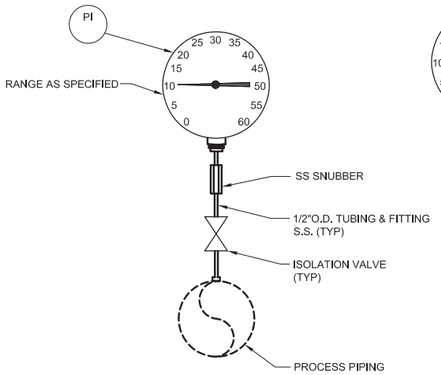
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

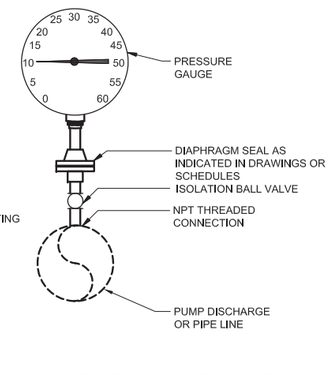
INSTRUMENTATION TTF CONTROL NETWORK DIAGRAM

DRAWING NUMBER
001-X-6001

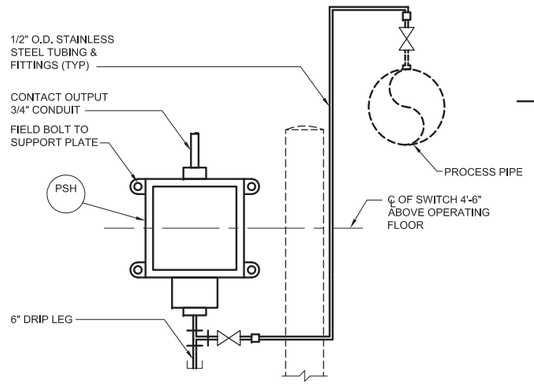
SHEET NUMBER
302 OF 370



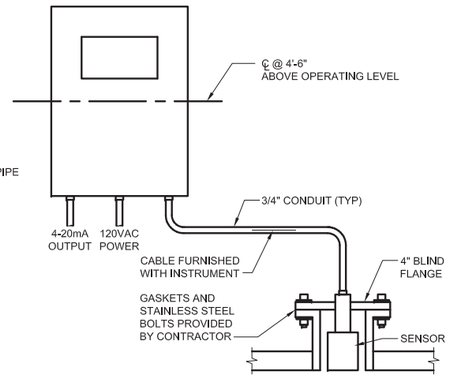
A PRESSURE GAUGE
NO SCALE



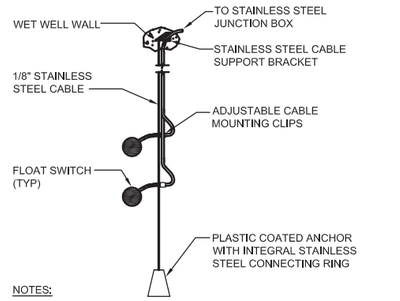
B FIELD-MOUNT PRESSURE GAUGE WITH DIAPHRAGM SEAL
NO SCALE



C PRESSURE SWITCH
NO SCALE



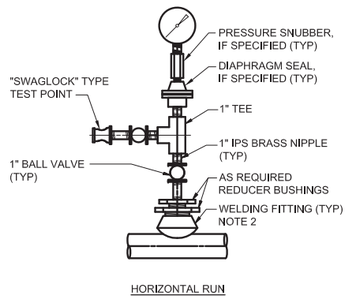
D ULTRASONIC LEVEL TRANSMITTER
NO SCALE

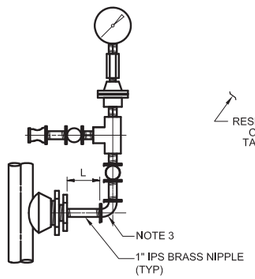


NOTES:

1. LEVEL FLOATS TO BE MOUNTED WITHIN 18" TO ONE SIDE OF ACCESS OPENING.
2. WHERE FLOATS ARE SET CLOSER THAN 18" OF LEVEL DIFFERENCE, ROTATE FLOATS AROUND PIP TO AVOID INTERFERENCE.

E WET WELL LEVEL FLOATS
NO SCALE

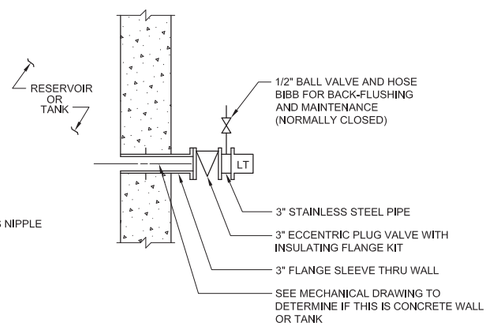




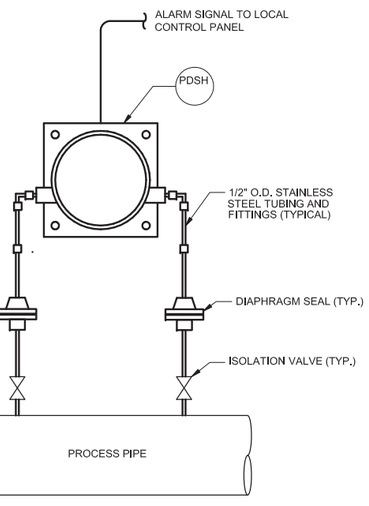
F PRESSURE GAUGE/TRANSMITTER/SWITCH
NO SCALE

NOTES:

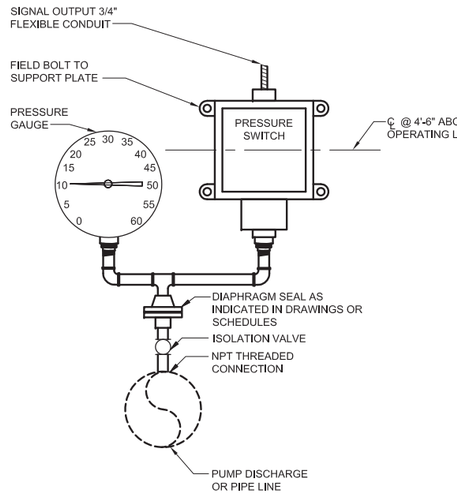
1. THIS TYPICAL DETAIL APPLIES TO MOUNTING OF INDICATORS, SWITCHES AND TRANSMITTERS.
2. WELDING FITTING SHALL BE BONNEY FORGE "THEDOLETS", PORTER "W-S TEELETS", VOGT "WELD COUPLETS", OR EQUAL. FOR 2-INCH AND SMALLER STEEL PIPE, PROVIDE STD OR REDUCING TEE IN LIEU OF WELDED FITTING.
3. ANSI B16.15, CLASS 125 BRONZE THREADED FITTING.
4. DIMENSION "L" SHALL BE SUFFICIENT TO PREVENT CONTACT BETWEEN THE GAUGE CASE, DIAPHRAGM SEAL HOUSING, OR VALVE OPERATING LEVER AND ADJACENT PIPING OR INSULATION BUT SHALL NOT EXCEED 4 INCHES UNLESS OTHERWISE PERMITTED BY THE ENGINEER.
5. PROVIDE DIELECTRIC ISOLATION BUSHINGS OR FITTINGS ON ALL INSTRUMENT CONNECTIONS TO PIPE.
6. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.



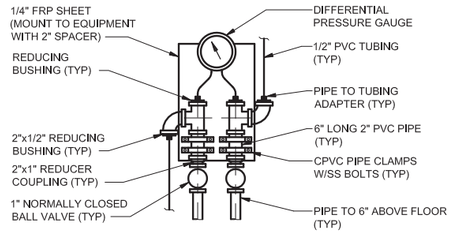
FLANGE MOUNTED PRESSURE SENSING
G LEVEL TRANSMITTER
NO SCALE



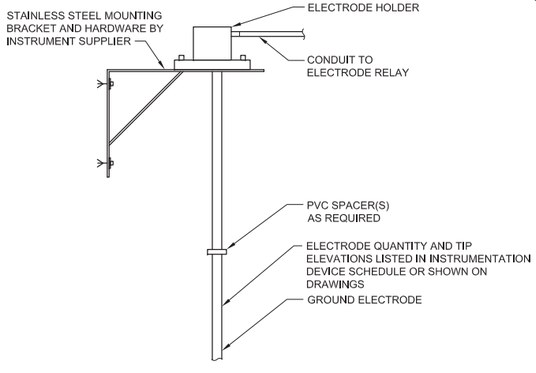
H LIQUID DIFFERENTIAL PRESSURE SWITCH
NO SCALE



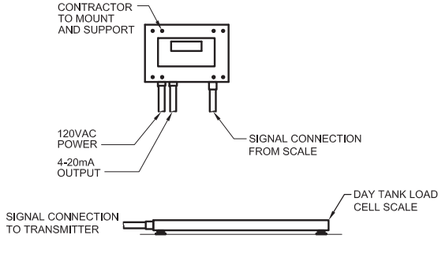
PRESSURE SWITCH & GAUGE
I WITH DIAPHRAGM SEAL
NO SCALE



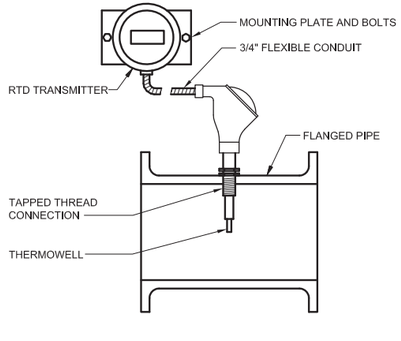
J PRESSURE DIFFERENTIAL INDICATOR
NO SCALE



K ELECTRODE RELAY LEVEL SWITCH
NO SCALE



L LOAD CELL TYPE TANK WEIGH SCALE
NO SCALE



M RTD/THERMOWELL
NO SCALE

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER No. E 16568 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:41:36-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

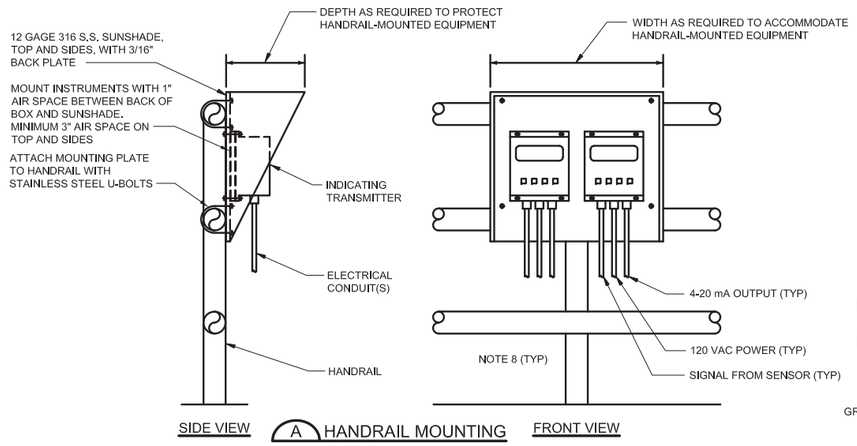
DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 002-X-5001
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

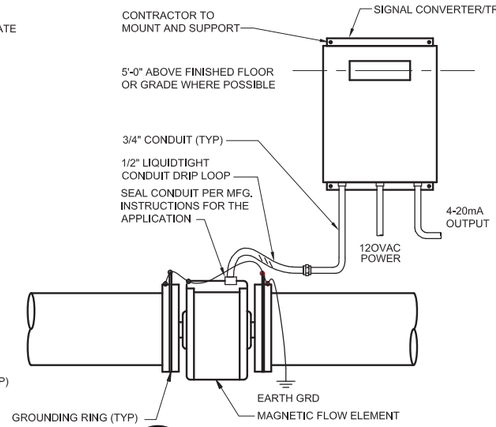
INSTRUMENTATION
AWPF INSTRUMENTATION INSTALLATION DETAILS
SHEET 1 OF 5

DRAWING NUMBER
002-X-5001

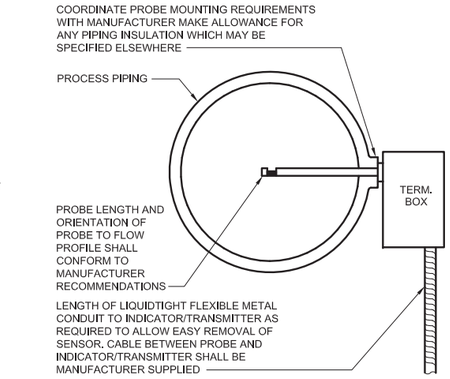
SHEET NUMBER
303 OF 370



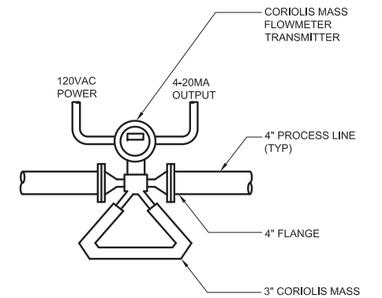
A HANDRAIL MOUNTING
NO SCALE



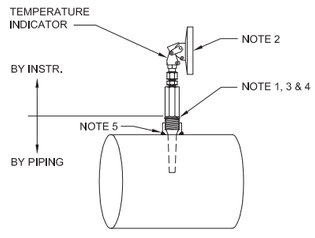
B MAGNETIC FLOWMETER
NO SCALE
NOTE: PIPE TO BE SUPPORTED ON BOTH SIDES OF METER.



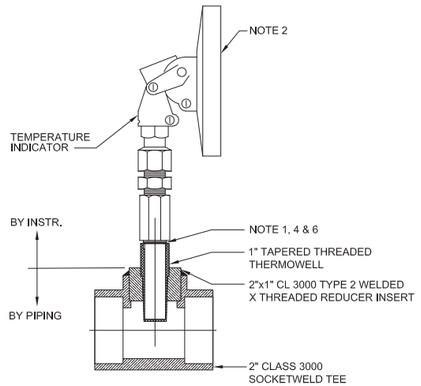
C THERMAL DISPERSION FLOWMETER SENSOR
NO SCALE



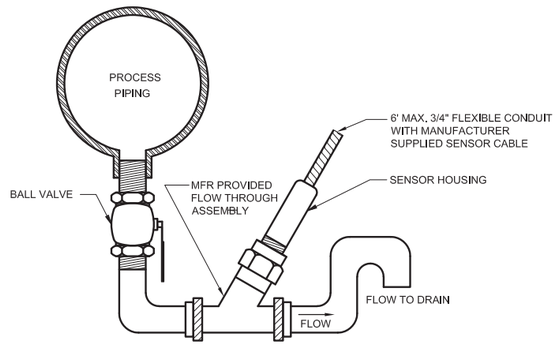
D CORIOLIS MASS FLOWMETER
NO SCALE



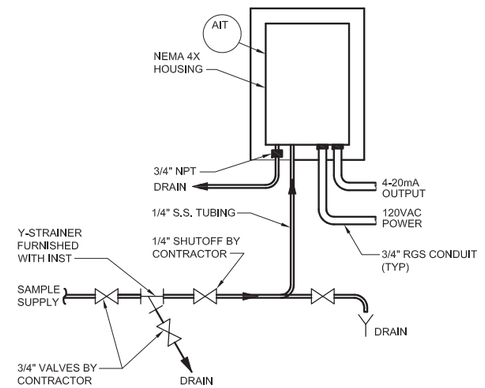
E TEMPERATURE INDICATOR INSTALLATION IN PIPING 2-1/2" AND LARGER AND IN VESSELS
NO SCALE



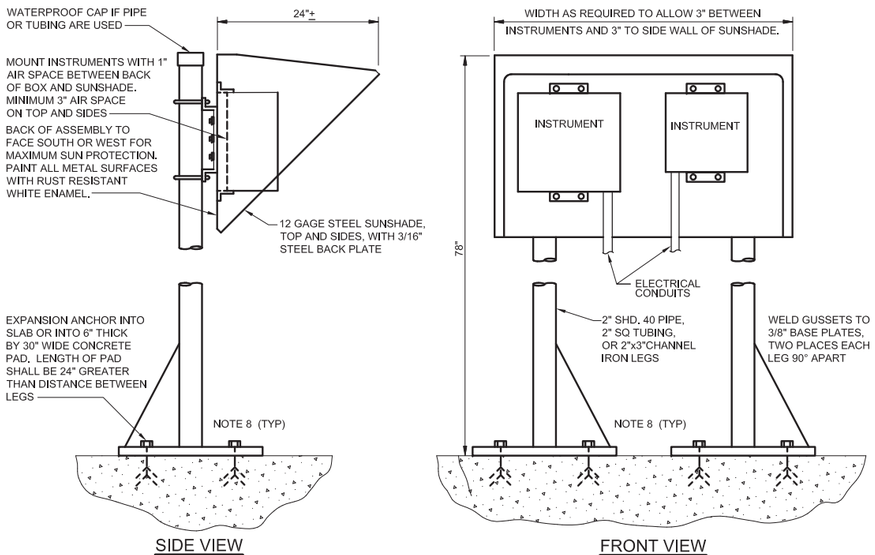
F TEMPERATURE INDICATOR INSTALLATION IN PIPING 2 1/2" AND SMALLER
NO SCALE (NOTES 6 & 7)



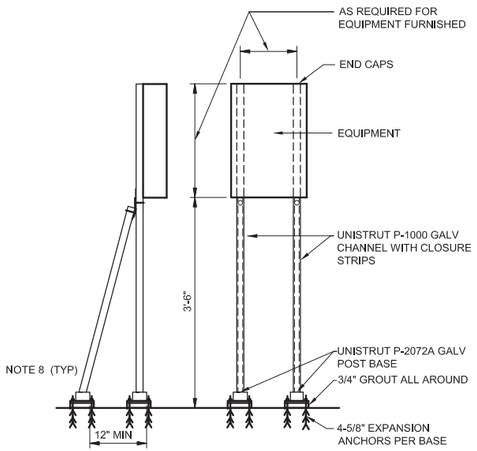
G CONDUCTIVITY, pH AND ORP SENSOR FLOW-THROUGH CELL MOUNTED
NO SCALE



H RESIDUAL CHLORINE ANALYZER
NO SCALE



I OUTDOOR INSTRUMENT MOUNTING DETAIL
NO SCALE
(FOR INSTRUMENTS GREATER THAN 10" WIDE OR MULTIPLE INSTRUMENTS)



J TYPICAL EQUIPMENT MOUNTING DETAIL
NO SCALE
NOTE: IN OUTDOOR LOCATIONS, USE STAINLESS STEEL BOLTS, NUTS, WASHERS AND ANCHOR BOLTS.

NOTES:

1. SEAL WELD THREADED THERMOWELLS WHEN DESIGN CONDITIONS EXCEED 925° OR 1500 PSI. (SEE B31.1-114.2.3)
2. ORIENT TEMPERATURE INDICATOR TO BE VISIBLE FROM NEAREST ISLE OR WALKWAY.
3. PROVIDE THERMOWELL BOSS FOR NEW THERMOWELL INSTALLATION WHERE NO CONNECTIONS CURRENTLY EXIST.
4. REMOVE THERMOWELL AND INSTALL PLUG FOR STEAM BLOW.
5. ENSURE THAT THE HOLE FOR THE WELL IS DRILLED BEFORE THE BOSS IS INSTALLED. COORDINATE THE HOLE SIZE WITH THE SHOP DRAWINGS.
6. FOR SIZES LESS THAN 2" USE CONCENTRIC PIPING REDUCERS WITH THIS 2" TEE.
7. SEE THERMOCOUPLE AND TEST WELL ASSY - NPT FOR ALTERNATE TEE AND ELBOW METHODS.
8. THE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
9. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 16569
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:41:44-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

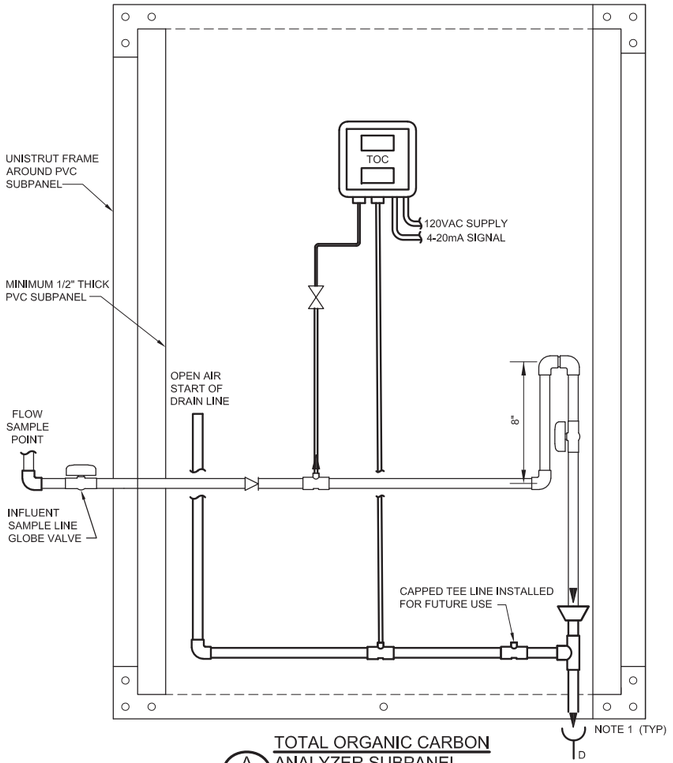
LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	002-X-5002
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

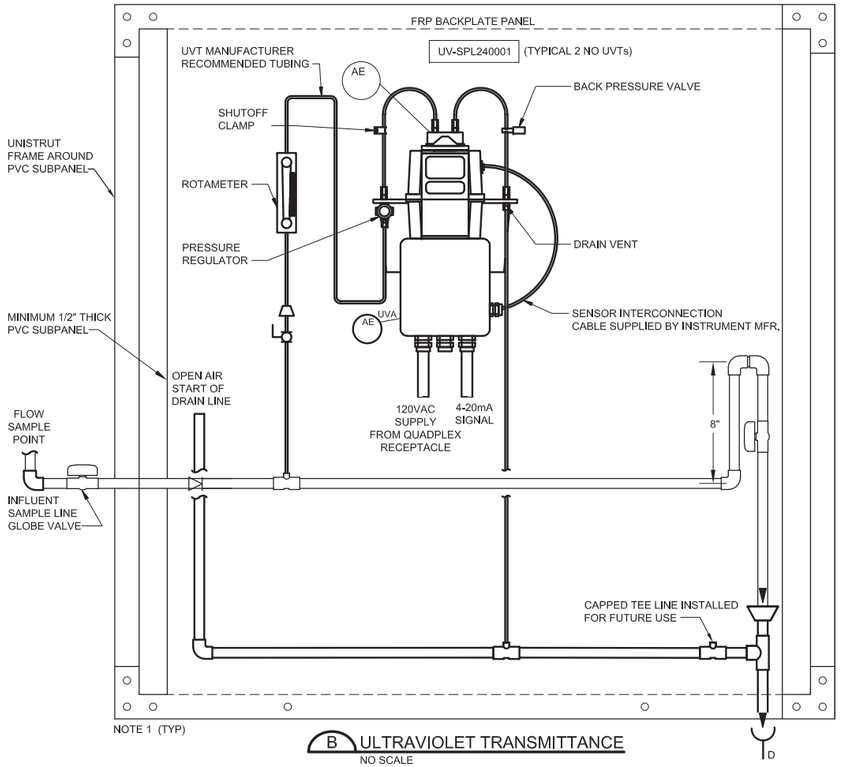
INSTRUMENTATION
AWPF INSTRUMENTATION INSTALLATION DETAILS
SHEET 2 OF 5

DRAWING NUMBER
002-X-5002

SHEET NUMBER
304 OF 370



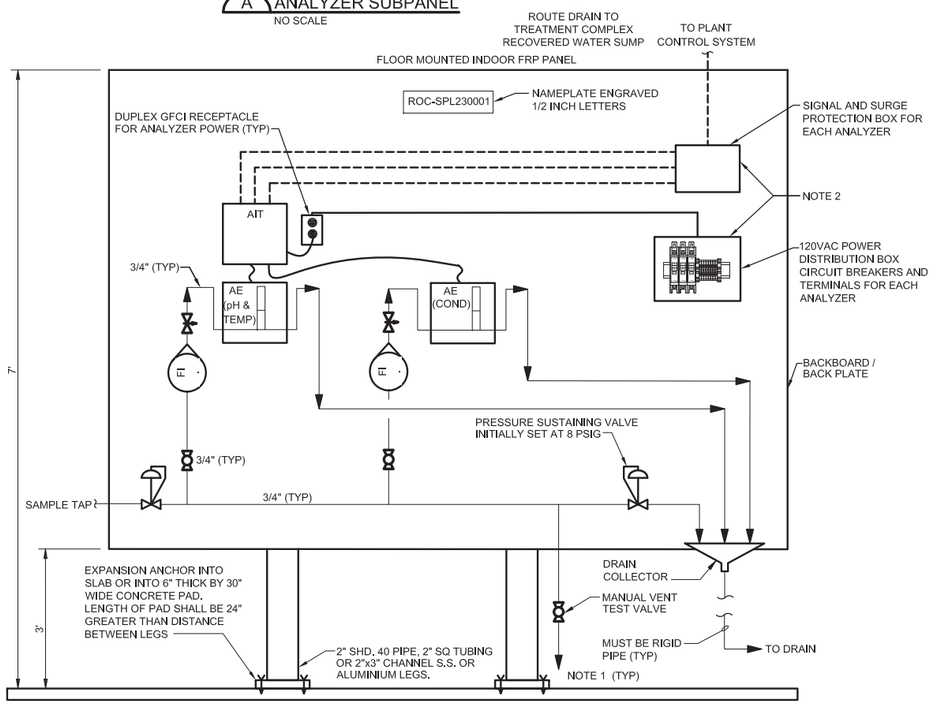
A TOTAL ORGANIC CARBON ANALYZER SUBPANEL
NO SCALE



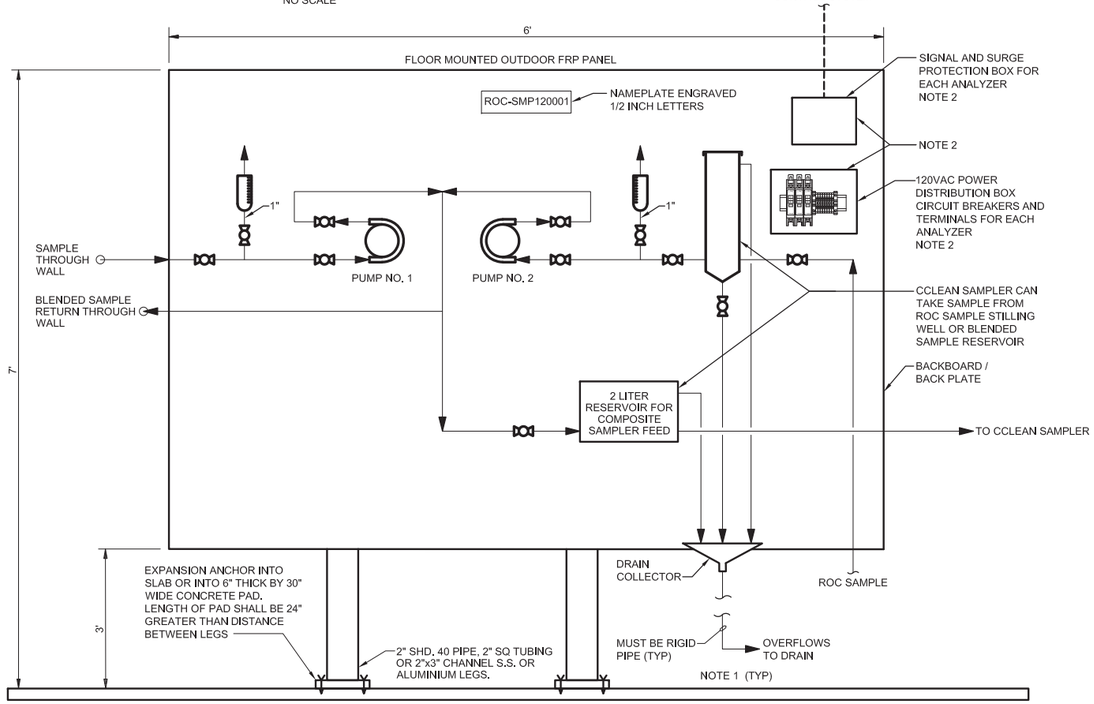
B ULTRAVIOLET TRANSMITTANCE
NO SCALE

NOTE:

1. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.
2. POWER DISTRIBUTION BOX AND SIGNAL JUNCTION BOX SHALL BE NEMA 3R RATED FOR OUTDOOR, NEMA 12 RATED FOR INDOOR AND NEMA 4X RATED FOR CHEMICAL AREA.



C pH AND CONDUCTIVITY ANALYZER SAMPLE BOARD
NO SCALE



D BIOASSAY SAMPLE BLEND PANEL
NO SCALE

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Walnut Creek, California

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No. E 16568
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:41:51-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 002-X-5003
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF INSTRUMENTATION INSTALLATION DETAILS
SHEET 3 OF 5

DRAWING NUMBER
002-X-5003

SHEET NUMBER
305 OF 370

PLOTTED: 8/20/2021 3:11 PM
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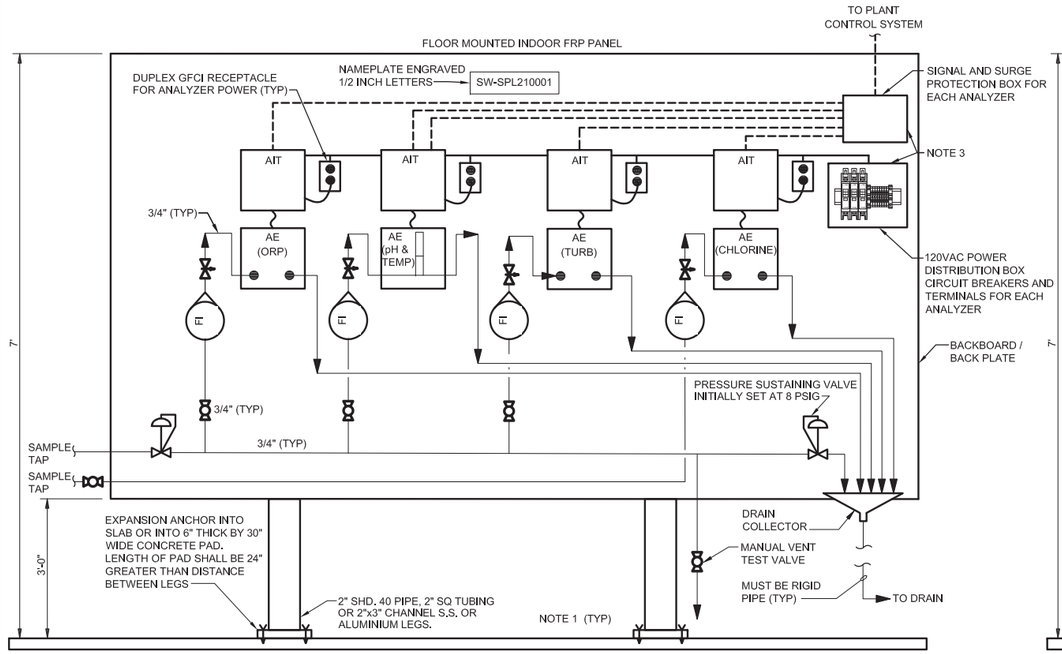
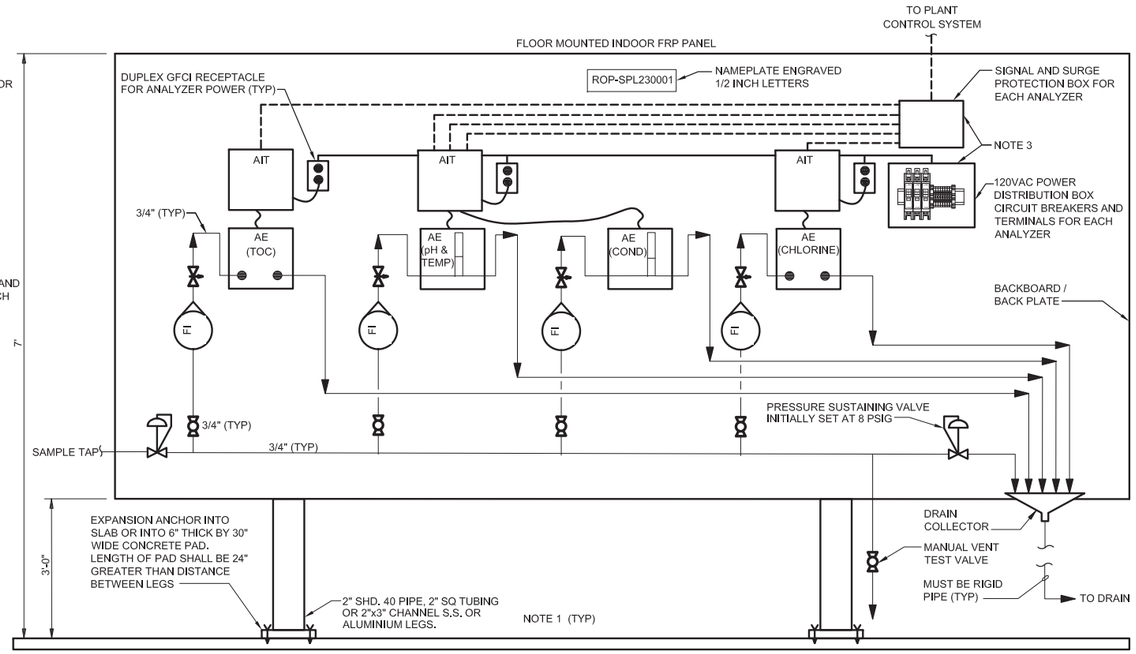
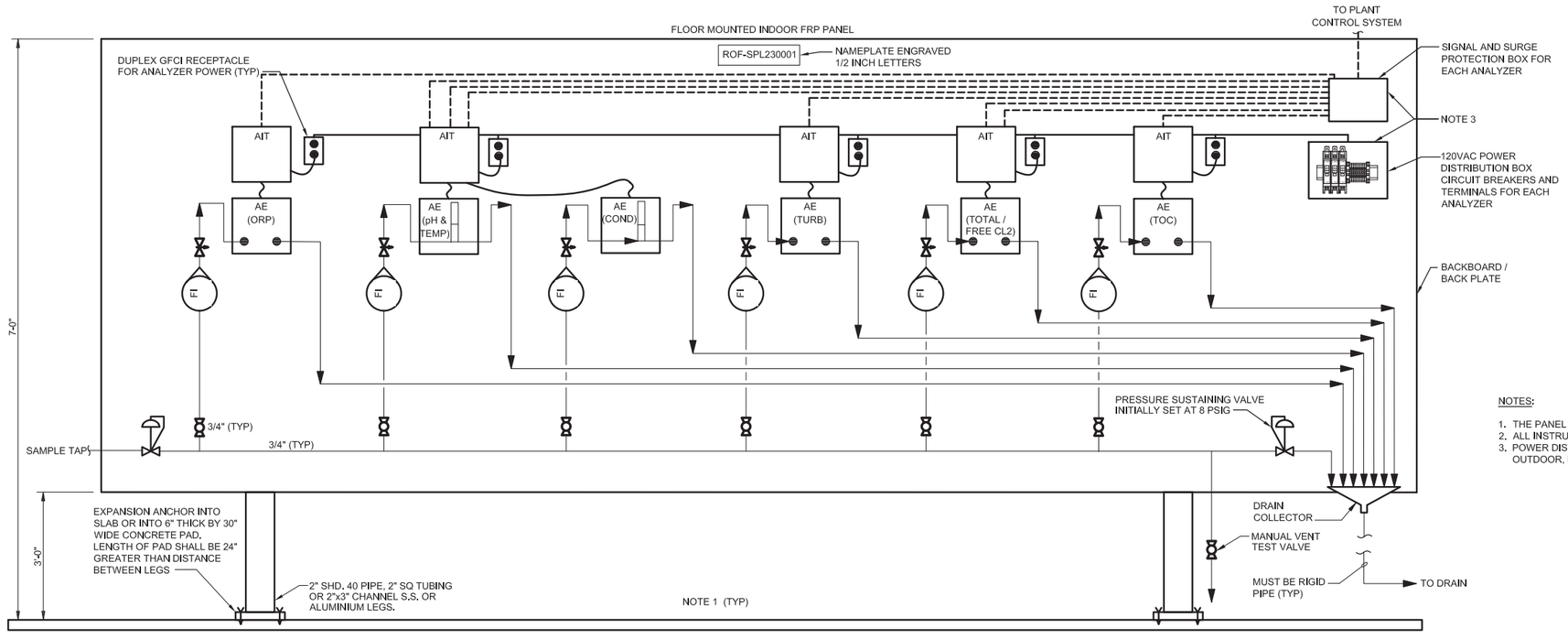


A ORP, pH, TURBIDITY AND CHLORINE ANALYZER SAMPLE BOARD
NO SCALE



B TOC, pH, CONDUCTIVITY AND CHLORINE ANALYZER SAMPLE BOARD
NO SCALE



C ORP, pH, CONDUCTIVITY, TURBIDITY, CHLORINE AND TOC ANALYZER SAMPLE BOARD
NO SCALE

NOTES:

1. THE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
2. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.
3. POWER DISTRIBUTION BOX AND SIGNAL JUNCTION BOX SHALL BE NEMA 3R RATED FOR OUTDOOR, NEMA 12 RATED FOR INDOOR AND NEMA 4X RATED FOR CHEMICAL AREA.

ISSUED FOR CONSTRUCTION

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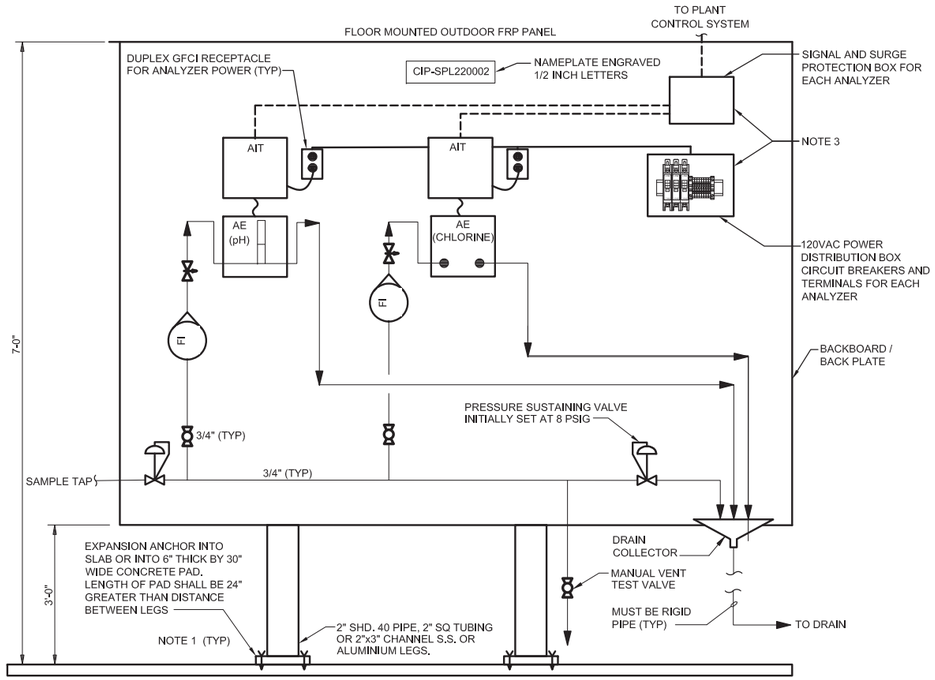
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	002-X-5004
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION
AWPF INSTRUMENTATION INSTALLATION DETAILS
SHEET 4 OF 5

DRAWING NUMBER
002-X-5004

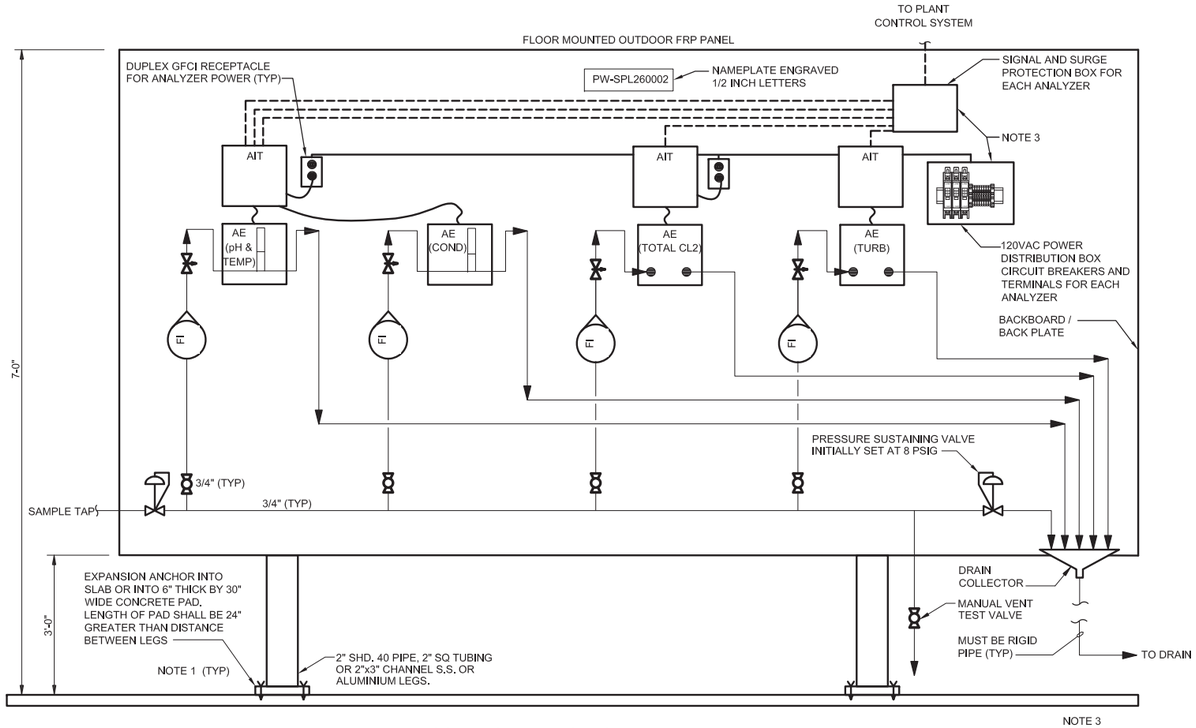
SHEET NUMBER
306 OF 370



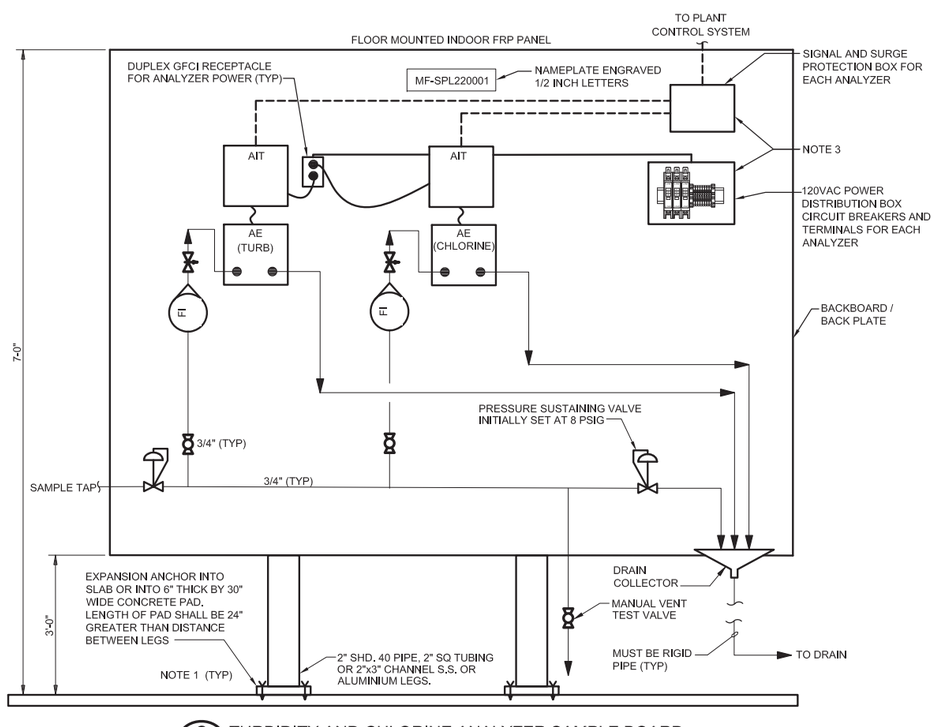
A pH AND CHLORINE ANALYZER SAMPLE BOARD
NO SCALE

NOTES:

1. THE SAMPLE PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
2. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.
3. POWER DISTRIBUTION BOX AND SIGNAL JUNCTION BOX SHALL BE NEMA 3R RATED FOR OUTDOOR, NEMA 12 RATED FOR INDOOR AND NEMA 4X RATED FOR CHEMICAL AREA.



B pH, CONDUCTIVITY, CHLORINE AND TURBIDITY ANALYZER SAMPLE BOARD
NO SCALE



C TURBIDITY AND CHLORINE ANALYZER SAMPLE BOARD
NO SCALE

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 3:12 PM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16568
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:42:08-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

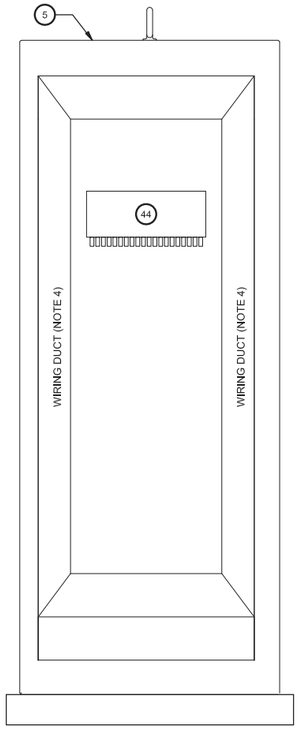
DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 002-X-5005
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

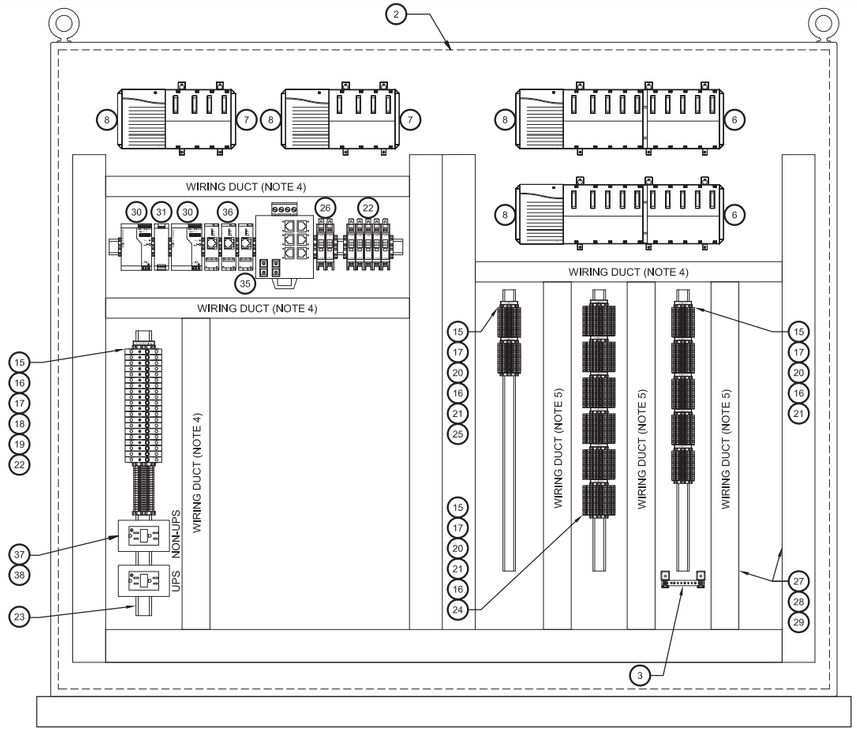
INSTRUMENTATION
AWPF INSTRUMENTATION INSTALLATION DETAILS
SHEET 5 OF 5

DRAWING NUMBER
002-X-5005

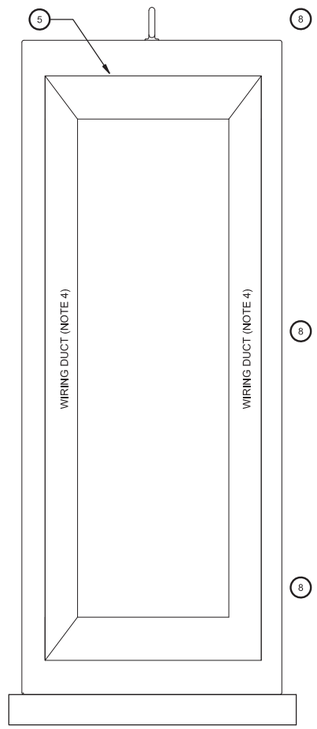
SHEET NUMBER
307 OF 370



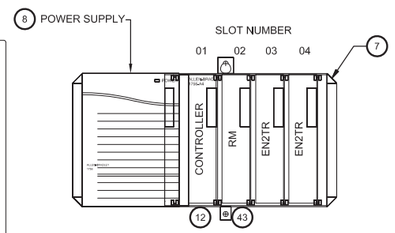
LEFT SIDE PANEL LAYOUT
PLC ENCLOSURE



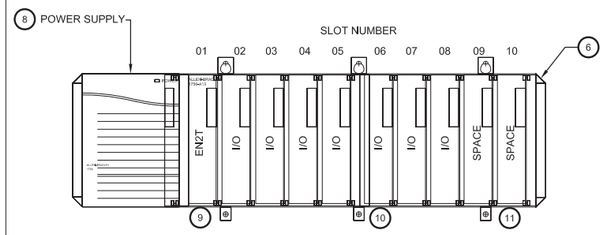
BACK PANEL LAYOUT
PLC ENCLOSURE

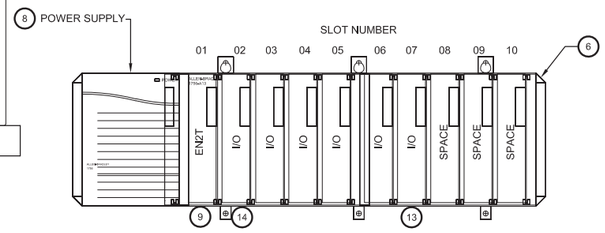


RIGHT SIDE PANEL LAYOUT
PLC ENCLOSURE

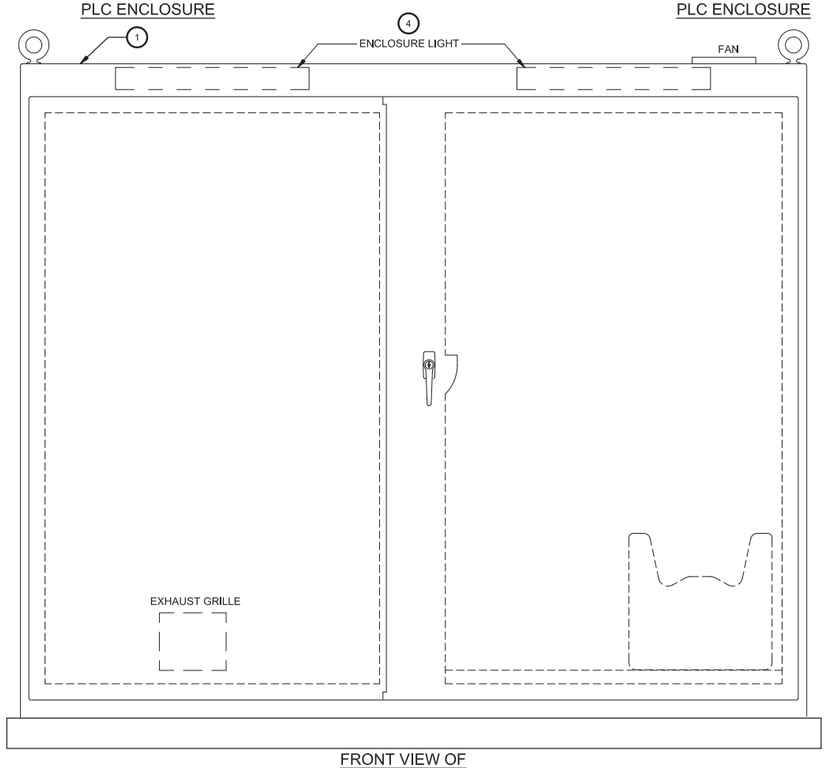


PLC MAIN RACK
SLOT LAYOUT AND ARRANGEMENT
(TYPICAL FOR TWO PLCS)





PLC RIO RACK
SLOT LAYOUT AND ARRANGEMENT



FRONT VIEW OF
PLC ENCLOSURE

REFERENCE PLC CONTROL PANEL BILL OF MATERIALS

ITEM	MANUFACTURER	DESCRIPTION
1		NEMA 12/4X ENCLOSURE, 84" x 72" x 24" OR (SEE NOTE 1,5)
2		SUB PANEL, 72" x 68" OR (SEE NOTE 5)
3		GROUNDING BAR, WITH A-GLK2 MOUNTING KIT
4		24" LED LIGHT PACKAGE
5		SIDE PANEL, 72" X 14" OR (SEE NOTE 5)
6	ALLEN-BRADLEY	CHASSIS, 10 SLOT
7	ALLEN-BRADLEY	CHASSIS, 4 SLOT
8	ALLEN-BRADLEY	120VAC POWER SUPPLY, 75W
9	ALLEN-BRADLEY	SINGLE PORT ETHERNET MODULE
10	ALLEN-BRADLEY	120VAC ISOLATED DIGITAL INPUT MODULE, 16 POINTS
11	ALLEN-BRADLEY	ANALOG INPUT MODULE, 16 SINGLE-ENDED/ 4-20mA POINTS
12	ALLEN-BRADLEY	CONTROLOGIX CONTROLLER WITH 3 MB USER MEMORY
13	ALLEN-BRADLEY	ANALOG OUTPUT MODULE, 8 OUTPUTS, 4-20mA
14	ALLEN-BRADLEY	120VAC DIGITAL OUTPUT MODULE, 16 OUTPUTS
15	ALLEN-BRADLEY	END ANCHOR
16	ALLEN-BRADLEY	END BARRIER FOR TERMINALS
17	ALLEN-BRADLEY	TERMINAL GROUP MARKER
18	ALLEN-BRADLEY	TERMINAL BLOCK, 20A (GREY)
19	ALLEN-BRADLEY	TERMINAL BLOCK, 30A (GREY)
20	ALLEN-BRADLEY	3-TIER TERMINAL BLOCK, 20A (GREY)
21	ALLEN-BRADLEY	END BARRIER FOR 3-TIER TERMINAL BLOCK
22	ALLEN-BRADLEY	CIRCUIT BREAKER, SINGLE POLE, 2AMP
23		DIN RAIL, HI-RISE
24	ALLEN-BRADLEY	2-TIER TERMINAL BLOCK, 20A (GREY)
25	ALLEN-BRADLEY	END BARRIER FOR 2-TIER TERMINAL BLOCK
26	ALLEN-BRADLEY	CIRCUIT BREAKER, SINGLE POLE, 20AMP
27		WIRE DUCT COVER, 3" (NOTE 4)
28		WIRE DUCT, 2" x 4" (NOTE 4)
29		WIRE DUCT COVER, 2" (NOTE 4)
30		24VDC POWER SUPPLY
31		DIODE MODULE
32		PREWIRED CABLE FOR 16 POINT ISOLATED I/O MODULES
33		PREWIRED CABLE FOR 1756 ANALOG INPUT MODULES
34		PREWIRED CABLE FOR 1756 ANALOG OUTPUT MODULES
35		ETHERNET SWITCH, 120VAC, (NOTE 6)
36	ALLEN-BRADLEY	1783-ETAP2F
37		DUPLEX RECEPTACLE COVER PLATE, IVORY
38		RECEPTACLE, 15 AMP, DUPLEX , GFCI
39		NIPPLE, 1/2"
40		LOCK NUT, 1/2"
41		PLASTIC BUSHING, 1/2"
42		STEEL, 4" x 2-1/8" x 1-7/8"
43	ALLEN-BRADLEY	REDUNDANCY MODULE
44		FIBER PATCH PANEL - 24 PORT

NOTES:

1. PLC ENCLOSURE SHALL BE A FREE STANDING NEMA 12 (INDOOR) OR NEMA 4X STAINLESS STEEL POWDER COATED WHITE (OUTDOOR).
2. ENCLOSURE FINISHED SHALL BE DONE BY MANUFACTURER: INTERIOR - STANDARD WHITE ENAMEL (INTERIOR) EXTERIOR - POLYESTER URETHANE POWDER.
3. ENCLOSURE BOTTOM SHALL BE PUNCHED FOR THE EXACT NUMBER OF CONDUITS STUBS TO BE USED. PUNCHED HOLE DIAMETER SHALL NOT EXCEED CONDUIT DIAMETER PLUS 1/2 INCH.
4. VERIFY EXACT SIZE OF ALL WIRING DUCTS. WIRING DUCTS SHALL BE SIZED WITH 30 PERCENT SPARE CAPACITY.
5. PLC ENCLOSURE EXACT DIMENSION SHALL DETERMINED BY THE CONTRACTOR.
6. ETHERNET SWITCH SHALL HAVE TWO SPARE COPPER PORTS.
7. FIBER PATCH PANEL INSIDE THE PLC ENCLOSURE SHALL BE PROVIDED FOR THE FIELD FIBER OPTIC CABLE. ALL FIBERS SHALL BE LANDED INSIDE THE FIBER PANEL. FIBER PATCH CABLES SHALL BE PROVIDED BY THE PLC SUPPLIER.
8. PANEL DRAWING LAYOUT AND DETAILS INDICATED FOR REFERENCE ONLY. CONTRACTOR SHALL DEVELOP ACTUAL LAYOUT, DETAILS AND WIRING AND SUBMIT FOR REVIEW.
9. FANS SHALL BE PROVIDED ONLY FOR NEMA 12 PANELS.
10. THE PLC PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
11. PROVIDE SUNRAIN SHIELD FOR ANY OUTDOOR PANELS THAT ARE NOT UNDER ANY COVER. SEE ELECTRICAL DRAWINGS WHICH SHOW THE LOCATIONS OF THE PANELS.

ISSUED FOR CONSTRUCTION

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16569
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:42:15-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
002-X-5011

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF PLANT PLC PANEL LAYOUT

DRAWING NUMBER
002-X-5011

SHEET NUMBER
308 OF 370

PLOTTED: 8/20/2021 3:12 PM
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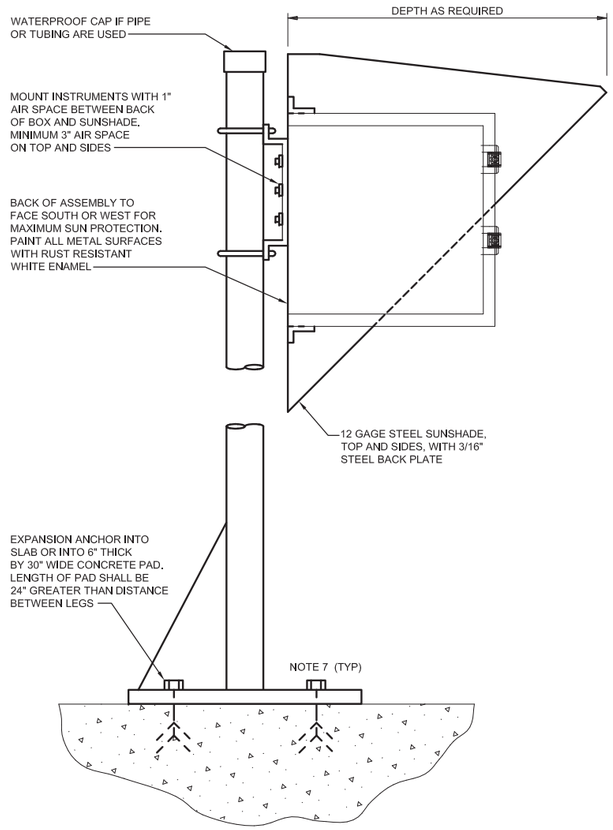
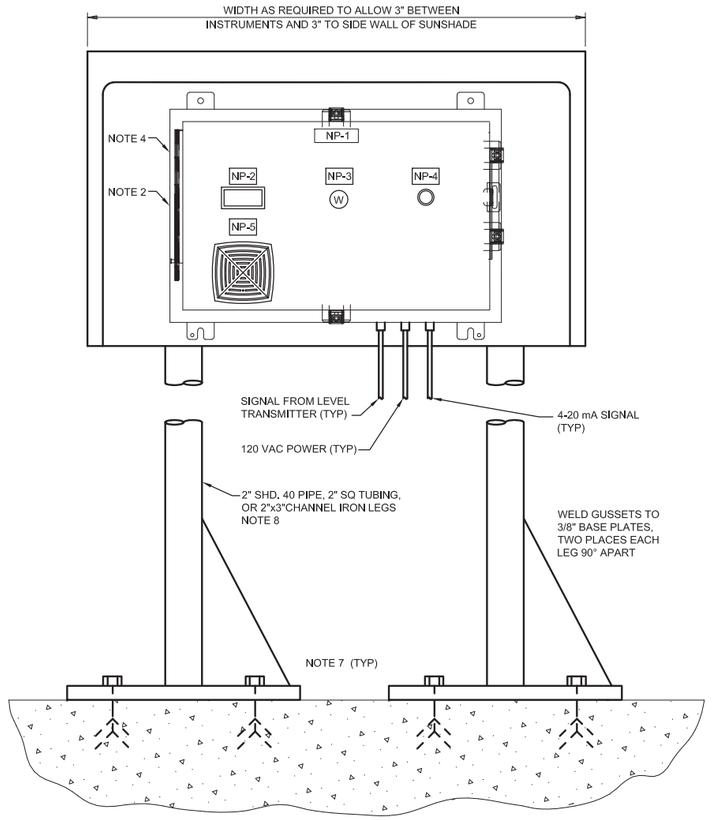


SIDE VIEW



FRONT VIEW

NAMEPLATE LEGEND FOR CALCIUM CHLORIDE SYSTEM		
NP #	1ST LINE TEXT	2ND LINE TEXT
NP-1	CALCIUM CHLORIDE TRUCK UNLOADING PANEL	CACL-LCP286011
NP-2	CALCIUM CHLORIDE STORAGE TANK	LEVEL
NP-3	CALCIUM CHLORIDE STORAGE TANK	HIGH LEVEL ALARM
NP-4		ALARM SILENCE
NP-5		ALARM HORN

BILL OF MATERIAL FOR CALCIUM CHLORIDE SYSTEM		
SR.	QUANTITY	DESCRIPTION
1	1	PUSH BUTTON (MOMENTORY)
2	1	DIGITAL INDICATOR WITH CONTACTS
3	1	120VAC RELAY, 5A 2NO+2NC
4	1	PILOT LIGHT
5	1	ELECTRONIC HORN

NAMEPLATE LEGEND FOR SODIUM BISULFITE SYSTEM		
NP #	1ST LINE TEXT	2ND LINE TEXT
NP-1	SODIUM BISULFITE TRUCK UNLOADING PANEL	NHS-LCP288011
NP-2	SODIUM BISULFITE STORAGE TANK	LEVEL
NP-3	SODIUM BISULFITE STORAGE TANK	HIGH LEVEL ALARM
NP-4		ALARM SILENCE
NP-5		ALARM HORN

BILL OF MATERIAL FOR SODIUM BISULFITE SYSTEM		
SR.	QUANTITY	DESCRIPTION
1	1	PUSH BUTTON (MOMENTORY)
2	1	DIGITAL INDICATOR WITH CONTACTS
3	1	120VAC RELAY, 5A 2NO+2NC
4	1	PILOT LIGHT
5	1	ELECTRONIC HORN

NAMEPLATE LEGEND FOR SODIUM HYPOCHLORITE SYSTEM		
NP #	1ST LINE TEXT	2ND LINE TEXT
NP-1	SODIUM HYPOCHLORITE TRUCK UNLOADING PANEL	NOCL-LCP281011
NP-2	SODIUM HYPOCHLORITE STORAGE TANK	LEVEL
NP-3	SODIUM HYPOCHLORITE STORAGE TANK	HIGH LEVEL ALARM
NP-4		ALARM SILENCE
NP-5		ALARM HORN

NAMEPLATE LEGEND FOR SODIUM HYDROXIDE SYSTEM		
NP #	1ST LINE TEXT	2ND LINE TEXT
NP-1	SODIUM HYDROXIDE TRUCK UNLOADING PANEL	NAOH-LCP283011
NP-2	SODIUM HYDROXIDE STORAGE TANK	LEVEL
NP-3	SODIUM HYDROXIDE STORAGE TANK	HIGH LEVEL ALARM
NP-4		ALARM SILENCE
NP-5		ALARM HORN

NAMEPLATE LEGEND FOR SULFURIC ACID SYSTEM		
NP #	1ST LINE TEXT	2ND LINE TEXT
NP-1	SULFURIC ACID TRUCK UNLOADING PANEL	HSO4-LCP285011
NP-2	SULFURIC ACID STORAGE TANK	LEVEL
NP-3	SULFURIC ACID STORAGE TANK	HIGH LEVEL ALARM
NP-4		ALARM SILENCE
NP-5		ALARM HORN

BILL OF MATERIAL (TYPICAL)		
SR.	QUANTITY	DESCRIPTION
1	1	PUSH BUTTON (MOMENTORY)
2	1	DIGITAL INDICATOR WITH 1 X 4-20mA INPUT AND 1 X 4-20mA OUTPUT
3	1	120VAC RELAY, 5A 2NO+2NC
4	1	PILOT LIGHT
5	1	ELECTRONIC HORN

NOTES:

1. COMPONENTS ARE SHOWN TO PROVIDE A GENERAL GUIDE ON PANEL LAYOUT AND DO NOT REFLECT EVERY COMPONENT NECESSARY FOR A COMPLETE INSTALLATION. SYSTEM SUPPLIER SHALL PROVIDE ADDITIONAL COMPONENTS AS NECESSARY FOR A COMPLETE INSTALLATION. SEE SPECIFICATIONS FOR ADDITIONAL DETAILS.
2. INSTRUMENTS, DEVICES AND WIREWAY SHALL BE MOUNTED TO A BACK OR SIDE SUB-PANEL.
3. SEE P&IDS AND SPECIFICATIONS FOR ADDITIONAL DETAILS.
4. PANEL SHALL BE POWDER COATED WHITE STAINLESS STEEL RATED NEMA 4X.
5. SEE ELECTRICAL DRAWINGS FOR ADDITIONAL DETAILS.
6. UNISTRUT CAN BE USED AS AN ALTERNATIVE FOR THE INSTALLATION OF UNLOADING PANEL.
7. THE UNLOADING PANEL SUPPORT SHALL CONFORM TO THE STATE AND LOCAL SEISMIC REQUIREMENTS.
8. ALL INSTRUMENT PANELS INSTALLED OUTDOOR SHALL BE PROVIDED WITH SUN SHADE.

ISSUED FOR CONSTRUCTION

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER No. E 16568 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:42:23-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	002-X-5012
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION AWPF CHEMICAL UNLOADING PANEL LAYOUT

DRAWING NUMBER
002-X-5012

SHEET NUMBER
309 OF 370

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CHANTICLEER AWPF

OMAR BUSINESS SERVER RACK
NOTE 5

19" FULL SERVER RACK
CL-SRK201001

HISTORIAN REDUNDANT SERVERS
(MS SERVER 2016)

REDUNDANT VMW SERVERS
(VM VSPHERE)
(MS SERVER)
THIN CLIENT SERVER

CL-SVR201001A
CL-SVR201001B
CL-SVR201002A
CL-SVR201002B

KVM
WITH KEY, MOUSE, MONITOR

NOTE 6
WIN911

FIREWALL
(TYPICAL)

OMAR OFFICE LAN
TELEPHONE
CAT6

DMZ NETWORK

MAIN GATE CCTV (IP)
NOTE 7

DISTRICT LEASED ALWAYS-ON PRIVATE INTERNET VPN LINE

FROM UNLICENSED ETHERNET RADIO CL-RAD-201001 (CONTINUED FROM DWG. 001-X-6001)

NOTE 3

ETHERNET LAYER 2/3 SW
CL-ESW201001A
CL-ESW201001B
CL-FPP201001

CL-PC201001A & 1B
OPERATOR THIN CLIENT PC x 2
2 x 24" SCREENS
(WONDERWARE SYS. PLATFORM, 2020, R2, MS WINDOWS 10)

SCADA NETWORK

CL-PC201002
ENGINEERING PC
2 x 24" SCREENS
(WONDERWARE DEVELOPMENT LICENSE, MS WINDOWS 10)
NOTE 7

LASER PRINTER

DISTRICT REMOTE PC
W 1 x 24" SCREEN
(WONDERWARE SYSTEM PLATFORM, 2020, R2 - VIEW ONLY, MS WINDOWS 10)
NOTE 8

DISTRICT'S DOWNTOWN OFFICE IT NETWORK

INJECTION WELLS
(BY OTHERS)

CL-RAD201002
UNLICENSED ETHERNET RADIO

UNLICENSED ETHERNET RADIO

FO JUMPER (TYP.)

CL-FPP201002
CL-ESW201002
PANELVIEW 7+,12"
MCC 1
MCC 2
REDUNDANCY CABLE
CL-ETAP201002
AB DLR ETAP 1783-ETAP2F
CL-ETAP201001
CL-FPP201003
CL-ETAP201003
CL-PLC201001
PLC NEMA 12 PANEL WITH DOUBLE-DOOR
(7' H x 6' W x 2' D)
LOCATED IN THE FIELD ELECTRICAL ROOM

UV-FPP240001
UV-ESW240001
UV-PLC240001
UV 1 PLC

UV-FPP240002
UV-ESW240002
UV-PLC240002
FUTURE UV 2 PLC

MF-FPP220001
MF-ESW220001
MF-PLC220001
MF MASTER PLC

RO-FPP230001
RO-ESW230001
RO-PLC230001
RO MASTER PLC

CO2-FPP250001
CO2-ESW250001
OZ-PLC270001
OZONE SYSTEM
VENDOR PLC

CL-FPP201004
CL-ETAP201004
CL-RIO201001
EAST OUTDOOR AREA
RIO PANEL

CL-FPP201006
CL-ETAP201006
CL-RIO201003
NORTH OUTDOOR AREA
RIO PANEL

CL-FPP201005
CL-ETAP201005
CL-RIO201002
WEST OUTDOOR AREA
RIO PANEL

CL-FPP201007
CL-ETAP201007
CL-RIO201004
FUTURE RIO PANEL FOR
FUTURE EQUIPMENT
NOTE 2

MF-RIO220001
MF TRAIN 1 RIO PANEL

MF-RIO220002
MF TRAIN 2 RIO PANEL

MF-RIO220003
MF TRAIN 3 RIO PANEL

RO-RIO230001
RO TRAIN 1 RIO PANEL

RO-RIO230002
RO TRAIN 2 RIO PANEL

INJECTION WELL
(3 TOTAL)
NOTE 9

NOTES:

1. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
2. THE PLC PROCESSORS AND HMI SOFTWARE SHALL INCLUDE THE CAPACITY FOR FUTURE EXPANSION IDENTIFIED ON THE P&ID'S AND IN THE LIST FOR ALL FUTURE EQUIPMENT.
3. FIBER OPTIC CABLE SHALL BE MULTI-MODE, 50/125, 6-STRANDS.
4. ALL PLC PANELS HAVE CENTRALIZED UPS POWER BACKUP EXCEPT WHAT IS SHOWN ON THE DRAWING.
5. SPACE WILL BE PROVIDED IN THE IT ROOM FOR OMAR TO FURNISH AND INSTALL ITS OWN BUSINESS SERVER RACK.
6. SYSTEM INTEGRATOR TO PROVIDE WIN911-2021 WITH EMAIL, TEXT AND MOBILE NOTIFICATIONS.
7. THE MAIN GATE CCTV IP CAMERA SHOULD BE DISPLAYED ON THE ENGINEERING WORK STATION.
8. SYSTEM INTEGRATOR SHALL DEVELOP A VIEW ONLY HMI SCREEN TO DISPLAY THE INJECTION WELL EQUIPMENT ON THE AWPF HMI. SYSTEM INTEGRATOR SHALL FURNISH A REMOTE FULL WORKSTATION WITH VIEW ONLY LICENSE. SYSTEM INTEGRATOR SHALL COORDINATE WITH THE DISTRICT TO INSTALL THE REMOTE WORKSTATION IN DISTRICT'S DOWNTOWN OFFICE.
9. SYSTEM INTEGRATOR SHALL PROVIDE A 200MHZ RADIO AND ASSOCIATED EQUIPMENT AT CHANTICLEER SITE FOR THE RADIO COMMUNICATION WITH THE INJECTION WELL, WILLOWBROOK SITE. THE RADIO AND ASSOCIATED EQUIPMENT AT WILLOWBROOK SITE WILL BE PROVIDED AND INSTALLED BY OTHERS.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16589
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:42:31-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

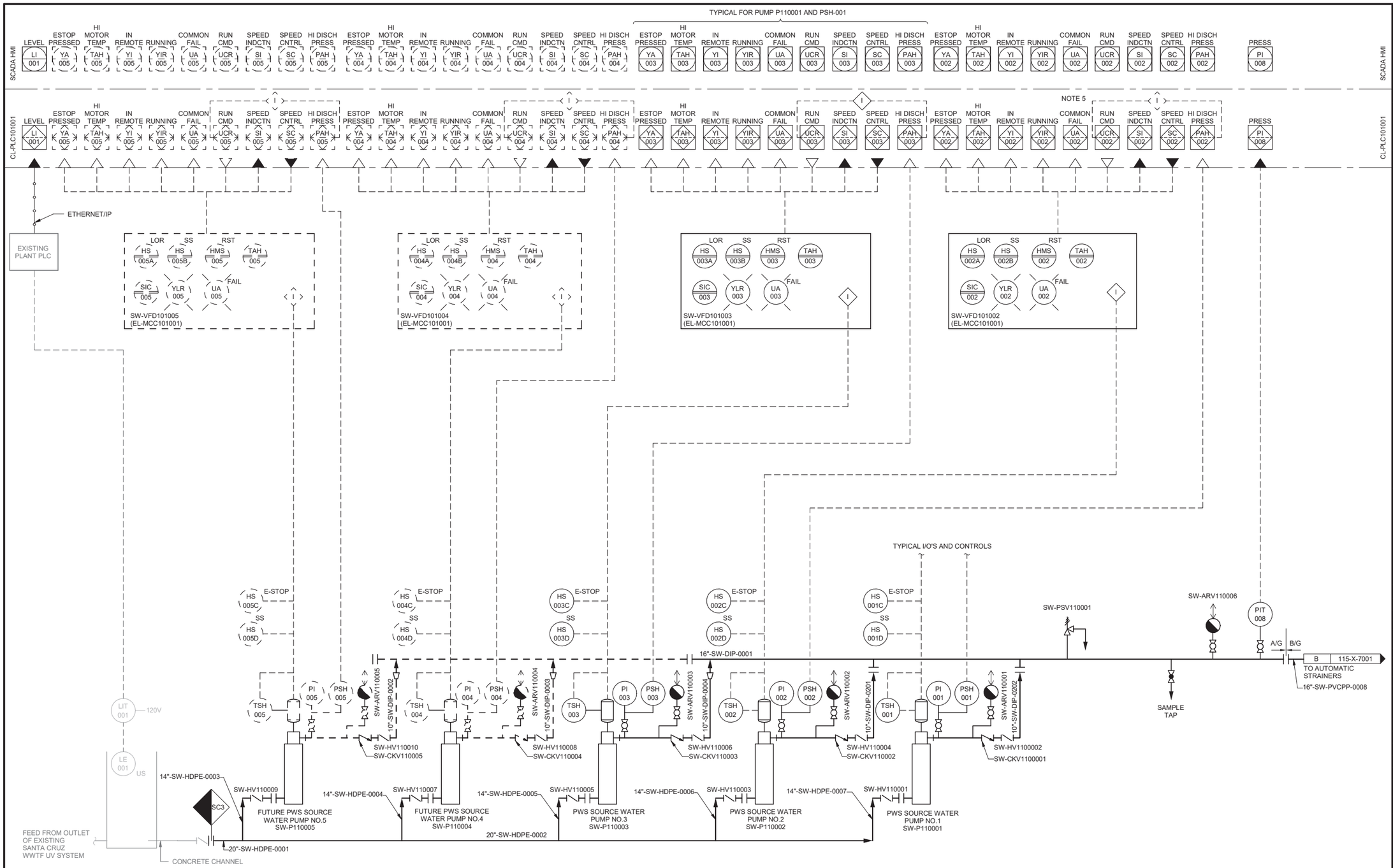
LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	002-X-6001
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION AWPF CONTROL NETWORK DIAGRAM

DRAWING NUMBER
002-X-6001

SHEET NUMBER
310 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS SW AND AREA CODE IS 110 UNLESS OTHERWISE NOTED.
4. SEE INSTRUMENT INSTALLATION DETAIL DRAWING FOR INSTALLATION DETAILS AND ACCESSORIES.
5. FUTURE I/O'S FOR FUTURE EQUIPMENT ARE LOCATED IN THE FUTURE RIO PANELS.

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER BRIANL. BUTLER NO. E 18564 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:42:39-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

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CHECKED:	KAB, BLB
APPROVED:	BLB

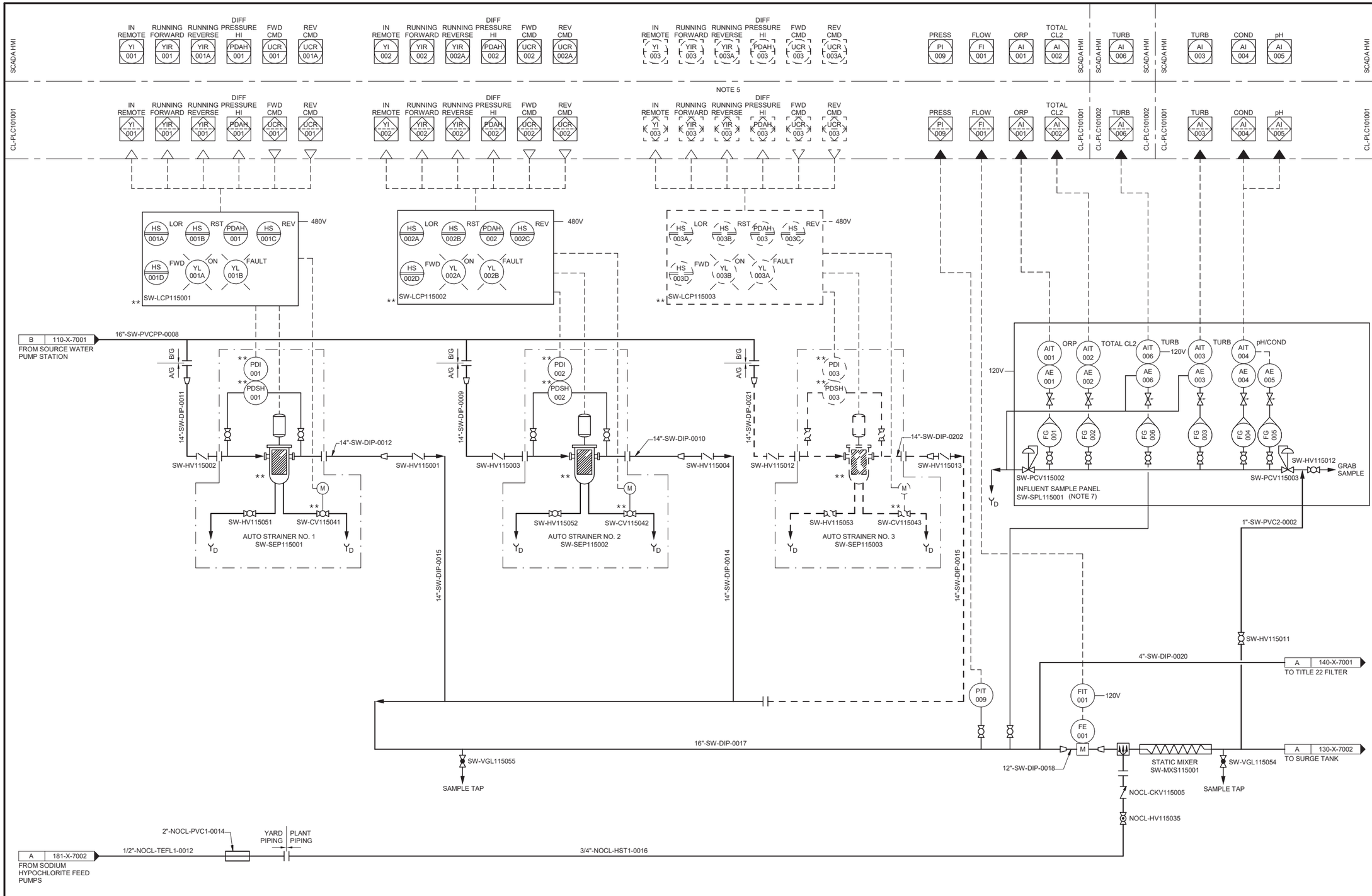
FILENAME 404790-110-SEC_EFF_PS.rvt
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

INSTRUMENTATION TTF PWS SOURCE WATER PUMP STATION P&ID

DRAWING NUMBER
110-X-7001

SHEET NUMBER
311 OF 370

PLOTTED: 8/20/2021 8:57:04 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS SW AND AREA CODE IS 115 UNLESS OTHERWISE NOTED.
4. ** PROVIDED BY AUTO STRAINER SUPPLIER.
5. FUTURE I/O'S FOR FUTURE EQUIPMENT ARE LOCATED IN THE FUTURE RIO.
6. NOT USED.
7. SEE INSTRUMENT INSTALLATION DETAIL DRAWING FOR INSTALLATION DETAILS AND ACCESSORIES.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 16563
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:42:47-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-101-NBAF_BUILDING.rvt

BV PROJECT NUMBER
404790

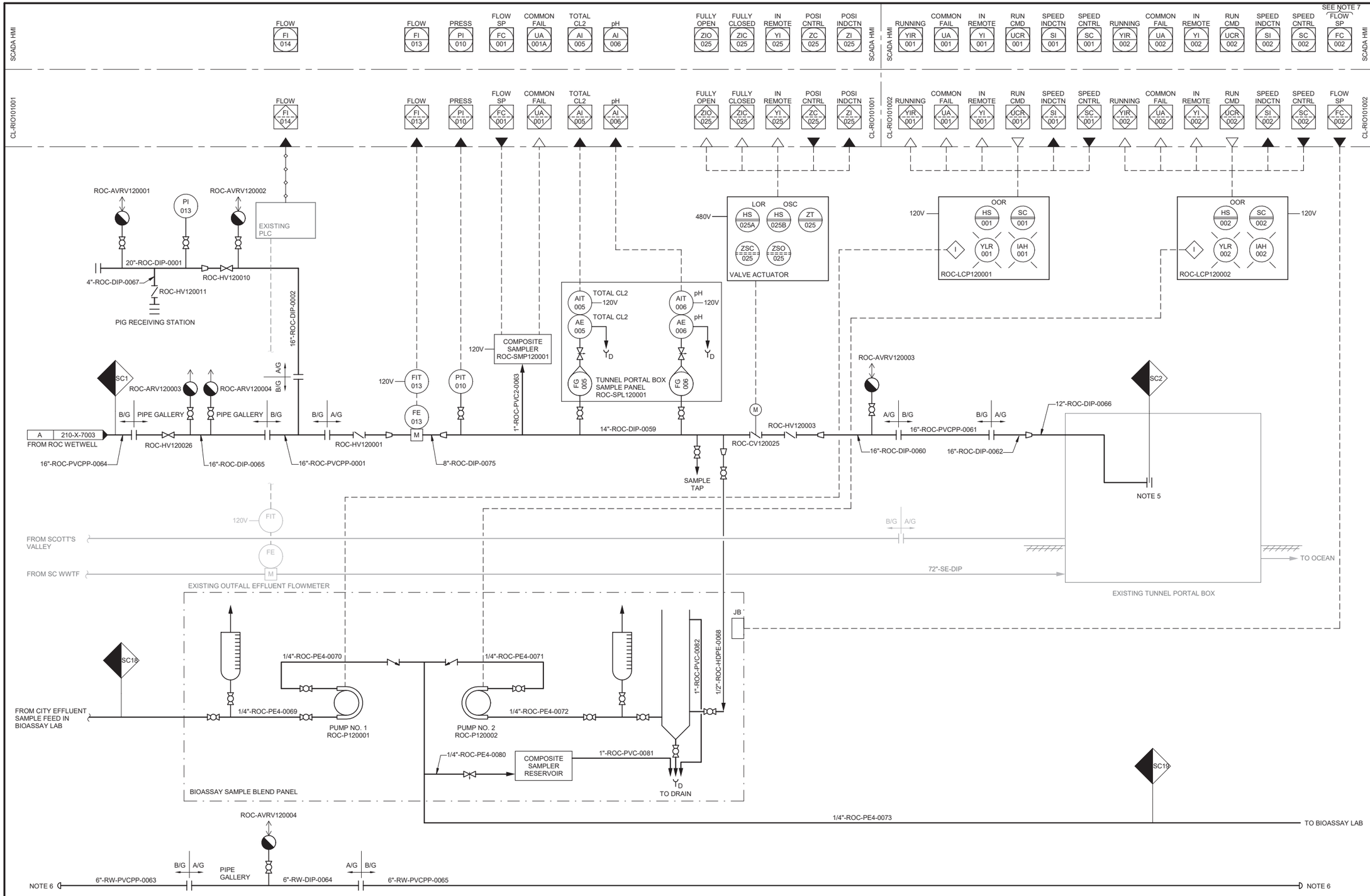
CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF AUTOMATIC STRAINERS
P&ID

DRAWING NUMBER
115-X-7001

SHEET NUMBER
312 OF 370

PLOTTED: 8/20/2021 11:41:01 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS ROC AND AREA CODE IS 120 UNLESS OTHERWISE NOTED.
4. FURNISH BIOASSAY LAB EQUIPMENT.
5. TERMINATION POINT LOCATION APPROX 3' INTO OCEAN OUTFALL PIPE.
6. ENDS OF RECYCLED WATER PIPE TO BE CAPPED.
7. SYSTEM INTEGRATOR TO PROVIDE AN ANALOG OUTPUT SIGNAL ISOLATOR FOR THE ANALOG OUTPUT - CCLEAN PUMP FLOW IN THE PLC.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:50:31 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 19566 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:42:54-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	404790-101-NBAF_BUILDING.rvt
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

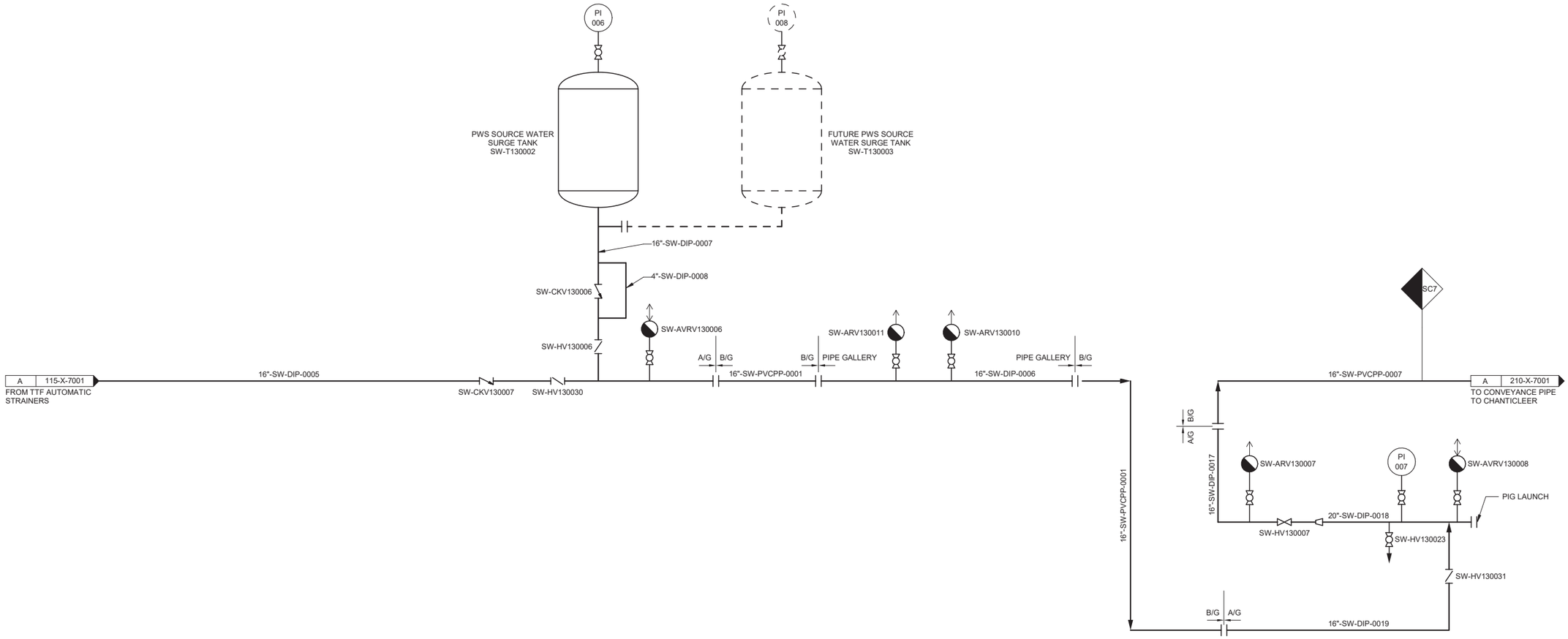
INSTRUMENTATION SC WWTF TUNNEL PORTAL BOX P&ID

DRAWING NUMBER
120-X-7013

SHEET NUMBER
313 OF 370

SCADA HMI

CL-PLC101001



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS SW AND AREA CODE IS 130 UNLESS OTHERWISE NOTED.
4. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 9:06:32 AM
D10000

SCADA HMI

CL-PLC101001

BLACK & VEATCH

Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRANL. BUTLER NO. E 18568 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:43:02-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-101-NBAF_BUILDING.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF PWS SOURCE
WATER SURGE TANK
P&ID

DRAWING NUMBER
130-X-7002

SHEET NUMBER
314 OF 370

SCADA HMI

CL-PLC101002

FLOW FI 001 | FULLY OPEN ZIO 001 | FULLY CLOSED ZIC 001 | IN REMOTE YI 001 | POSI CNTRL ZC 001 | POSI INDCTN ZI 001 | IN REMOTE YI 001 | RUNNING YIR 001 | COMMON FAIL UA 001 | BACKWASH PERMISS YA 001 | RUN CMD UCR 001 | IN REMOTE YI 001A | RUNNING YIR 001A | COMMON FAIL UA 001A | IN REMOTE YI 002 | RUNNING YIR 002 | COMMON FAIL UA 002 | PRESS PI 002 | PRESS PI 003 | LEVEL LI 001

FILTER UNIT | BACKWASH / WASTE PUMP 1 | BACKWASH / WASTE PUMP 2

120V — LOR HS 001A | OSC HS 001B | ZT 001 | ZSC 001 | ZSO 001 — VALVE ACTUATOR

480V — YLR 001 RUN | HS 001A SS | HMS 001 RST | HS 001B LOR | PI 002 | HS 001A LOR | HS 001B SS | HMS 001 RST | HS 002A LOR | HMS 002 RST | HS 002B SS

TAH 001 | LI 001 | SIC 001 | SIK 001 | PI 003 | SIC 001A | YLR 001 | UA 001 FAIL | SIC 002 | YLR 002 | UA 002 FAIL

FILTER UNIT | BACKWASH / WASTE PUMP 1 | BACKWASH / WASTE PUMP 2

* RW-LCP140001
LCP (WITH LOCAL STARTERS)

* LIT 001 — 120V

OVERFLOW WEIR | * LE 001 US | INFLUENT WEIR

RW-FLT140001

EFFLUENT WEIR

PIT 003

SAMPLE TAP

6"-FE-PVC2-0003

A | 140-X-7002
TO TITLE 22 FILTER BREAK TANK

120V — FIT 001

FE 001 | M

A | 115-X-7001
FROM AUTOMATIC STRAINERS

SW-HV140004

SW-PCV140001

3"-SW-DIP-0021

M SW-CV140001

SEE NOTE 6

6"-SW-DIP-0022

SAMPLE TAP

RW-CV140013

RW-CV140014

SOLIDS VALVE (TYP)

RW-CV140011

RW-CV140012

PIT 002

CLOTH FILTER BACKWASH / WASTE PUMP NO. 1 RW-P140001

CLOTH FILTER BACKWASH / WASTE PUMP NO. 2 RW-P140002

3"-FBW-PVC2-0002

TITLE 22 FILTER SKID NOTE 5

6"-RW-PVC2-0013

TO STORM DRAIN CATCH BASIN

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS RW AND AREA CODE IS 140 UNLESS OTHERWISE NOTED.
4. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
5. ALL ITEMS MARKED BY AN ' ⋆ ' ARE TO BE PROVIDED BY CLOTH FILTER SUPPLIER.
6. CONNECTION FOR FUTURE COAGULANT ADDITION, IF REQUIRED.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 9:07:19 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16569 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:43:10-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

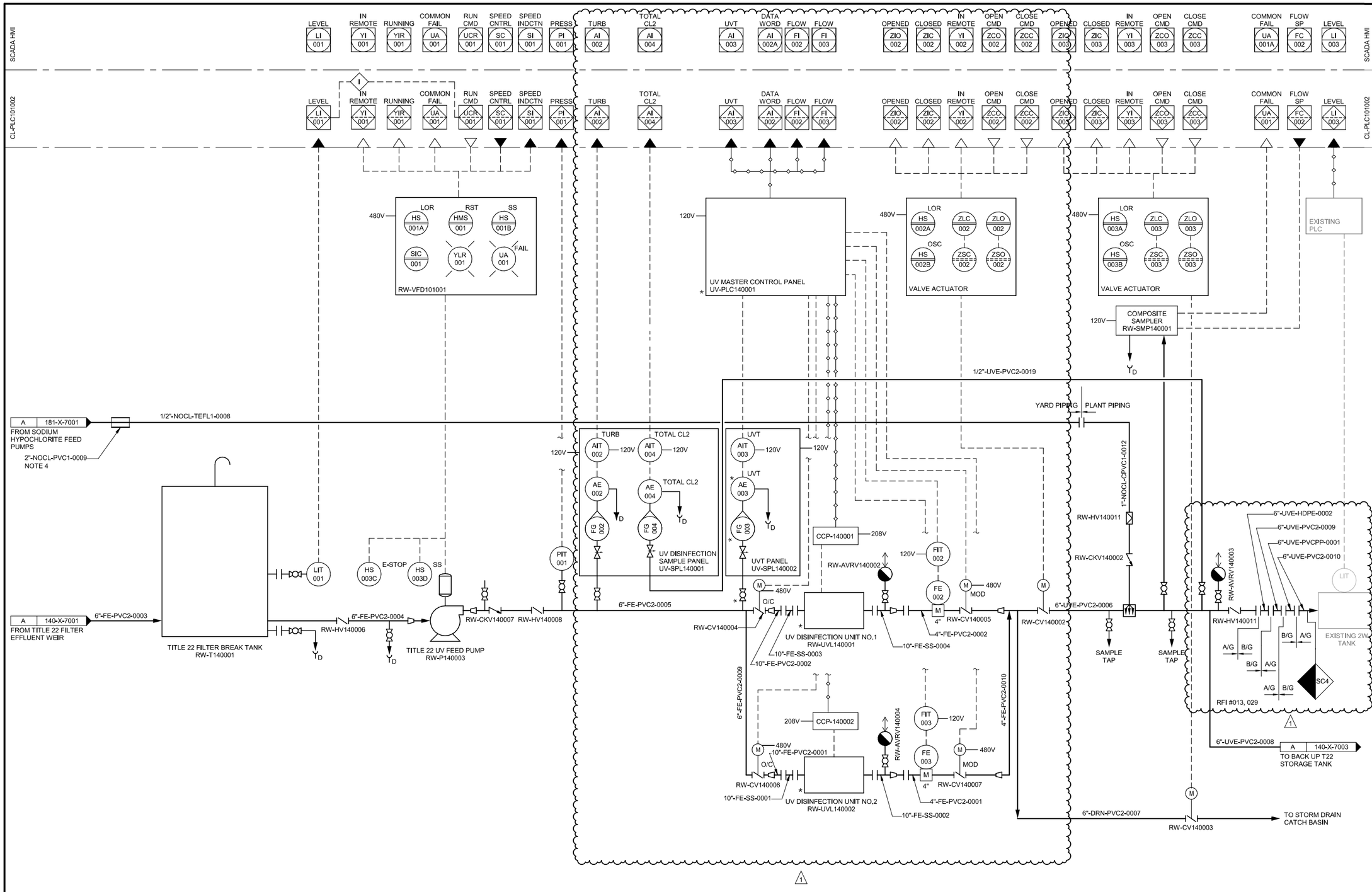
LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	404790-101-NBAF_BUILDING.rvt
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION
TTF TITLE 22 FILTERS AND UV
SHEET 1 OF 2
P&ID

DRAWING NUMBER
140-X-7001

SHEET NUMBER
315 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS RW AND AREA CODE IS 140 UNLESS OTHERWISE NOTED.
4. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
5. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY UV SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

PLOTTED: 4/14/2022 10:06:24 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRANDY L. BUTLER NO. E 16569 ELECTRICAL STATE OF CALIFORNIA
2022.04.14 14:46:15-08'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION
1	04/14	GENERAL REVISION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-101-NBAF_BUILDING.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF TITLE 22 FILTERS AND UV
SHEET 2 OF 2
P&ID

DRAWING NUMBER
140-X-7002

SHEET NUMBER
316 OF 370

SCADA HMI

CL-PLC101002

LO-LO LEVEL LALL 002 | LEVEL LI 002

ESTOP PRESSED YA 004A | IN REMOTE YI 004 | RUNNING YIR 004 | COMMON FAIL UA 004 | RUN CMD UCR 004 | SPEED CNTRL SC 004 | SPEED INDCTN SI 004 | ESTOP PRESSED YA 005A | IN REMOTE YI 005 | RUNNING YIR 005 | COMMON FAIL UA 005 | RUN CMD UCR 005 | SPEED CNTRL SC 005 | SPEED INDCTN SI 005 | PRESS PI 004

TITLE 22 BACK-UP PUMP STATION

UVE-LCP140002

480V

UVE-VFD140004 — LOR HS 004A | RST HMS 004 | SS HS 004B | SIC 004 | YLR 004 | UA 004 FAIL | I

UVE-VFD140005 — LOR HS 005A | RST HMS 005 | SS HS 005B | SIC 005 | YLR 005 | UA 005 FAIL | I

MANWAY

4"-UVE-PVC2-0008

A | 140-X-7002

UVE-HV140012

LIT 002

LSLL 002

T22 BACK-UP STORAGE TANK UVE-T140002

3"-UVE-PVC2-0010

6"-UVE-PVC2-0009

UVE-HV140019

UVE-HV140020

Y_D

4"-UVE-PVC2-0011 — UVE-HV140013 — T22 BACK-UP PUMP NO. 1 UVE-P140004 — SS HS 004D | E-STOP HS 004C | PI 001 | 4"-UVE-PVC2-0014 | UVE-CKV140003 | UVE-HV140016

4"-UVE-PVC2-0012 — UVE-HV140014 — T22 BACK-UP PUMP NO. 2 UVE-P140005 — SS HS 005D | E-STOP HS 005C | PI 002 | 4"-UVE-PVC2-0015 | UVE-CKV140004 | UVE-HV140017

BLADDER TANK UVE-T140003

6"-UVE-PVC2-0017

PIT 004

6"-UVE-PVC2-0018 — UVE-HV140021 — A/G — B/G — UVE-HV140022 — SC9 — 6"-UVE-HDPE-0001 — EXISTING 2W NETWORK

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS UVE AND AREA CODE IS 140 UNLESS OTHERWISE NOTED.
4. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
5. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY EQUIPMENT VENDOR.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 3:26:59 PM
D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIAN L. BUTLER — No. E 18569 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:43:34-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-101-NBAF_BUILDING.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION TTF TITLE 22 BACK-UP STORAGE TANK AND PUMPS P&ID

DRAWING NUMBER
140-X-7003

SHEET NUMBER
317 OF 370

SCADA HMI

AUTO / MANUAL HC 001 | RUNNING YIR 001 | COMMON FAIL UA 001 | IN REMOTE YI 001 | RUN CMD UCR 001 | SPEED CNTRL SC 001 | SPEED INDCTN SI 001 | HI DISCH PRESS PAH 001

AUTO / MANUAL HC 002 | RUNNING YIR 002 | COMMON FAIL UA 002 | IN REMOTE YI 002 | RUN CMD UCR 002 | SPEED CNTRL SC 002 | SPEED INDCTN SI 002 | HI DISCH PRESS PAH 002

CL-PLC101002

RUNNING YIR 001 | COMMON FAIL UA 001 | IN REMOTE YI 001 | RUN CMD UCR 001 | I | SPEED CNTRL SC 001 | SPEED INDCTN SI 001 | HI DISCH PRESS PAH 001

RUNNING YIR 002 | COMMON FAIL UA 002 | IN REMOTE YI 002 | RUN CMD UCR 002 | I | SPEED CNTRL SC 002 | SPEED INDCTN SI 002 | HI DISCH PRESS PAH 002

120V — OOR — HS 001 — SC 001 — YLR 001 — IAH 001 — I — NOCL-LCP181001

NOTE 8 (TYP)

120V — OOR — HS 002 — SC 002 — YLR 002 — IAH 002 — I — NOCL-LCP181002

SC16

FROM EXISTING STORAGE TANK VENT

1"-NOCL-CPVC1-0006

6" (TYP)

NOCL-CKV181001

NOCL-CKV181002

VACUUM BREAKER (TYP)

A | 181-X-7002

TO EXISTING STORAGE TANK VENT

NOTE 9 (TYP)

1"-NOCL-CPVC1-0007

NOCL-HV181016

NOCL-HV181017

181-X-7002 | B

ANTI-SIPHON LOOP

EL. NOTE 7

SC13

NOCL-HV181004

PI 001 | PSH 001

NOCL-PSV181002

NOCL-PSV181004

NOCL-HV181015

1"-NOCL-CPVC1-0003

NOCL-HV181003

NOCL-PSV181001

NOCL-HV181009

NOCL-HV181011

NOCL-HV181013

1"-NOCL-CPVC1-0005

1"-NOCL-CPVC1-0010

NOTE 12

A | 140-X-7002

TO TITLE 22 UV EFFLUENT

PLANT PIPING | YARD PIPING

1/2"-NOCL-TEFL1-0008

1"

SODIUM HYPOCHLORITE METERING PUMP NO.1 NOCL-P181001

1"-NOCL-CPVC1-0001

FROM EXISTING STORAGE TANK

NOCL-HV181001

NOCL-HV181002

1"-NOCL-CPVC1-0001

NOCL-HV181007

SC12

PI 002 | PSH 002

NOCL-PSV181003

NOTE 6 (TYP)

NOCL-HV181012

NOCL-HV181005

1"-NOCL-CPVC1-0004

NOCL-HV181014

1"-NOCL-CPVC1-0002

1"

NOCL-HV181010

SODIUM HYPOCHLORITE METERING PUMP NO.2 NOCL-P181002

1"-NOCL-CPVC1-0002

NOCL-HV181006

DRAIN / FLUSH VALVE (TYP)

NOCL-HV181008

THREADED CAP (TYP)

TO STORAGE TANK VENT | METERING PUMP DISCHARGE | METERING PUMP

NOTE 13

NOTE 10

PUMP BASE

MAXIMIZE THIS DISTANCE

MINIMIZE THIS DISTANCE

NOTE 11

FROM TANK

PUMP SUCTION DETAIL

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS NOCL AND AREA CODE IS 181 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN EXISTING STORAGE TANK OVERFLOW CONNECTION.
8. CONTROL PANEL IS INTEGRAL TO THE PUMP.
9. ROUTE VENT HEADERS 12 INCHES ABOVE EXISTING STORAGE TANK OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHLL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWORD FROM THE EXISTING STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
13. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 9:18:21 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER · BRIAN L. BUTLER · NO. E 18563 · ELECTRICAL · STATE OF CALIFORNIA

2021.08.26 09:43:41-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-180-CHEMICAL_STORAGE.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
TTF SODIUM HYPOCHLORITE FEED SYSTEM
SHEET 1 OF 2
P&ID

DRAWING NUMBER
181-X-7001

SHEET NUMBER
318 OF 370

SCADA HMI

AUTO / MANUAL HC 003 | RUNNING YIR 003 | COMMON FAIL UA 003 | IN REMOTE YI 003 | RUN CMD UCR 003 | SPEED INDCTN SI 003 | STROKE LENGTH NI 003 | STROKE CMD NC 003 | SPEED CNTRL SC 003 | HI DISCH PRESS PAH 003

AUTO / MANUAL HC 004 | RUNNING YIR 004 | COMMON FAIL UA 004 | IN REMOTE YI 004 | RUN CMD UCR 004 | SPEED INDCTN SI 004 | STROKE LENGTH NI 004 | STROKE CMD NC 004 | SPEED CNTRL SC 004 | HI DISCH PRESS PAH 004

CL-RIO101001

RUNNING YIR 003 | COMMON FAIL UA 003 | IN REMOTE YI 003 | RUN CMD UCR 003 | I | SPEED INDCTN SI 003 | STROKE LENGTH NI 003 | STROKE CMD NC 003 | SPEED CNTRL SC 003 | HI DISCH PRESS PAH 003

RUNNING YIR 004 | COMMON FAIL UA 004 | IN REMOTE YI 004 | RUN CMD UCR 004 | I | SPEED INDCTN SI 004 | STROKE LENGTH NI 004 | STROKE CMD NC 004 | SPEED CNTRL SC 004 | HI DISCH PRESS PAH 004

120V — OOR — HS 003 | SC 003 | NC 003 | YLR 003 | IAH 003 | I — NOCL-LCP181003

120V — OOR — HS 004 | SC 004 | NC 004 | YLR 004 | IAH 004 | I — NOCL-LCP181004

A | 181-X-7001

1"-NOCL-CPVC1-0006

181-X-7001 | B

NOTE 9 (TYP)

1"-NOCL-CPVC1-0007

6" (TYP)

VACUUM BREAKER (TYP)

NOCL-CKV181003

NOCL-CKV181004

NOCL-HV181033

NOCL-HV181034

ANTI-SIPHON LOOP

EL. NOTE 7

3/4"-NOCL-HST1-0015

3/4"-NOCL-HST1-0015

PI 006

PI 003

PSH 003

PI 005

NOCL-PSV181006

NOCL-PCV181001

NOCL-PSV181008

NOCL-HV181032

3/4"-NOCL-HST1-0013

NOCL-HV181028

NOCL-HV181035

NOCL-HV181031

NOCL-HV181020

NOCL-PSV181005

1"

NOCL-HV181021

NOCL-HV181026

SODIUM HYPOCHLORITE METERING PUMP NO. 3 NOCL-P181003

1"-NOCL-CPVC1-0011

FROM EXISTING STORAGE TANK

NOCL-HV181018

NOCL-HV181019

1"-NOCL-CPVC1-0011

NOCL-HV181024

SC15

2"-NOCL-PVC1-0014

NOTE 12

A | 115-X-7001

SW TO AWPF

PLANT PIPING | YARD PIPING

1/2"-NOCL-TEFL1-0012

PI 008

PI 004

PSH 004

NOCL-PSV181007

NOCL-PCV181002

NOTE 6 (TYP)

NOCL-HV181029

3/4"-NOCL-HST1-0014

NOCL-HV181030

NOCL-HV181036

NOCL-HV181022

1"-NOCL-CPVC1-0012

PI 007

1"

SODIUM HYPOCHLORITE METERING PUMP NO. 4 NOCL-P181004

1"-NOCL-CPVC1-0012

NOCL-HV181027

NOCL-HV181023

NOCL-HV181025

DRAIN / FLUSH VALVE (TYP)

THREADED CAP (TYP)

TO STORAGE TANK VENT

METERING PUMP DISCHARGE

NOTE 13

METERING PUMP

NOTE 10

PUMP BASE

MINIMIZE THIS DISTANCE

NOTE 11

FROM TANK

PUMP SUCTION DETAIL

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'T-'.
3. PROCESS CODE IS NOCL AND AREA CODE IS 181 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN EXISTING STORAGE TANK OVERFLOW CONNECTION.
8. NOT USED.
9. ROUTE VENT HEADERS 12 INCHES ABOVE EXISTING STORAGE TANK OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHLL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWORD FROM THE EXISTING STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
13. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 9:18:03 AM
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CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIANL. BUTLER — NO. E 18565 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:43:48-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-180-CHEMICAL_STORAGE.rvt

BV PROJECT NUMBER
404790

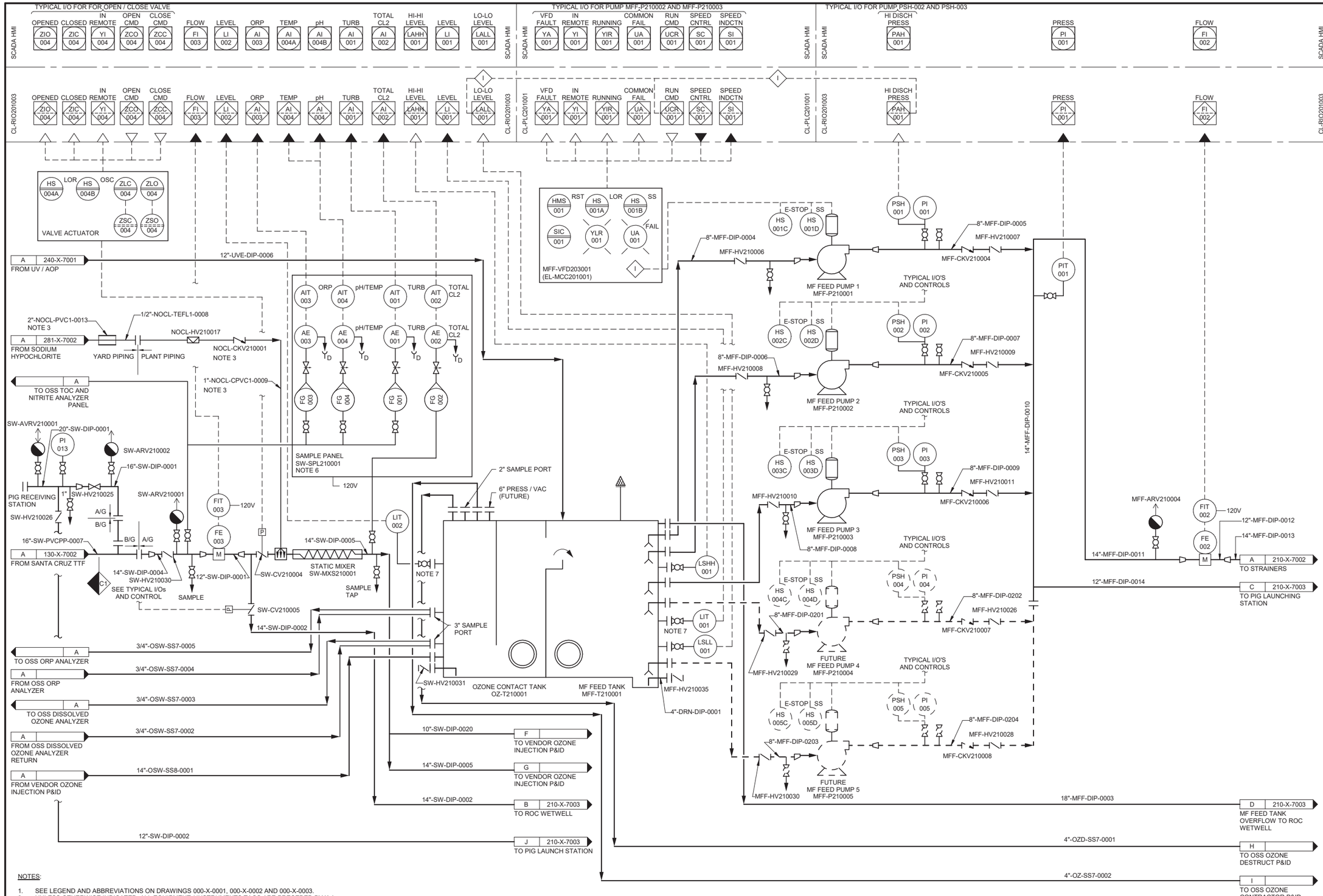
CLIENT PROJECT NUMBER

INSTRUMENTATION TTF SODIUM HYPOCHLORITE FEED SYSTEM SHEET 2 OF 2 P&ID

DRAWING NUMBER

181-X-7002

SHEET NUMBER
319 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
4. PROCESS CODE IS MFF AND AREA CODE IS 210 UNLESS OTHERWISE NOTED.
5. OSS- OZONE SYSTEM SUPPLIER.
6. SEE INSTRUMENT INSTALLATION DETAIL DRAWING FOR INSTALLATION DETAILS AND ACCESSORIES.
7. THE LEVEL INSTRUMENTS SHALL BE MOUNTED 6' OFF THE GROUND.

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER DANIEL BUTLER NO. E 19568 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:43:56-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-210-Intake PS.rvt

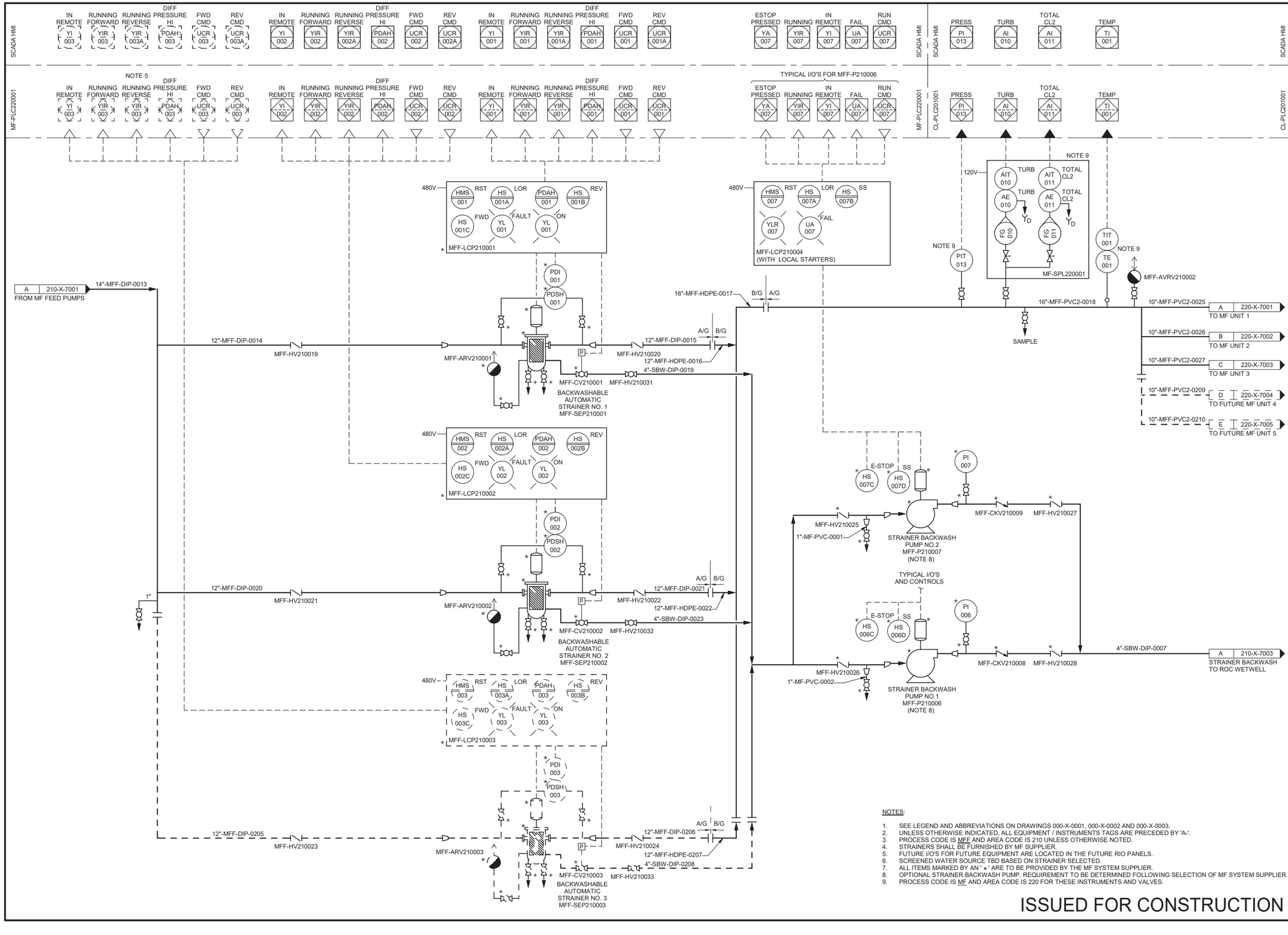
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF MF FEED TANK AND PUMP STATION P&ID

DRAWING NUMBER
210-X-7001

SHEET NUMBER
320 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MFF AND AREA CODE IS 210 UNLESS OTHERWISE NOTED.
4. STRAINERS SHALL BE FURNISHED BY MF SUPPLIER.
5. FUTURE I/O'S FOR FUTURE EQUIPMENT ARE LOCATED IN THE FUTURE RIO PANELS.
6. SCREENED WATER SOURCE TBD BASED ON STRAINER SELECTED.
7. ALL ITEMS MARKED BY AN ' ⋆ ' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.
8. OPTIONAL STRAINER BACKWASH PUMP. REQUIREMENT TO BE DETERMINED FOLLOWING SELECTION OF MF SYSTEM SUPPLIER.
9. PROCESS CODE IS MF AND AREA CODE IS 220 FOR THESE INSTRUMENTS AND VALVES.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
DANIEL BUTLER
No. E 18888
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:44:05-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-210-Intake PS.rvt

BV PROJECT NUMBER
404790

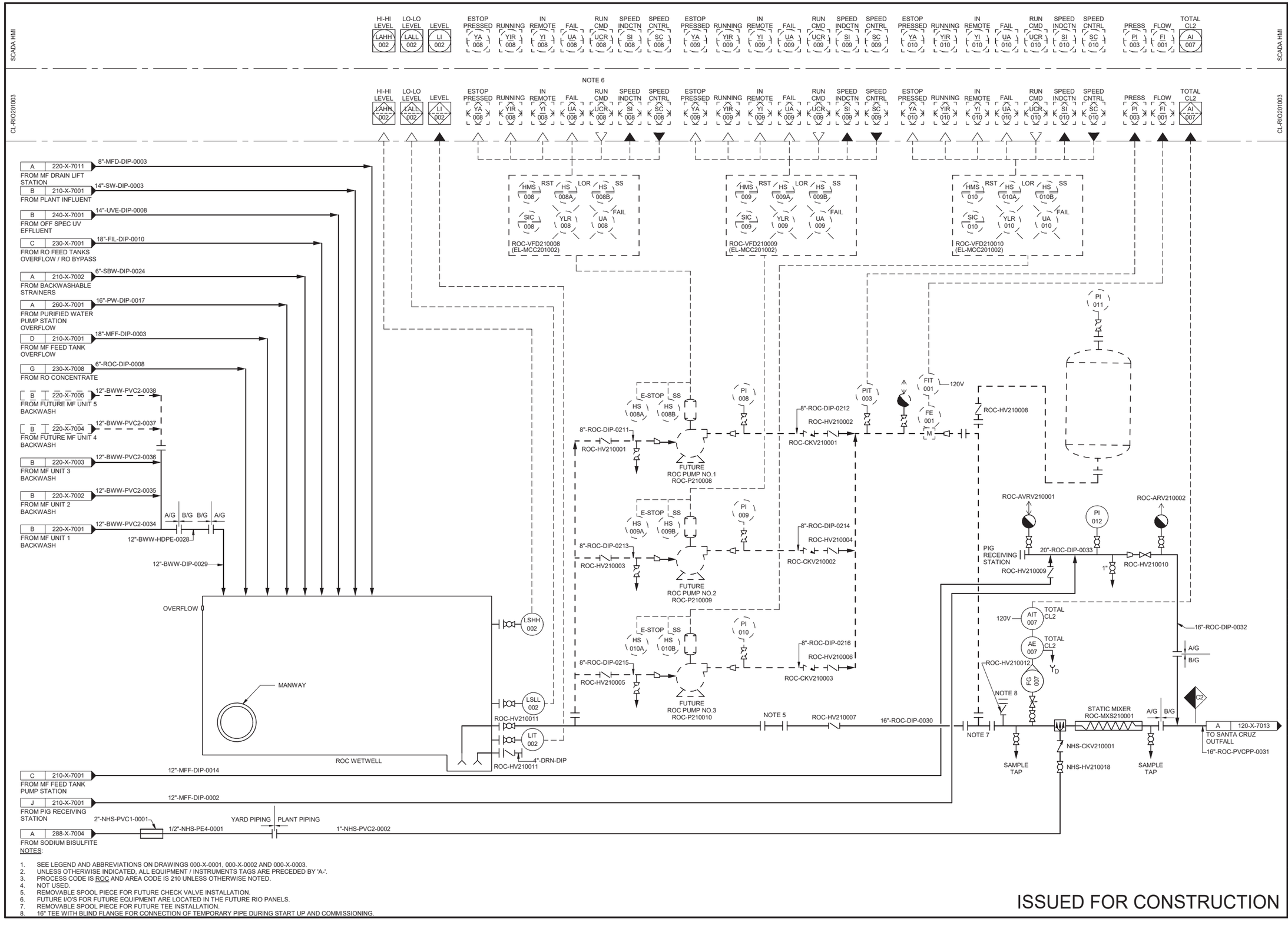
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF BACKWASHABLE STRAINERS
P&ID

DRAWING NUMBER
210-X-7002

SHEET NUMBER
321 OF 370

PLOTTED: 8/20/2021 9:34:25 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROC AND AREA CODE IS 210 UNLESS OTHERWISE NOTED.
4. NOT USED.
5. REMOVABLE SPOOL PIECE FOR FUTURE CHECK VALVE INSTALLATION.
6. FUTURE I/O'S FOR FUTURE EQUIPMENT ARE LOCATED IN THE FUTURE RIO PANELS.
7. REMOVABLE SPOOL PIECE FOR FUTURE TEE INSTALLATION.
8. 16" TEE WITH BLIND FLANGE FOR CONNECTION OF TEMPORARY PIPE DURING START UP AND COMMISSIONING.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 9:34:50 AM
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REGISTERED PROFESSIONAL ENGINEER DANIEL BUTLER NO. E 18568 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:39:27-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 404790-210-Intake PS.rvt
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF ROC WETWELL P&ID

DRAWING NUMBER
210-X-7003

SHEET NUMBER
322 OF 370

SCADA HMI

OPEN ZIO 002 | CLOSED ZIC 002 | IN REMOTE YI 002 | OPEN CMD ZCO 002 | CLOSE CMD ZCC 002 | FULLY OPEN ZIO 001 | FULLY CLOSED ZIC 001 | IN REMOTE YI 001 | POSI. INDCTN ZI 001 | POSI. CNTRL ZC 001

OPEN ZIO 003 | CLOSED ZIC 003 | IN REMOTE YI 003 | OPEN CMD ZCO 003 | CLOSE CMD ZCC 003

LO PRESS PAL 001 | HI PRESS PAH 001 | PRESS PI 001 | FLOW FI 001

OPEN ZIO 008 | CLOSED ZIC 008 | IN REMOTE YI 008 | OPEN CMD ZCO 008 | CLOSE CMD ZCC 008

OPEN ZIO 010 | CLOSED ZIC 010 | IN REMOTE YI 010 | OPEN CMD ZCO 010 | CLOSE CMD ZCC 010

PRESS PI 002

OPEN ZIO 011 | CLOSED ZIC 011 | IN REMOTE YI 011 | OPEN CMD ZCO 011 | CLOSE CMD ZCC 011

TURB AI 001

OPEN ZIO 013 | CLOSED ZIC 013 | IN REMOTE YI 013 | OPEN CMD ZCO 013 | CLOSE CMD ZCC 013

SCADA HMI

TYPICAL I/Os FOR MF-CV220005, MF-CV220006, MF-CV220110

TYPICAL I/Os FOR MF-CV220004, MF-CV220007, MF-CV220009, MF-CV220100, MF-CV220101, MF-CV220014, MF-CV220016 TO MF-CV220018

MF-RIO220001

OPEN ZIO 002 | CLOSED ZIC 002 | IN REMOTE YI 002 | OPEN CMD ZCO 002 | CLOSE CMD ZCC 002 | FULLY OPEN ZIO 001 | FULLY CLOSED ZIC 001 | IN REMOTE YI 001 | POSI. INDCTN ZI 001 | POSI. CNTRL ZC 001

OPEN ZIO 003 | CLOSED ZIC 003 | IN REMOTE YI 003 | OPEN CMD ZCO 003 | CLOSE CMD ZCC 003

LO PRESS PAL 001 | HI PRESS PAH 001 | PRESS PI 001 | FLOW FI 001

OPEN ZIO 008 | CLOSED ZIC 008 | IN REMOTE YI 008 | OPEN CMD ZCO 008 | CLOSE CMD ZCC 008

OPEN ZIO 010 | CLOSED ZIC 010 | IN REMOTE YI 010 | OPEN CMD ZCO 010 | CLOSE CMD ZCC 010

PRESS PI 002

OPEN ZIO 011 | CLOSED ZIC 011 | IN REMOTE YI 011 | OPEN CMD ZCO 011 | CLOSE CMD ZCC 011

TURB AI 001

OPEN ZIO 013 | CLOSED ZIC 013 | IN REMOTE YI 013 | OPEN CMD ZCO 013 | CLOSE CMD ZCC 013

HS 002A | LOR | HS 002B | OSC | ZLC 002 | ZLO 002 | ZSC 002 | ZSO 002 — VALVE ACTUATOR

HS 001A | LOR | HS 001B | OSC | ZSC 001 | ZSO 001 | ZT 001 — VALVE ACTUATOR

HS 003A | LOR | HS 003B | OSC | ZLC 003 | ZLO 003 | ZSC 003 | ZSO 003 — VALVE ACTUATOR

HS 008A | LOR | HS 008B | OSC | ZLC 008 | ZLO 008 | ZSC 008 | ZSO 008 — VALVE ACTUATOR

HS 010A | LOR | HS 010B | OSC | ZLC 010 | ZLO 010 | ZSC 010 | ZSO 010 — VALVE ACTUATOR

HS 011A | LOR | HS 011B | OSC | ZLC 011 | ZLO 011 | ZSC 011 | ZSO 011 — VALVE ACTUATOR

HS 013A | LOR | HS 013B | OSC | ZLC 013 | ZLO 013 | ZSC 013 | ZSO 013 — VALVE ACTUATOR

MEMBRANE FILTRATION PACKAGE UNIT 1 PROVIDED BY MFSS

A | 220-X-7010 — FROM INSTRUMENT AIR — 1/2"-IA-CU-0001

PI 001 | PSL 001

MF-HV220005 | MF-CKV220001

* SOLENOID DISTRIBUTION MANIFOLD

A | 220-X-7010 — FROM PROCESS AIR/MIT — MF-HV220001

A | 210-X-7002 — FROM STRAINERS — 10"-MFF-PVC2-0025 — MFF-HV220002 — MF-CV220110 — MF-FCV220001 — MF-CV220002

A | 220-X-7006 — FROM AIR BLOWERS — 6"-AS-SS2-0004 — MF-HV220004 — MF-CV220003 — MF-CKV220004

A | 220-X-7007 — FROM BACKWASH PUMP — 12"-BWH-PVC2-0012 — MF-CV220004

A | 220-X-7008 — FROM CIP — 8"-CIP-CPVC-0002 — MF-CV220005 — MF-CV220006 — MF-CV220007

SEE TYPICAL I/Os AND CONTROL

MF-CV220008 | MF-CV220012 | PSH 001 | PIT 001 | FIT 001 | 120V | FE 001 | M

MF-CKV220003 | MF-CV220010 | PIT 002 | MF-CV220100 | MF-CV220011 | MF-CV220013 | MF-CV220014 | MF-CV220016 | MF-CV220017 | MF-CV220018

TO FILTRATE VENT

8"-CIP-CPVC-0003 — C | 220-X-7008 — TO CIP FEED / FILTRATE RETURN

120V | AIT 001 | TURB | AE 001 | TURB — SAMPLE

10"-FIL-PVC2-0021 — A | 230-X-7001 — TO FILTRATE

PSH 002 | MF-CV220009

12"-BWW-PVC2-0034 — FALL — B | 210-X-7003 — BACKWASH TO ROC WETWELL

MF-CV220101

A/G | B/G

12"-DRN-PVC2-0035 — 14"-MFD-HDPE-0001 — D | 220-X-7011 — TO MF BACKWASH DRAIN WETWELL

MF SYSTEM 1
MFR: WIGEN
MEMBRANE: DUPONT SFD-2880XP

MEMBRANE FILTRATION SYSTEM

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWING 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. BASED ON THE VENDOR SELECTION, MODIFICATIONS MAY BE REQUIRED TO MEET THE SPECIFIC DESIGN OF SELECTED VENDOR EQUIPMENT.
5. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

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D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIAN L. BUTLER — No. E 18888 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:39:16-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: JSL
DRAWN: VSD, AD
CHECKED: BDS
CHECKED: KAB, BLB
APPROVED: BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF MF UNIT 1
P&ID

DRAWING NUMBER
220-X-7001

SHEET NUMBER
323 OF 370

SCADA HMI

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD	FULLY OPEN	FULLY CLOSED	IN REMOTE	POSI. INDCTN	POSI. CNTRL
ZIO 020	ZIC 020	YI 020	ZCO 020	ZCC 020	ZIO 019	ZIC 019	YI 019	ZI 019	ZC 019

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD
ZIO 021	ZIC 021	YI 021	ZCO 021	ZCC 021

LO PRESS	HI PRESS	PRESS	FLOW
PAL 002	PAH 005	PI 003	FI 002

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD
ZIO 026	ZIC 026	YI 026	ZCO 026	ZCC 026

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD
ZIO 028	ZIC 028	YI 028	ZCO 028	ZCC 028

PRESS
PI 004

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD
ZIO 030	ZIC 030	YI 030	ZCO 030	ZCC 030

TURB
AI 002

OPEN	CLOSED	IN REMOTE	OPEN CMD	CLOSE CMD
ZIO 029	ZIC 029	YI 029	ZCO 029	ZCC 029

TYPICAL I/Os FOR MF-CV220023, MF-CV220024, MF-CV220111

TYPICAL I/Os FOR MF-CV220025, MF-CV220027, MF-CV220031, MF-CV220032, MF-CV220034 TO MF-CV220036, MF-CV220102, MF-CV220103

MF-RIO220002

VALVE ACTUATOR: HS 020A, LOR, HS 020B, OSC, ZLC 020, ZLO 020, ZSC 020, ZSO 020

VALVE ACTUATOR: HS 019A, LOR, HS 019B, OSC, ZSC 019, ZSO 019, ZT 019

VALVE ACTUATOR: HS 021A, LOR, HS 021A, OSC, ZLC 021, ZLO 021, ZSC 021, ZSO 021

VALVE ACTUATOR: HS 026A, LOR, HS 026B, OSC, ZLC 026, ZLO 026, ZSC 026, ZSO 026

VALVE ACTUATOR: HS 028A, LOR, HS 028B, OSC, ZLC 028, ZLO 028, ZSC 028, ZSO 028

VALVE ACTUATOR: HS 030A, LOR, HS 030B, OSC, ZLC 030, ZLO 030, ZSC 030, ZSO 030

VALVE ACTUATOR: HS 029A, LOR, HS 029B, OSC, ZLC 029, ZLO 029, ZSC 029, ZSO 029

MEMBRANE FILTRATION PACKAGE UNIT 2 PROVIDED BY MFSS

A | 220-X-7010 — FROM INSTRUMENT AIR — 1/2"-IA-CU-0001

PI 002, PSL 002

MF-HV220010

MF-CKV220005

* SOLENOID DISTRIBUTION MANIFOLD

B | 220-X-7010 — FROM PROCESS AIR/MIT — MF-HV220006

8"-CIP-CPVC-0004 — C | 220-X-7008 — TO CIP FEED / FILTRATE RETURN

MF-CV220030

TO FILTRATE VENT

MF-CKV220007

SEE TYPICAL I/Os AND CONTROL

MF-CV220102

MF-CV220028

PIT 004

MF-CV220032

MF-CV220029

B | 210-X-7002 — FROM STRAINERS — 10"-MFF-PVC2-0026 — MFF-HV220007 — MF-CV220111 — MF-FCV220019 — NC — MF-CV220020

MF-CV220026

MF-CV220031

PSH 005

AIT 002, 120V, TURB

AE 002, TURB

B | 220-X-7006 — FROM AIR BLOWERS — 6"-AS-SS2-0005 — MF-HV220009 — MF-CV220021 — MF-CKV220008

MF-CV220034

MF-CV220035

10"-FIL-PVC-0022 — A | 230-X-7001 — TO FILTRATE

SAMPLE

B | 220-X-7007 — FROM BACKWASH PUMP — 12"-BWH-PVC2-0013 — MF-CV220022

PSH 006

MF-CV220027

MF-CV220036

FIT 002, 120V

PIT 003

FE 002

MF-CV220023

MF-CV220024

12"-BWW-PVC2-0036 — B | 210-X-7003 — BACKWASH TO ROC WETWELL

FALL

B | 220-X-7008 — FROM CIP — 8"-CIP-CPVC-0003

NC — MF-CV220025

MF-CV220103

12"-DRN-PVC2-0037

A/G B/G — 14"-MFD-HDPE-0002 — D | 220-X-7011 — TO MF BACKWASH DRAIN WETWELL

MF SYSTEM 2
MFR: WIGEN
MEMBRANE: DUPONT SFD-2880XP

MEMBRANE FILTRATION SYSTEM

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWING 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. BASED ON THE VENDOR SELECTION, MODIFICATIONS MAY BE REQUIRED TO MEET THE SPECIFIC DESIGN OF SELECTED VENDOR EQUIPMENT.
5. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER — FRANK L. BUTLER — No. E 16605 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:39:07-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME: 404790-220-RO UV Building.rvt

BV PROJECT NUMBER: 404790

CLIENT PROJECT NUMBER

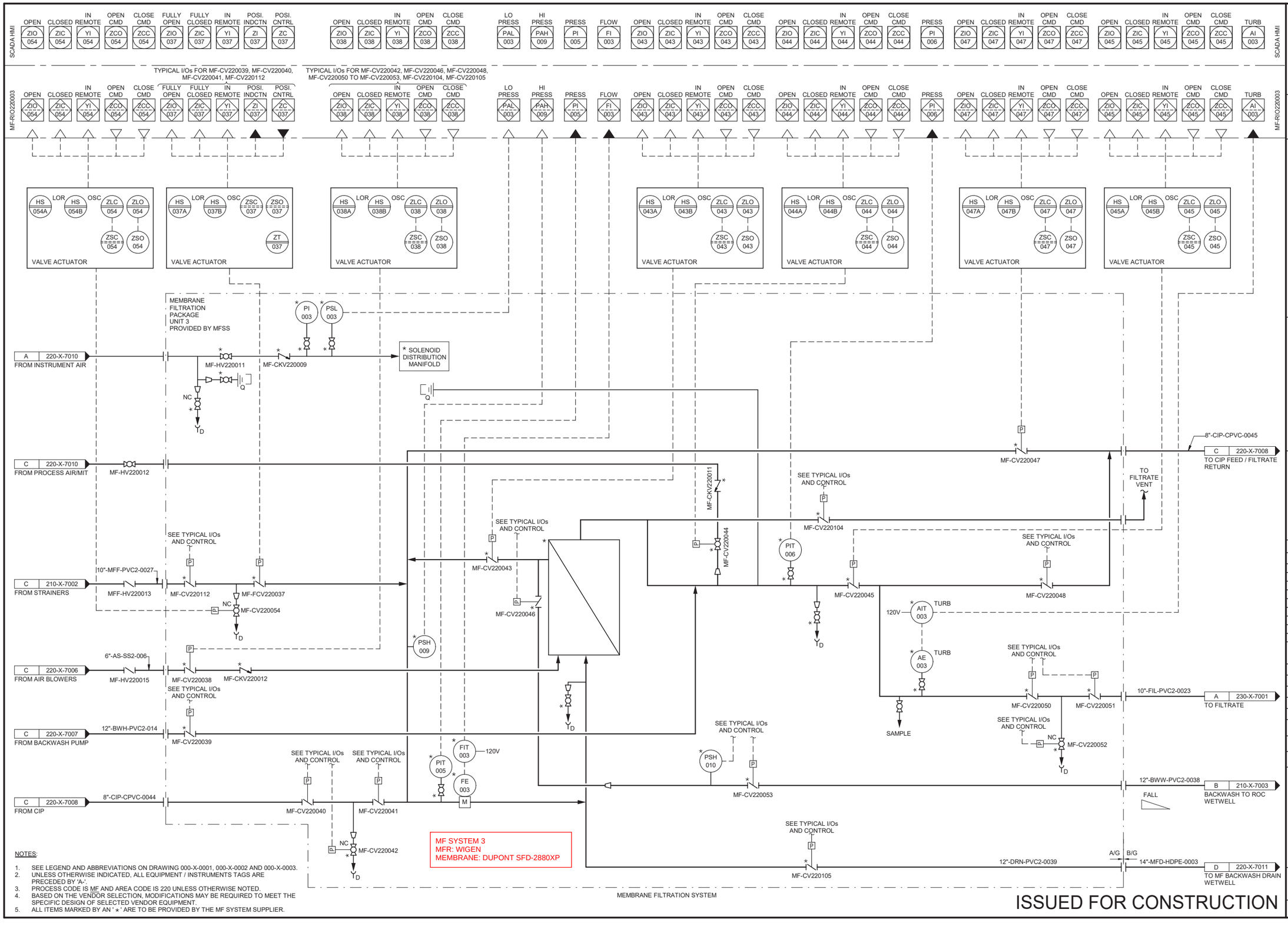
INSTRUMENTATION AWPF MF UNIT 2 P&ID

DRAWING NUMBER

220-X-7002

SHEET NUMBER

324 OF 370



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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
FRANK L. BUTLER
No. E 19687
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:38:57-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	404790-220-RO UV Building.rvt
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION AWPF MF UNIT 3 P&ID

DRAWING NUMBER
220-X-7003

SHEET NUMBER
325 OF 370

PLOTTED: 8/20/2021 9:57:32 AM
D10000

SCADA HMI

OPEN ZIO 056 | CLOSED ZIC 056 | IN REMOTE YI 056 | OPEN CMD ZCO 056 | CLOSE CMD ZCC 056 | FULLY OPEN ZIO 055 | FULLY CLOSED ZIC 055 | IN REMOTE YI 055 | POSI. INDCTN ZI 055 | POSI. CNTRL ZC 055

OPEN ZIO 057 | CLOSED ZIC 057 | IN REMOTE YI 057 | OPEN CMD ZCO 057 | CLOSE CMD ZCC 057

LO PRESS PAL 004 | HI PRESS PAH 013 | PRESS PI 007 | FLOW FI 004

OPEN ZIO 062 | CLOSED ZIC 062 | IN REMOTE YI 062 | OPEN CMD ZCO 062 | CLOSE CMD ZCC 062

OPEN ZIO 064 | CLOSED ZIC 064 | IN REMOTE YI 064 | OPEN CMD ZCO 064 | CLOSE CMD ZCC 064

PRESS PI 008

OPEN ZIO 067 | CLOSED ZIC 067 | IN REMOTE YI 067 | OPEN CMD ZCO 067 | CLOSE CMD ZCC 067

OPEN ZIO 065 | CLOSED ZIC 065 | IN REMOTE YI 065 | OPEN CMD ZCO 065 | CLOSE CMD ZCC 065 | TURB AI 004

TYPICAL I/Os FOR MF-CV220058, MF-CV220059, MF-CV220060, MF-CV220113

TYPICAL I/Os FOR MF-CV220061, MF-CV220063, MF-CV220066, MF-CV220068, MF-CV220070 TO MF-CV220072, MF-CV220106, MF-CV220107

MF-RIO220004

HS 056A | HS 056B | OSC | ZLC 056 | ZLO 056 | ZSC 056 | ZSO 056

HS 055A | HS 055B | OSC | ZLC 055 | ZSO 055 | ZT 055

HS 057A | HS 057B | OSC | ZLC 057 | ZLO 057 | ZSC 057 | ZSO 057

HS 062A | HS 062B | OSC | ZLC 062 | ZLO 062 | ZSC 062 | ZSO 062

HS 064A | HS 064B | OSC | ZLC 064 | ZLO 064 | ZSC 064 | ZSO 064

HS 067A | HS 067B | OSC | ZLC 067 | ZLO 067 | ZSC 067 | ZSO 067

HS 065A | HS 065B | OSC | ZLC 065 | ZLO 065 | ZSC 065 | ZSO 065

VALVE ACTUATOR

MEMBRANE FILTRATION PACKAGE UNIT 4 (FUTURE) PROVIDED BY MFSS

A 220-X-7010 FROM INSTRUMENT AIR

D 220-X-7010 FROM PROCESS AIR/MIT

D 210-X-7002 FROM STRAINERS

D 220-X-7006 FROM AIR BLOWERS

D 220-X-7007 FROM BACKWASH PUMP

D 220-X-7008 FROM CIP

MF-HV220016 | MF-HV220017 | MF-HV220018 | MF-HV220020

MF-CKV220013 | MF-CKV220015 | MF-CKV220016

PI 004 | PSL 004

* SOLENOID DISTRIBUTION MANIFOLD

MF-CV220113 | MF-FCV220055 | MF-CV220056 | MF-CV220057 | MF-CV220058 | MF-CV220059 | MF-CV220060 | MF-CV220061 | MF-CV220062 | MF-CV220063 | MF-CV220064 | MF-CV220065 | MF-CV220066 | MF-CV220067 | MF-CV220068 | MF-CV220070 | MF-CV220071 | MF-CV220072 | MF-CV220106 | MF-CV220107

10"-MFF-PVC2-0209 | 6"-AS-SS2-0201 | 12"-BWH-PVC2-0203 | 8"-CIP-CPVC-0046 | 8"-CIP-CPVC-0047 | 10"-FIL-PVC2-0205 | 12"-BWW-PVC2-0040 | 12"-DRN-PVC2-0041 | 14"-MFD-HDPE-0004

C 220-X-7008 TO CIP FEED / FILTRATE RETURN

A 230-X-7001 TO FILTRATE

B 210-X-7003 BACKWASH TO ROC WETWELL

D 220-X-7011 TO MF BACKWASH DRAIN WETWELL

TO FILTRATE VENT

SAMPLE

FALL

A/G | B/G

SEE TYPICAL I/Os AND CONTROL

PSH 013 | PSH 014 | PIT 007 | PIT 008 | FIT 004 | FE 004 | AIT 004 | AE 004 | 120V

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWING 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. BASED ON THE VENDOR SELECTION, MODIFICATIONS MAY BE REQUIRED TO MEET THE SPECIFIC DESIGN OF SELECTED VENDOR EQUIPMENT.
5. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.

MEMBRANE FILTRATION SYSTEM (FUTURE)

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
FRANK L. BUTLER
No. E 19662
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:38:48-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF MF UNIT 4 (FUTURE) P&ID

DRAWING NUMBER
220-X-7004

SHEET NUMBER
326 OF 370

SCADA HMI

OPEN ZIO 074 | CLOSED ZIC 074 | IN REMOTE YI 074 | OPEN CMD ZCO 074 | CLOSE CMD ZCC 074 | FULLY OPEN ZIO 073 | FULLY CLOSED ZIC 073 | IN REMOTE YI 073 | POSI. INDCTN ZI 073 | POSI. CNTRL ZC 073

OPEN ZIO 075 | CLOSED ZIC 075 | IN REMOTE YI 075 | OPEN CMD ZCO 075 | CLOSE CMD ZCC 075

LO PRESS PAL 005 | HI PRESS PAH 017 | PRESS PI 009 | FLOW FI 005

OPEN ZIO 080 | CLOSED ZIC 080 | IN REMOTE YI 080 | OPEN CMD ZCO 080 | CLOSE CMD ZCC 080

OPEN ZIO 082 | CLOSED ZIC 082 | IN REMOTE YI 082 | OPEN CMD ZCO 082 | CLOSE CMD ZCC 082

PRESS PI 010 | OPEN ZIO 085 | CLOSED ZIC 085 | IN REMOTE YI 085 | OPEN CMD ZCO 085 | CLOSE CMD ZCC 085

OPEN ZIO 083 | CLOSED ZIC 083 | IN REMOTE YI 083 | OPEN CMD ZCO 083 | CLOSE CMD ZCC 083 | TURB AI 005

SCADA HMI

TYPICAL I/Os FOR MF-CV220076, TO MF-CV220078, MF-CV220114

TYPICAL I/Os FOR MF-CV220079, MF-CV220081, MF-CV220083, MF-CV220084, MF-CV220086, MF-CV220088 TO MF-CV220090, MF-CV220108, MF-CV220109

MF-RIO201005

MF-RIO201005

HS 074A | LOR HS 074B | OSC ZLC 074 | ZLO 074 | ZSC 074 | ZSO 074

VALVE ACTUATOR

HS 073A | LOR HS 073B | OSC ZLC 073 | ZSO 073 | ZT 073

VALVE ACTUATOR

HS 075A | LOR HS 075B | OSC ZLC 075 | ZLO 075 | ZSC 075 | ZSO 075

VALVE ACTUATOR

HS 080A | LOR HS 080B | OSC ZLC 080 | ZLO 080 | ZSC 080 | ZSO 080

VALVE ACTUATOR

HS 082A | LOR HS 082B | OSC ZLC 082 | ZLO 082 | ZSC 082 | ZSO 082

VALVE ACTUATOR

HS 085A | LOR HS 085B | OSC ZLC 085 | ZLO 085 | ZSC 085 | ZSO 085

VALVE ACTUATOR

HS 083A | LOR HS 083B | OSC ZLC 083 | ZLO 083 | ZSC 083 | ZSO 083

VALVE ACTUATOR

MEMBRANE FILTRATION PACKAGE UNIT 5 (FUTURE) PROVIDED BY MFSS

A | 220-X-7010 FROM INSTRUMENT AIR

PI 005 | PSL 005

MF-HV220021

MF-CKV220017

SOLENOID DISTRIBUTION MANIFOLD

FROM PROCESS AIR/MIT

MF-HV220022

8"-CIP-CPVC-0049

C | 220-X-7008 TO CIP FEED / FILTRATE RETURN

MF-CV220085

SEE TYPICAL I/Os AND CONTROL

TO FILTRATE VENT

MF-CKV220019

MF-CV220108

SEE TYPICAL I/Os AND CONTROL

MF-CV220080

MF-CV220082

PIT 010

SEE TYPICAL I/Os AND CONTROL

SEE TYPICAL I/Os AND CONTROL

E | 210-X-7002 FROM STRAINERS

10"-MFF-PVC2-0210

MFF-HV220023

MF-CV220114

MF-FCV220073

NC

MF-CV220074

MF-CV220084

MF-CV220083

MF-CV220086

PSH 017

6"-AS-SS2-0202

E | 220-X-7006 FROM AIR BLOWERS

MF-HV220025

MF-CV220075

MF-CKV220020

SEE TYPICAL I/Os AND CONTROL

TURB

120V

AIT 005

AE 005

TURB

SEE TYPICAL I/Os AND CONTROL

SAMPLE

10"-FIL-PVC-0206

A | 230-X-7001 TO FILTRATE

MF-CV220088

MF-CV220089

E | 220-X-7007 FROM BACKWASH PUMP

12"-BWH-PVC2-0204

MF-CV220076

SEE TYPICAL I/Os AND CONTROL

SEE TYPICAL I/Os AND CONTROL

SEE TYPICAL I/Os AND CONTROL

NC

MF-CV220090

FIT 005

120V

PIT 009

FE 005

M

PSH 018

SEE TYPICAL I/Os AND CONTROL

MF-CV220081

12"-BWW-PVC2-0042

B | 210-X-7003 BACKWASH TO ROC WETWELL

FALL

E | 220-X-7008 FROM CIP

8"-CIP-CPVC-0048

MF-CV220077

MF-CV220078

NC

MF-CV220079

SEE TYPICAL I/Os AND CONTROL

MF-CV220109

12"-DRN-PVC2-0043

A/G | B/G

14"-MFD-HDPE-0005

D | 220-X-7011 TO MF BACKWASH DRAIN WETWELL

MEMBRANE FILTRATION SYSTEM (FUTURE)

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWING 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. BASED ON THE VENDOR SELECTION, MODIFICATIONS MAY BE REQUIRED TO MEET THE SPECIFIC DESIGN OF SELECTED VENDOR EQUIPMENT.
5. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
DANIEL BUTLER
No. E 18555
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:38:39-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	404790-220-RO UV Building.rvt
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION AWPF MF UNIT 5 (FUTURE) P&ID

DRAWING NUMBER

220-X-7005

SHEET NUMBER

327 OF 370

SCADA HMI

MF-PLC220001

HI DISCH PRESS PAH 006 | HI DISCH TEMP TAH 001 | HI DIFF PRESS PDAH 001 | IN REMOTE YI 001 | RUNNING YIR 001 | COMMON FAIL UA 001 | RUN CMD UCR 001 | SPEED INDCTN SI 001 | SPEED CNTRL SC 001

HI DISCH PRESS PAH 007 | HI DISCH TEMP TAH 002 | HI DIFF PRESS PDAH 002 | IN REMOTE YI 002 | RUNNING YIR 002 | COMMON FAIL UA 002 | RUN CMD UCR 002 | SPEED INDCTN SI 002 | SPEED CNTRL SC 002

PRESS PI 012 | FLOW FI 008

MF-LCP220004

HS 001A | LOR | HMS 001 | RST | HS 001B | SS | PDAH 001 | TAH 001 | SIC 001 | YLR 001 | UA 001 FAIL | PAH 006

480 V

MF SCOUR BLOWER NO.1 SKID WITH ACOUSTIC ENCLOSURE

PDSH 001 | PDI 001 | TI 001 | TSH 001 | MF-PSV220001 | PI 006 | PSH 006

MF-FLT220001 | S | S

ROTARY LOBE MF SCOUR BLOWER NO. 1
MF-B220001

MF-CKV220013

6"-AS-SS2-0001

MF-HV220016

MF-LCP220005

HS 002A | LOR | HMS 002 | RST | HS 002B | SS | PDAH 002 | TAH 002 | SIC 002 | YLR 002 | UA 002 FAIL | PAH 007

480 V

MF SCOUR BLOWER NO.2 SKID WITH ACOUSTIC ENCLOSURE

PDSH 002 | PDI 002 | TI 002 | TSH 002 | MF-PSV220002 | PI 007 | PSH 007

MF-FLT220002 | S | S

ROTARY LOBE MF SCOUR BLOWER NO. 2
MF-B220002

MF-CKV220014

6"-AS-SS2-0002

MF-HV220017

PIT 012 | FIT 008 120V | FE 008 ΔT

6"-AS-SS2-0003

6"-AS-SS2-0004 | A | 220-X-7001 | TO MF UNIT 1

6"-AS-SS2-0005 | B | 220-X-7002 | TO MF UNIT 2

6"-AS-SS2-0006 | C | 220-X-7003 | TO MF UNIT 3

6"-AS-SS2-0201 | D | 220-X-7004 | TO FUTURE MF UNIT 4

6"-AS-SS2-0202 | E | 220-X-7005 | TO FUTURE MF UNIT 5

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.
4. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16563
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:38:30 -05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

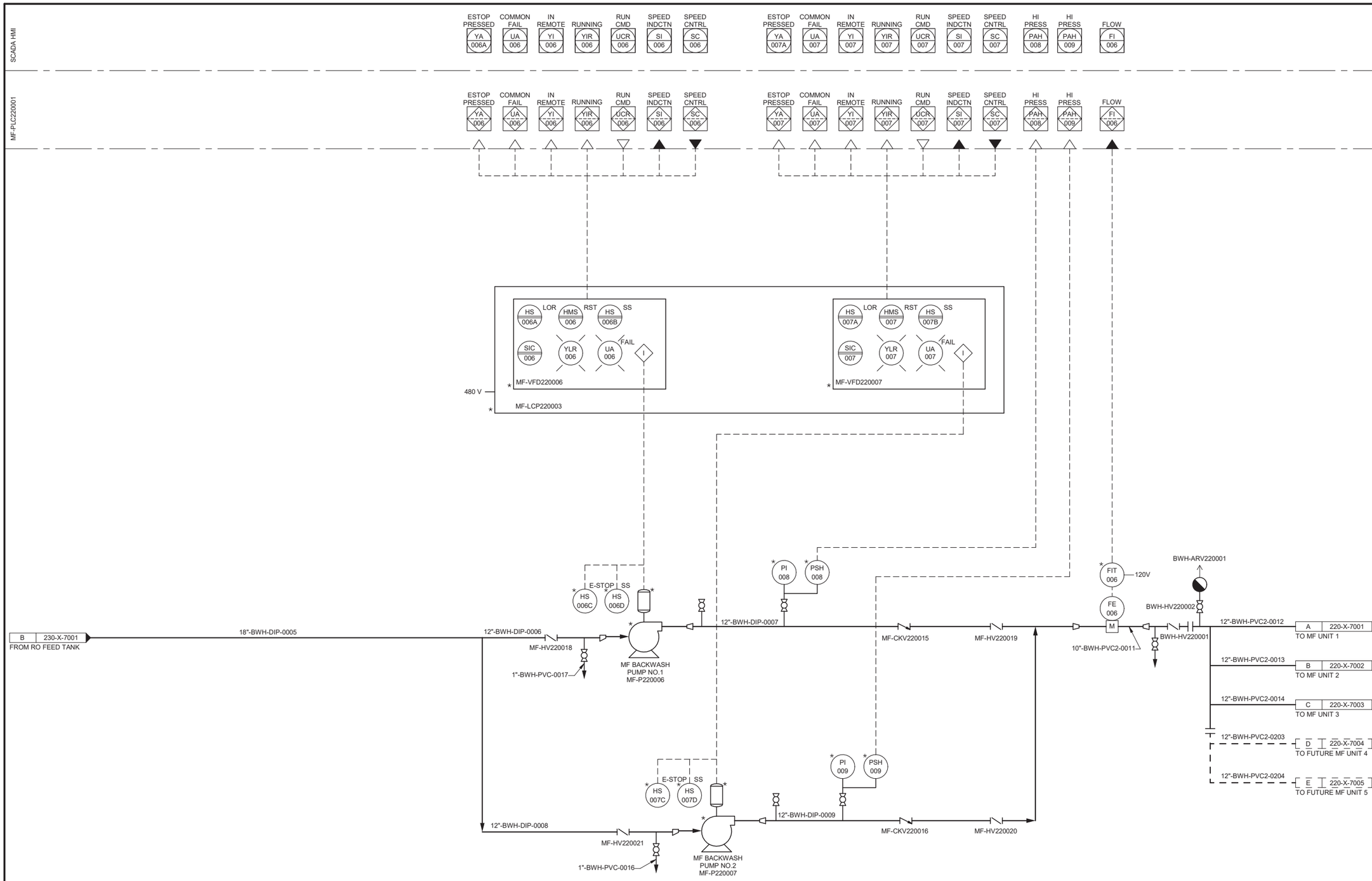
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF MF SCOUR AIR BLOWERS
P&ID

DRAWING NUMBER
220-X-7006

SHEET NUMBER
328 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY THE MF SYSTEM SUPPLIER.
4. PROCESS CODE IS MF AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.

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Black & Veatch Corporation
Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 18663 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:38:20-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF MF BACKWASH PUMPS
P&ID

DRAWING NUMBER
220-X-7007

SHEET NUMBER
329 OF 370

PLOTTED: 8/20/2021 11:58:40 AM
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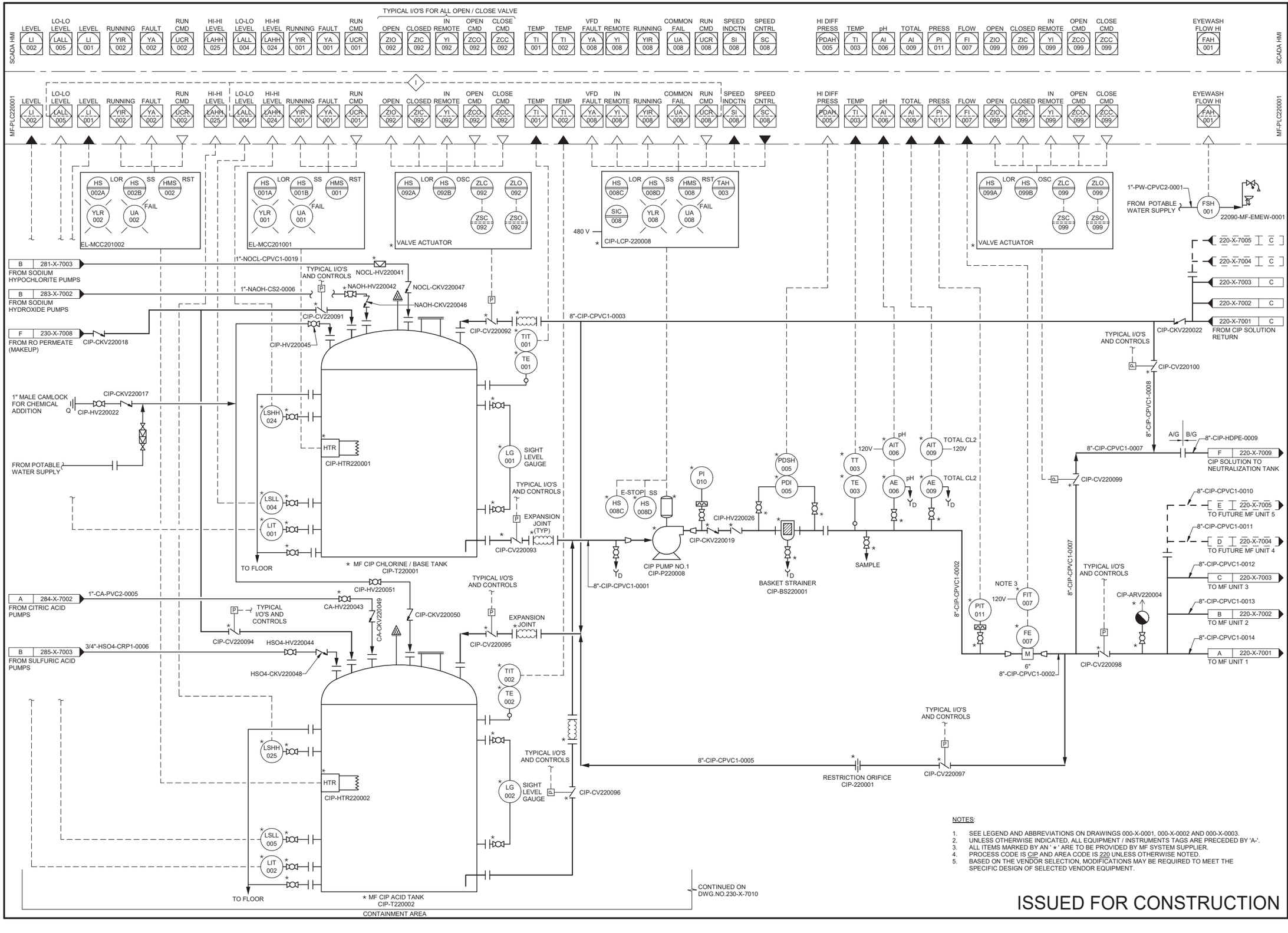

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY MF SYSTEM SUPPLIER.
4. PROCESS CODE IS CIP AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
5. BASED ON THE VENDOR SELECTION, MODIFICATIONS MAY BE REQUIRED TO MEET THE SPECIFIC DESIGN OF SELECTED VENDOR EQUIPMENT.

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 19585
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:38:12-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF MF CIP SYSTEM P&ID

DRAWING NUMBER
220-X-7008

SHEET NUMBER
330 OF 370

PLOTTED: 8/20/2021 10:01:07 AM
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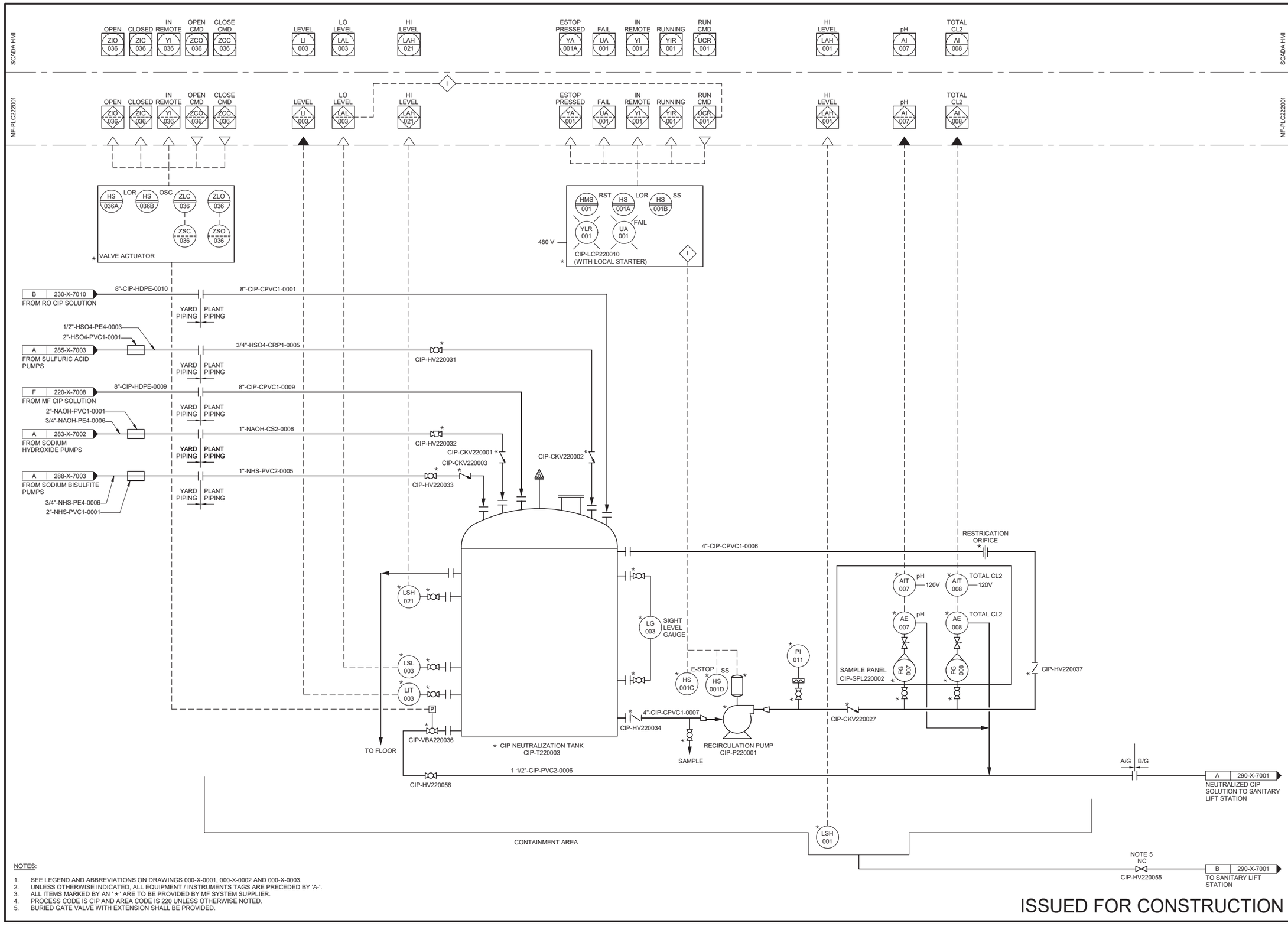

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY MF SYSTEM SUPPLIER.
4. PROCESS CODE IS CIP AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
5. BURIED GATE VALVE WITH EXTENSION SHALL BE PROVIDED.

ISSUED FOR CONSTRUCTION

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16869 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:38:03-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: JSL
DRAWN: VSD, AD
CHECKED: BDS
CHECKED: KAB, BLB
APPROVED: BLB

FILENAME
404790-270-CIP Neutralization.rvt

BV PROJECT NUMBER
404790

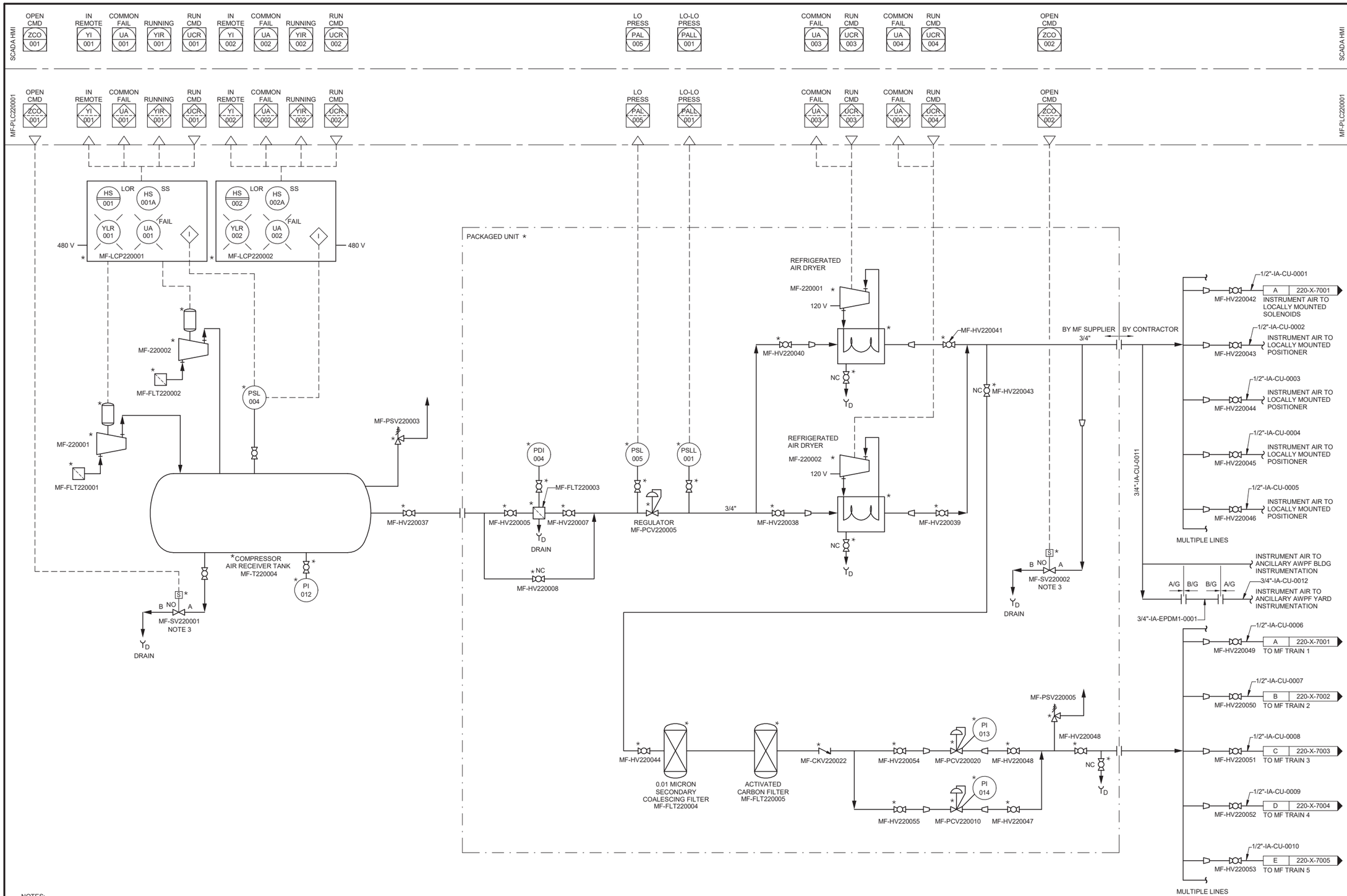
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF CIP
NEUTRALIZATION
SYSTEM
P&ID

DRAWING NUMBER
220-X-7009

SHEET NUMBER
331 OF 370

PLOTTED: 8/24/2021 11:19:30 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS AIR AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE AIR COMPRESSOR SYSTEM SUPPLIER.
5. 120 VAC POWER SUPPLY FROM COMPRESSOR PANEL.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 3:37:17 PM
D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16565
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:37:53-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

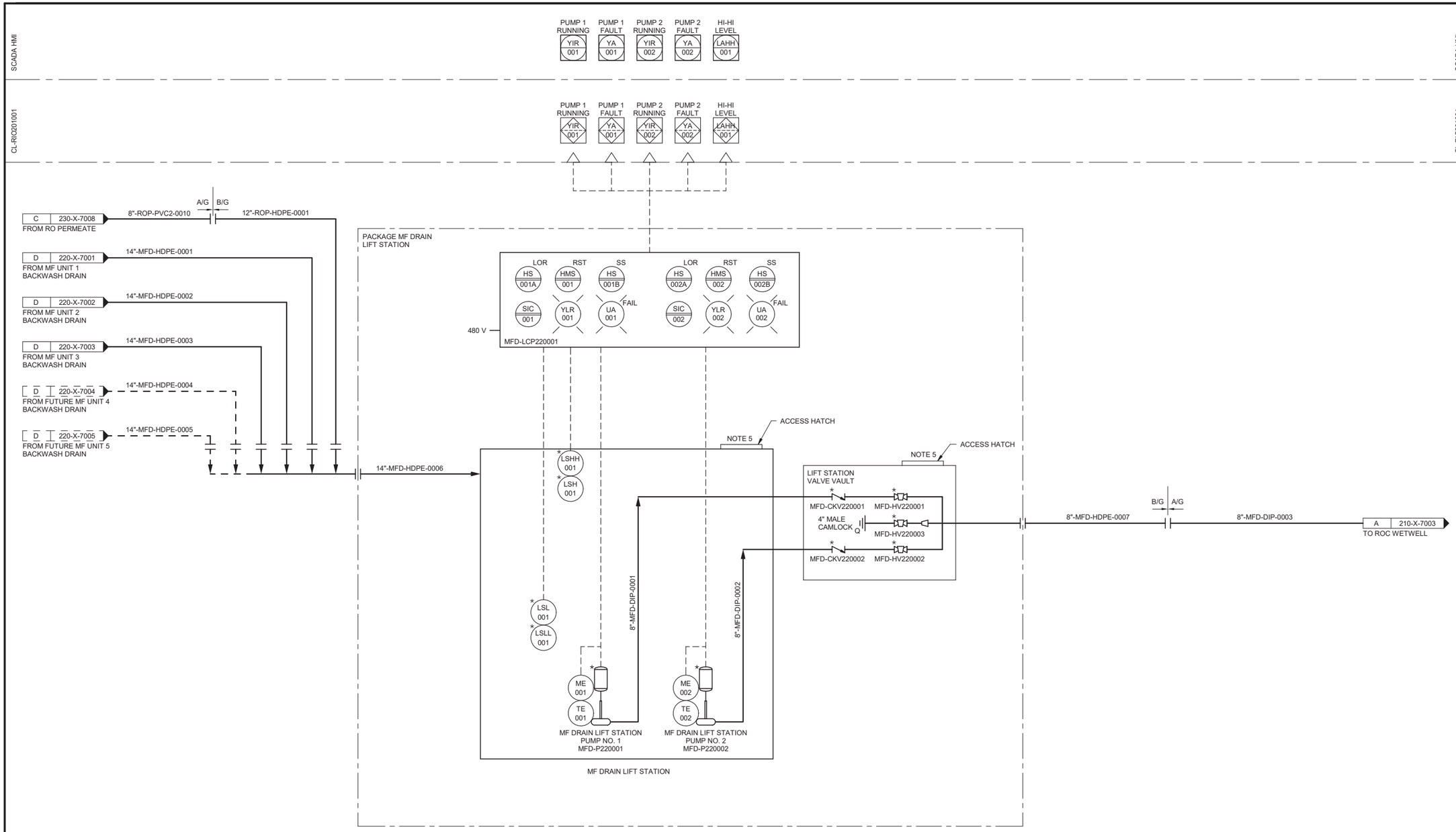
LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB
FILENAME	404790-220-RO UV Building.rvt
BV PROJECT NUMBER	404790
CLIENT PROJECT NUMBER	

INSTRUMENTATION AWPF MF AIR COMPRESSOR P&ID

DRAWING NUMBER
220-X-7010

SHEET NUMBER
332 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWING 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS MFD AND AREA CODE IS 220 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY THE MF DRAIN LIFT STATION SYSTEM SUPPLIER.
5. REFER TO SPECIFICATION SECTION 08 3119 - FLOOR ACCESS DOORS AND HATCHES FOR HATCH REQUIREMENTS.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16365 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:37:44-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: JSL
DRAWN: PVR
CHECKED: BDS
CHECKED: KAB, BLB
APPROVED: BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

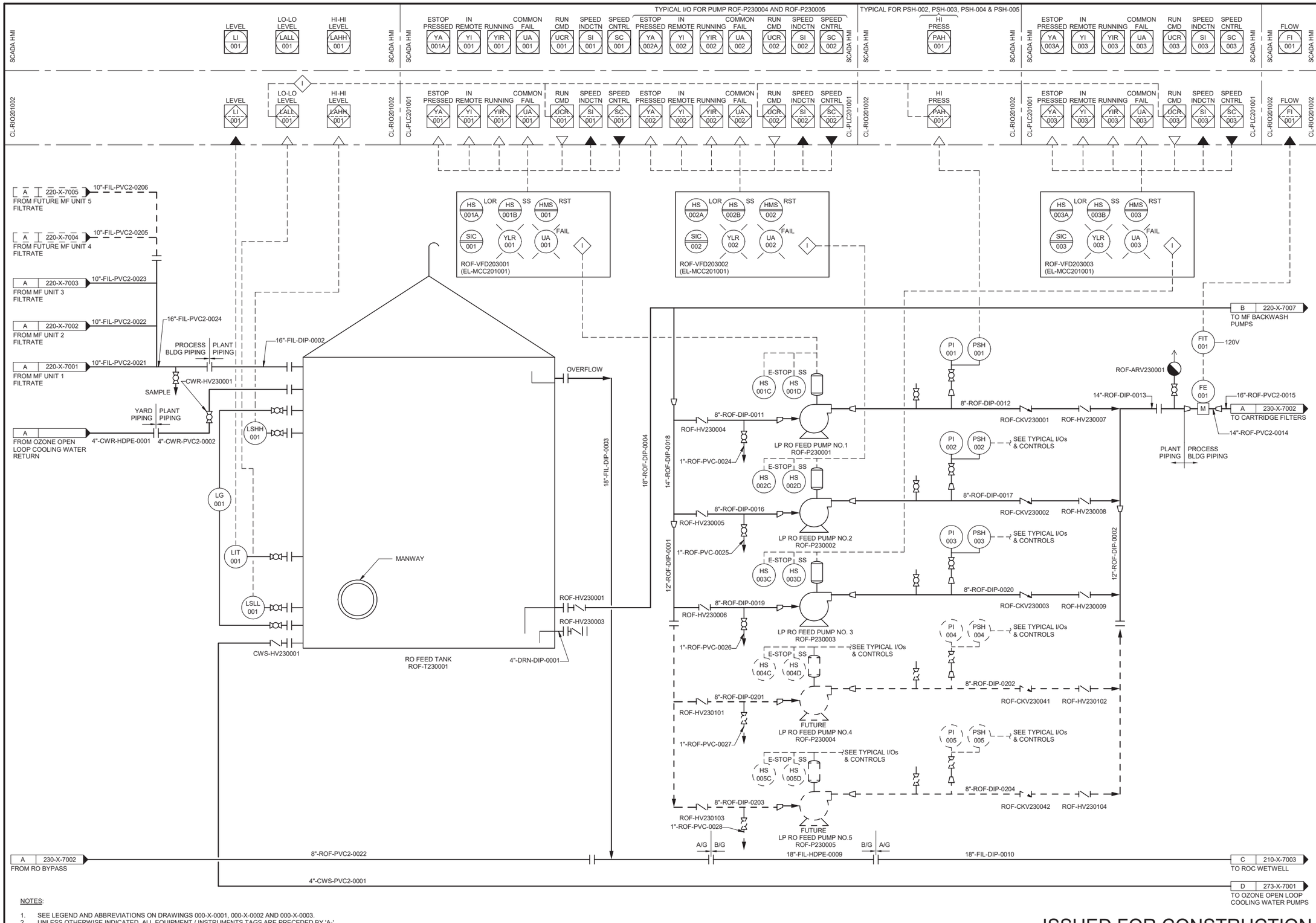
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF MF DRAIN
LIFT STATION
P&ID

DRAWING NUMBER
220-X-7011

SHEET NUMBER
333 OF 370

PLOTTED: 8/20/2021 1:31:52 PM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/24/2021 11:23:59 AM
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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
FRANK L. BUTLER
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:37:34-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

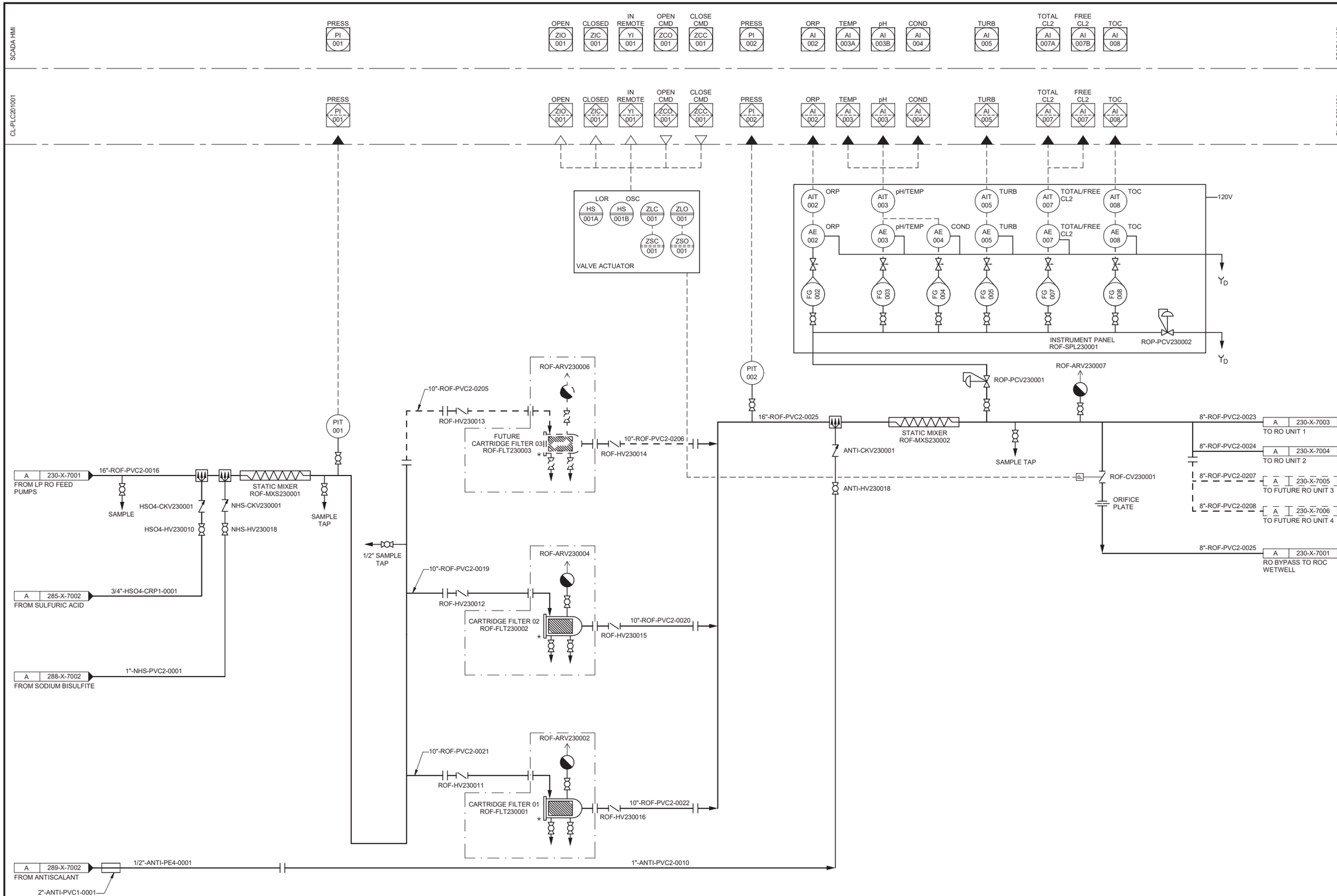
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO FEED TANK AND LP PUMPS
P&ID

DRAWING NUMBER
230-X-7001

SHEET NUMBER
334 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY RO SYSTEM SUPPLIER.
4. CLEAN PORTS OF FLOW METER.
5. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16663 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:37:25-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

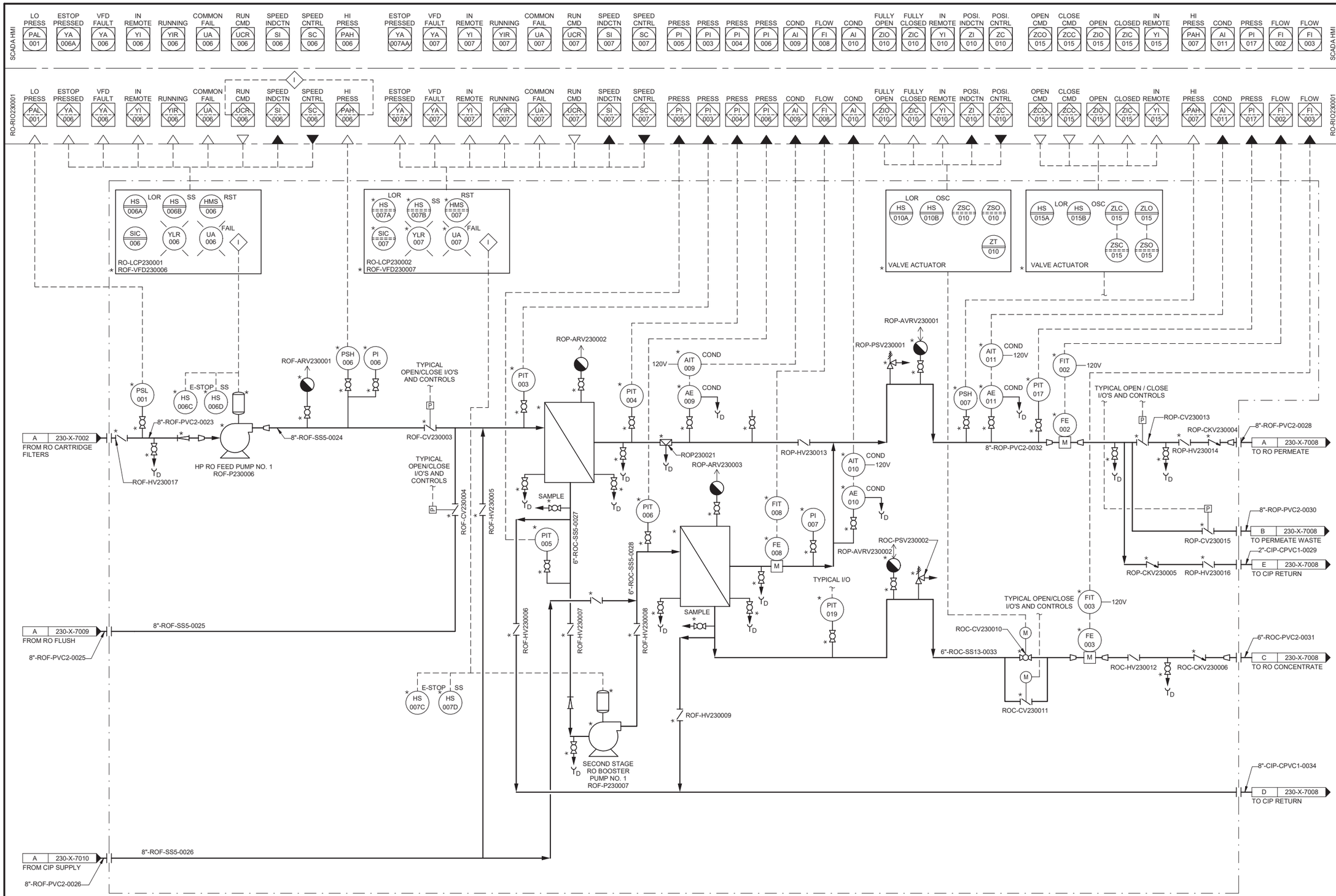
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO CARTRIDGE FILTERS
P&ID

DRAWING NUMBER
230-X-7002

SHEET NUMBER
335 OF 370

PLOTTED: 8/20/2021 4:29:55 PM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY RO SYSTEM SUPPLIER.

RO SYSTEM 1
MFR: WIGEN
MEMBRANE: DUPONT BW30XFR-400/34i

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 18603
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:37:09-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

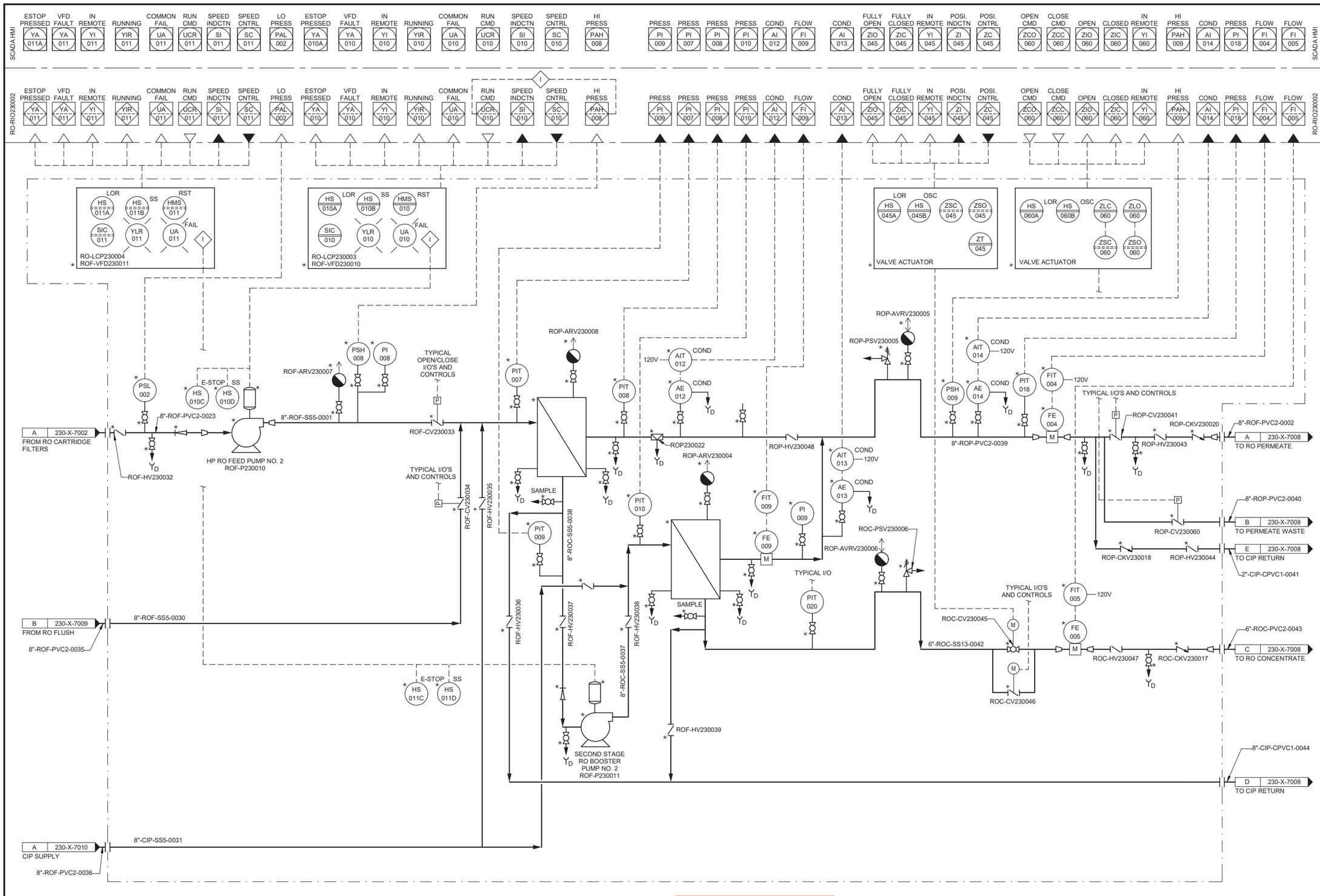
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO UNIT 1
P&ID

DRAWING NUMBER
230-X-7003

SHEET NUMBER
336 OF 370

PLOTTED: 8/24/2021 8:53:53 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY RO SYSTEM SUPPLIER.

RO SYSTEM 2
MFR: WIGEN
MEMBRANE: DUPONT BW30XFR-400/34i

ISSUED FOR CONSTRUCTION

PLOTTED: 8/24/2021 8:54:15 AM
D10000

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:36:59-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO UNIT 2
P&ID

DRAWING NUMBER
230-X-7004

SHEET NUMBER
337 OF 370

SCADA HMI: ESTOP PRESSED YA 013A | VFD FAULT YA 013 | IN REMOTE YI 013 | RUNNING YIR 013 | COMMON FAIL UA 013 | RUN CMD UCR 013 | SPEED INDCTN SI 013 | SPEED CNTRL SC 013 | LO PRESS PAL 004 | ESTOP PRESSED YA 012A | VFD FAULT YA 012 | IN REMOTE YI 012 | RUNNING YIR 012 | COMMON FAIL UA 012 | RUN CMD UCR 012 | SPEED INDCTN SI 012 | SPEED CNTRL SC 012 | HI PRESS PAH 010 | PRESS PI 022 | PRESS PI 011 | PRESS PI 012 | PRESS PI 023 | COND AI 025 | FLOW FI 015 | COND AI 027 | FULLY OPEN ZIO 072 | FULLY CLOSED ZIC 072 | IN REMOTE YI 072 | POSI. INDCTN ZI 072 | POSI. CNTRL ZC 072 | OPEN CMD ZCO 061 | CLOSE CMD ZCC 061 | OPEN ZIO 061 | CLOSED ZIC 061 | IN REMOTE YI 061 | HI PRESS PAH 011 | COND AI 026 | PRESS PI 021 | FLOW FI 014 | FLOW FI 016 — SCADA HMI

RO-RIO230003: ESTOP PRESSED K 013 | VFD FAULT K 013 | IN REMOTE K 013 | RUNNING K 013 | COMMON FAIL K 013 | RUN CMD K 013 | SPEED INDCTN K 013 | SPEED CNTRL K 013 | LO PRESS K 004 | ESTOP PRESSED K 012 | VFD FAULT K 012 | IN REMOTE K 012 | RUNNING K 012 | COMMON FAIL K 012 | RUN CMD K 012 | SPEED INDCTN K 012 | SPEED CNTRL K 012 | HI PRESS K 010 | PRESS K 022 | PRESS K 011 | PRESS K 012 | PRESS K 023 | COND K 025 | FLOW K 015 | COND K 027 | FULLY OPEN K 072 | FULLY CLOSED K 072 | IN REMOTE K 072 | POSI. INDCTN K 072 | POSI. CNTRL K 072 | OPEN CMD K 061 | CLOSE CMD K 061 | OPEN K 061 | CLOSED K 061 | IN REMOTE K 061 | HI PRESS K 011 | COND K 026 | PRESS K 021 | FLOW K 014 | FLOW K 016 — RO-RIO230003

RO-LCP230006 * ROF-VFD230013 — LOR HS 013A | RST HMS 013 | SS HS 013B | SIC 013 | YLR 013 | FAIL UA 013

RO-LCP230005 * ROF-VFD230012 — LOR HS 012A | RST HMS 012 | SS HS 012B | SIC 012 | YLR 012 | FAIL UA 012

VALVE ACTUATOR * — LOR HS 072A | OSC HS 072B | ZSC 072 | ZSO 072 | ZT 072

VALVE ACTUATOR * — LOR HS 061A | OSC HS 061B | ZLC 061 | ZLO 061 | ZSC 061 | ZSO 061

A 230-X-7002 FROM RO CARTRIDGE FILTERS — 8"-ROF-PVC2-0201 — PSL 004 — ROF-HV230065

HP RO FEED PUMP NO. 3 ROF-P230012 — E-STOP SS HS 012C | HS 012D

8"-ROF-SS5-0202 — ROF-ARV230018 — PSH 010 | PI 010 — TYPICAL OPEN/CLOSE I/O'S AND CONTROLS — ROF-CV230066

ROF-ARV230019 — PIT 011 — 120V AIT 025 COND | AE 025 COND

ROP-HV230055 ROP-ARV230020 — ROP-HV230074 — AIT 027 COND 120V | AE 027 COND

ROP-AVRV230021 — ROP-PSV230021

AIT 026 COND 120V | AE 026 COND | PSH 011 | PIT 021 | FIT 014 120V | FE 014 — TYPICAL I/O'S AND CONTROLS

8"-ROC-PVC2-0206 — ROP-CKV230033 — ROP-HV230070 — ROP-CV230069 — 8"-ROF-PVC2-0205 — A 230-X-7008 TO RO PERMEATE

TYPICAL I/O'S AND CONTROLS — ROF-CV230067 — ROF-HV230048

SAMPLE — PIT 022 — 8"-ROC-SS5-0206 — PIT 023 — FIT 015 | PI 011 | FE 015 — ROC-PSV230022 — ROP-AVRV230022

ROP-CV230061 — 8"-ROP-PVC2-0207 — B 230-X-7008 TO PERMEATE WASTE

ROP-CKV230032 — ROP-HV230054 — 2"-CIP-CPVC1-0208 — 230-X-7008 TO CIP RETURN

CIP-HV230053 — TYPICAL I/O — PIT 029

TYPICAL I/O'S AND CONTROLS — FIT 016 120V | FE 016

C 230-X-7009 FROM RO FLUSH — 8"-ROF-SS5-0203 — 8"-ROF-PVC2-0203

ROF-HV230049 — ROF-HV230050 — 8"-ROC-SS5-0205 — ROF-HV230051 — SAMPLE

ROC-CV230072 — 12"-FPRW-SS13-0206 — ROC-CV230071 — ROC-HV230073 — ROC-CKV230031 — 6"-ROC-PVC2-0209 — C 230-X-7008 TO RO CONCENTRATE

E-STOP SS HS 013C | HS 013D

SECOND STAGE RO BOOSTER PUMP NO. 3 ROF-P230013 — ROF-HV230052

8"-CIP-CPVC1-0210 — D 230-X-7008 TO CIP RETURN

A 230-X-7010 FROM CIP SUPPLY — 8"-ROF-SS5-0204 — 8"-ROF-PVC2-0204

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY RO SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/24/2021 8:54:41 AM
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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — DANIEL BUTLER — No. E 18665 — ELECTRICAL — STATE OF CALIFORNIA
2021.08.26 09:36:46-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

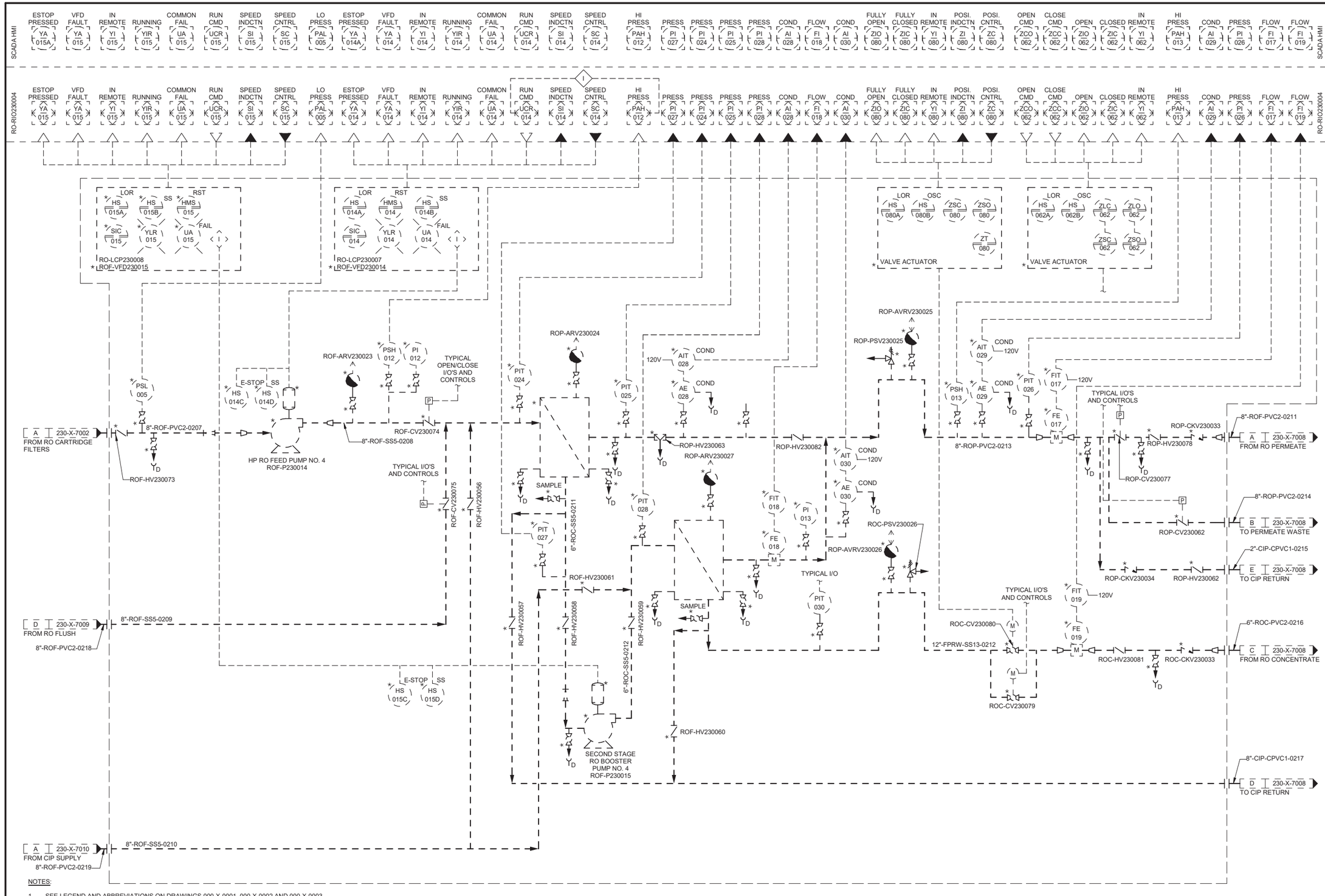
DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME 404790-220-RO UV Building.rvt
BV PROJECT NUMBER 404790
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO UNIT 3
(FUTURE)
P&ID

DRAWING NUMBER
230-X-7005

SHEET NUMBER
338 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS WILL BE PRECEDED BY 'A-'.
3. PROCESS CODE IS ROF AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. FUTURE I/O'S FOR FUTURE EQUIPMENT ARE LOCATED IN THE FUTURE RIO PANELS.
5. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY RO SUPPLIER.

ISSUED FOR CONSTRUCTION

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 18603
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:36:37-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO UNIT 4
(FUTURE)
P&ID

DRAWING NUMBER
230-X-7006

SHEET NUMBER
339 OF 370

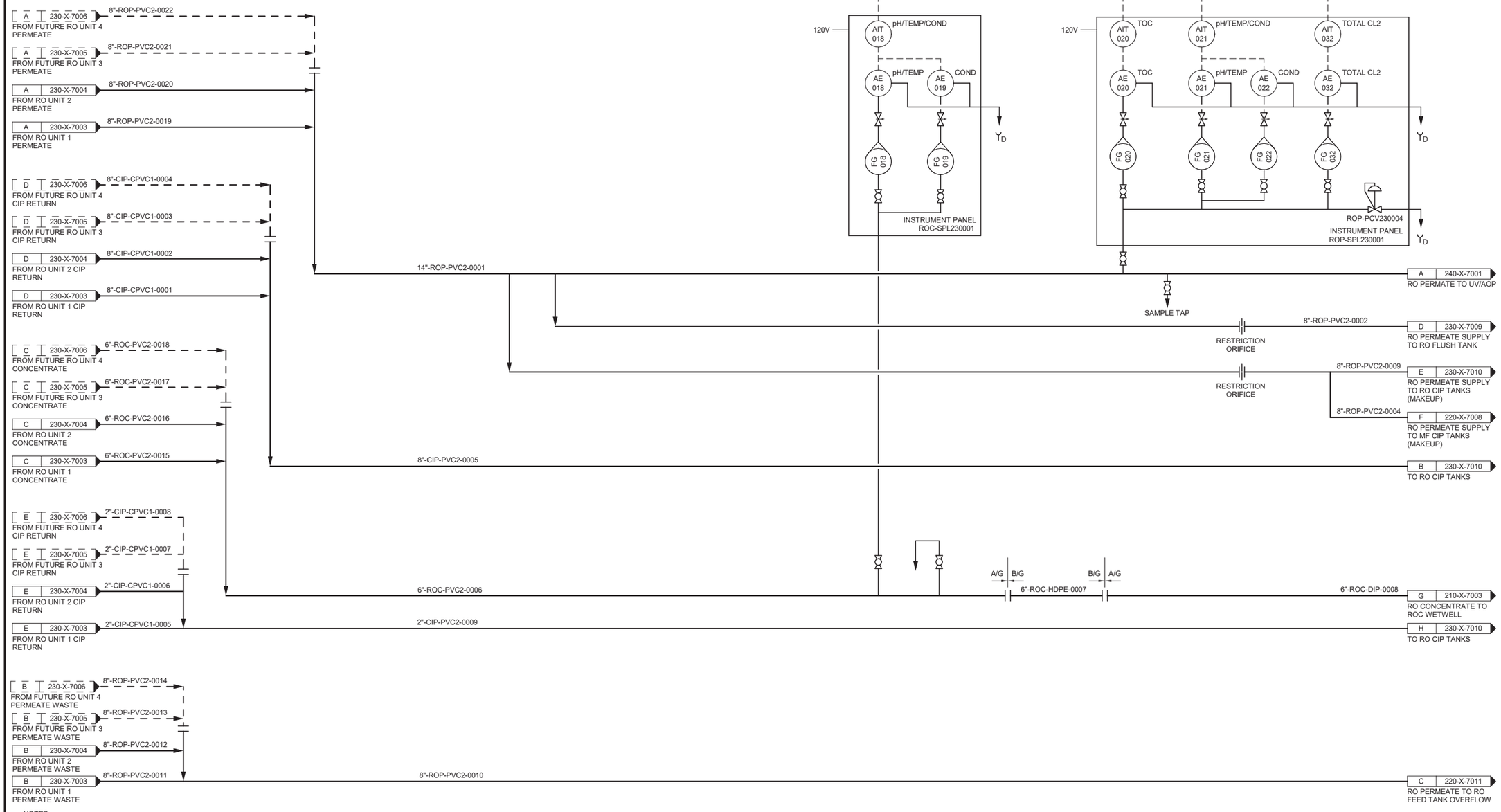
PLOTTED: 8/24/2021 8:54:59 AM
D10000

SCADA HMI

CL-PLC201001

TEMP AI 018A | pH AI 018B | COND AI 019

TOC AI 020 | TEMP AI 021A | pH AI 021B | COND AI 022 | TOTAL CL2 AI 032



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. CLEAN PORTS OF FLOW METER.
4. PROCESS CODE IS ROP AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/23/2021 6:50:47 PM
D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16661
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:36:28-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF REVERSE OSMOSIS OVERVIEW P&ID

DRAWING NUMBER
230-X-7008

SHEET NUMBER
340 OF 370

PCS HMI

RO-PLC230001

LEVEL LI 002 | LO LEVEL LAL 002 | HI LEVEL LAH 002 | OPEN CMD ZCO 048 | CLOSE CMD ZCC 048 | OPEN ZIO 048 | CLOSED ZIC 048 | IN REMOTE YI 048 | ESTOP PRESSED YA 016A | IN REMOTE YI 016 | RUNNING YIR 016 | COMMON FAIL UA 016 | RUN CMD UCR 016 | SPEED INDCTN SI 016 | SPEED CNTRL SC 016 | ESTOP PRESSED YA 017A | IN REMOTE YI 017 | RUNNING YIR 017 | COMMON FAIL UA 017 | RUN CMD UCR 017 | SPEED INDCTN SI 017 | SPEED CNTRL SC 017 | FLOW FI 012 | PRESS PI 015

LOR HS 048A | OSC HS 048B | ZLC 048 | ZLO 048 | ZSC 048 | ZSO 048 | VALVE ACTUATOR *

480 V * RO-VFD203016 * RO-LCP230001

LOR HS 016A | SS HS 016B | RST HMS 016 | SIC 016 | YLR 016 | FAIL UA 016

LOR HS 017A | SS HS 017B | RST HMS 017 | SIC 017 | YLR 017 | FAIL UA 017 * RO-VFD203017

D 230-X-7008 FROM RO PERMEATE

P * 8"-ROP-PVC2-0002 ROP-CV230048

LSH 002 * | LSL 002 * | LIT 002 *

OVERFLOW

* RO FLUSHING TANK RO-T230002

8"-RO-PVC2-0001 * RO-230001

CONE STRAINER *

8"-RO-PVC2-0002 * RO-HV230026

RO FLUSHING PUMP NO.1 RO-P230016

E-STOP SS HS 016C HS 016D

PI 010 *

RO-CKV230022 * RO-HV230029

8"-RO-PVC2-0004

120V FIT 012 * | FE 012 M | 6"-RO-PVC2-0006

PIT 015 * SAMPLE

RO-ARV230012 *

8"-RO-PVC2-0007 A 230-X-7003 FLUSHING WATER TO RO UNIT 1

8"-RO-PVC2-0008 B 230-X-7004 FLUSHING WATER TO RO UNIT 2

8"-RO-PVC2-0209 C 230-X-7005 FLUSHING WATER TO FUTURE RO UNIT 3

8"-RO-PVC2-0210 D 230-X-7006 FLUSHING WATER TO FUTURE RO UNIT 4

RO-HV230027 * 2" DRAIN TO FLOOR

8"-RO-PVC2-0003

RO-HV230028 * D

E-STOP SS HS 017C HS 017D

PI 011 *

RO FLUSHING PUMP NO.2 RO-P230017

RO-CKV230023 * RO-HV230030

8"-RO-PVC2-0005

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS RO AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN ' * ' ARE TO BE PROVIDED BY THE RO SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:30:04 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16000
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:36:18-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	PVR, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

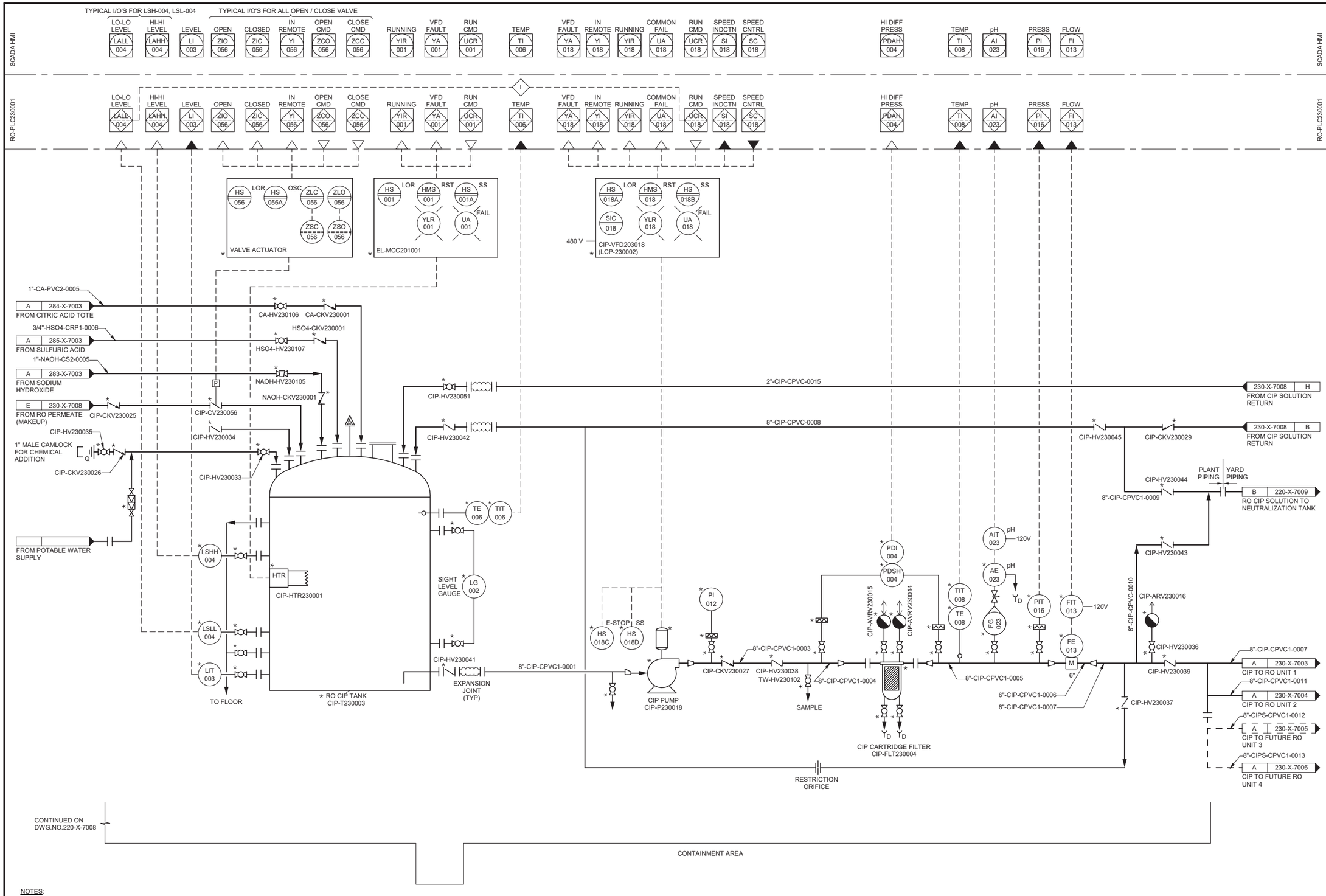
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF RO FLUSHING SYSTEM
P&ID

DRAWING NUMBER
230-X-7009

SHEET NUMBER
341 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS CIP AND AREA CODE IS 230 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE RO SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16563 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:36:09-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
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CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

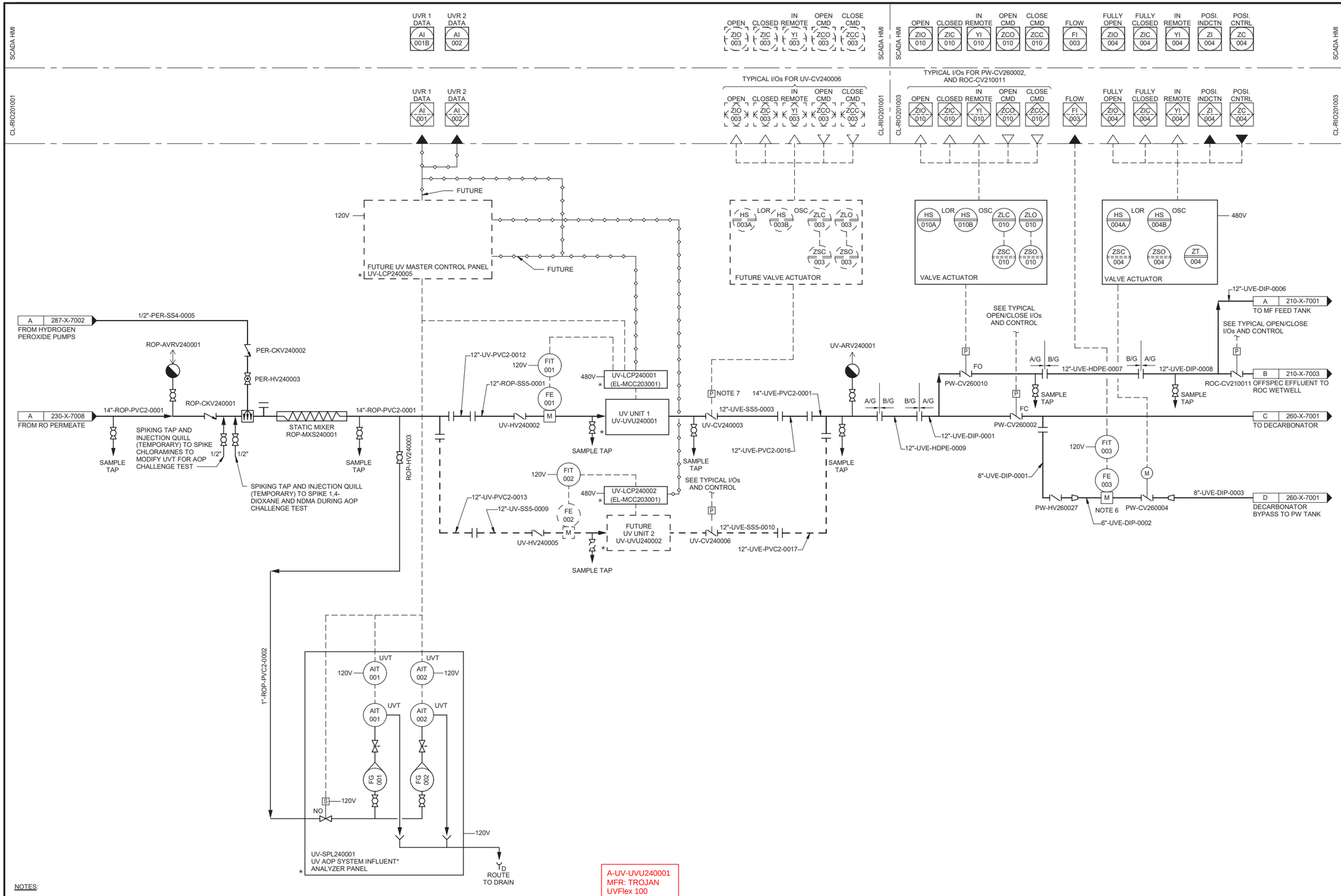
CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF RO CIP SYSTEM P&ID

DRAWING NUMBER
230-X-7010

SHEET NUMBER
342 OF 370

PLOTTED: 8/20/2021 10:30:40 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. ALL ITEMS MARKED BY AN '*' ARE TO BE PROVIDED BY THE UV SYSTEM SUPPLIER.
4. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
5. PROCESS CODE IS UV AND AREA CODE IS 240 UNLESS OTHERWISE NOTED.
6. PROCESS CODE IS PW AND AREA CODE IS 260 FOR THIS FLOWMETER.
7. VALVE ACTUATOR ONLY REQUIRED IN PHASE 2. AT PHASE 1 VALVE IS MANUALLY ACTUATED.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:31:35 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
SHAWN L. BUTLER
No. E 16565
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:35:59-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	MMD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

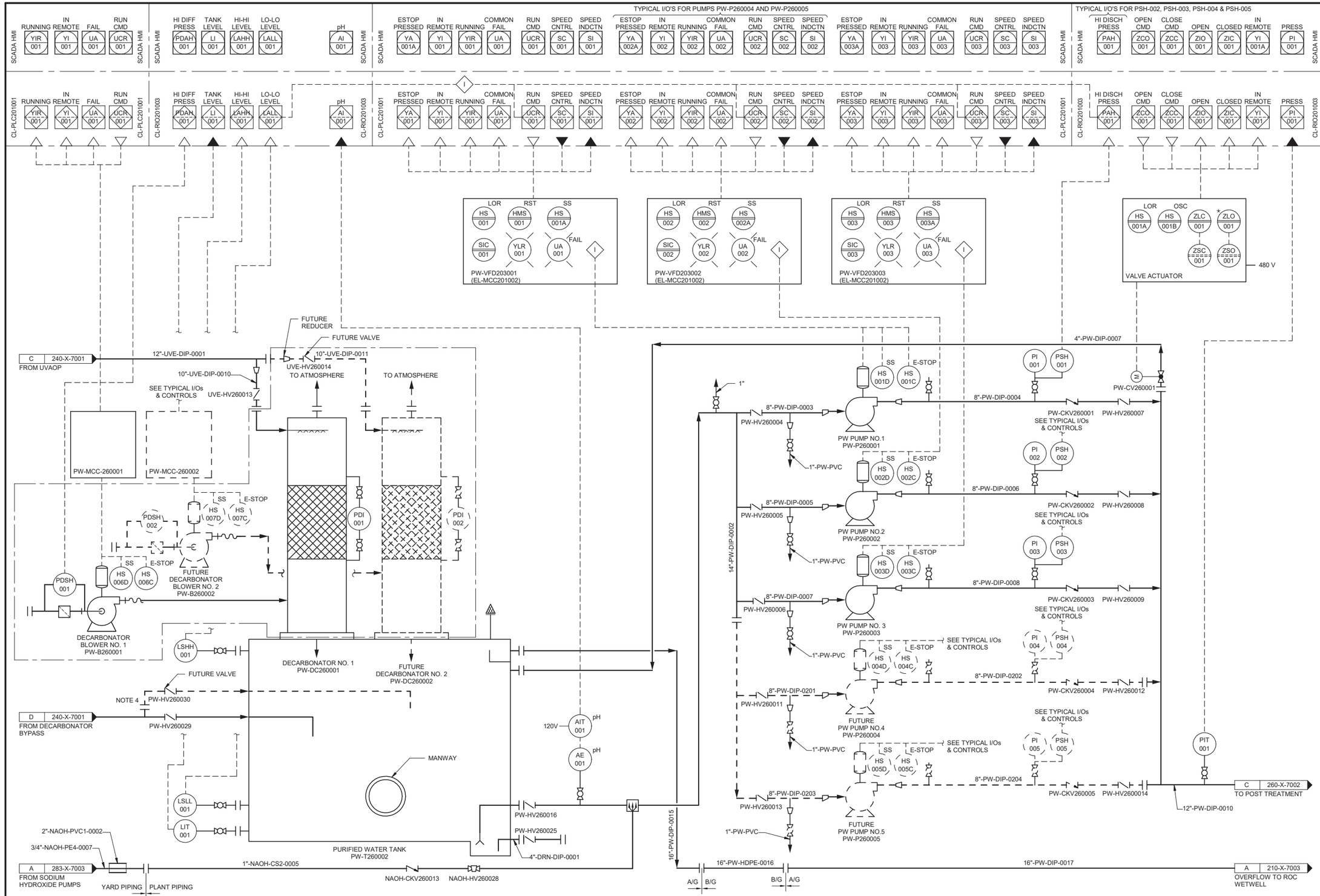
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF UV / AOP SYSTEM
P&ID

DRAWING NUMBER
240-X-7001

SHEET NUMBER
343 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS PW AND AREA CODE IS 260 UNLESS OTHERWISE NOTED.
4. 8" TEE WITH BLIND FLANGE FOR FUTURE DECARBONATOR BYPASS CONNECTION.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:36:05 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER
BRIANL. BUTLER
No. E 18565
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:35:51-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	MMD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-260-Purified Water PS.rvt

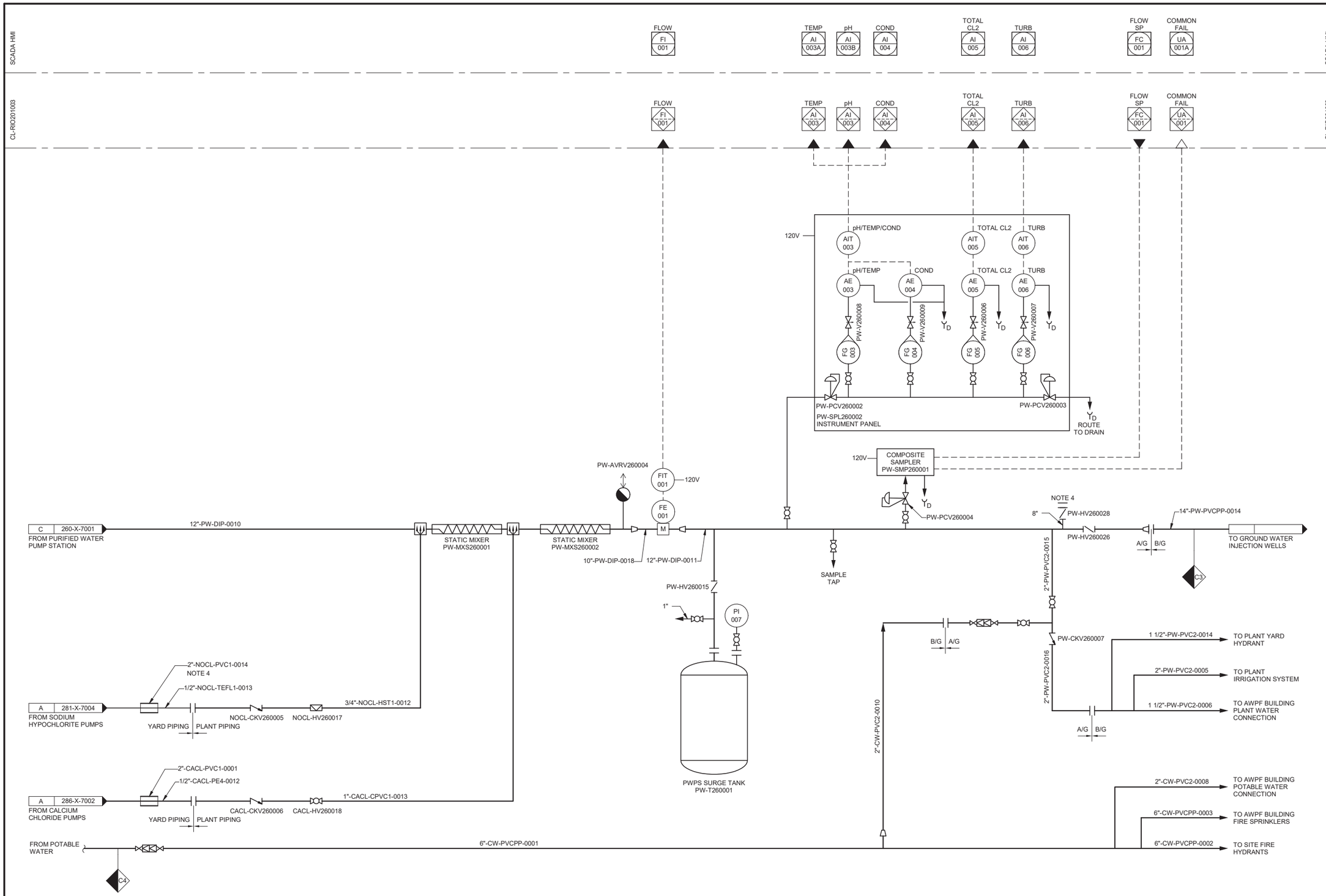
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF PURIFIED WATER PUMP STATION P&ID

DRAWING NUMBER
260-X-7001

SHEET NUMBER
344 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS PW AND AREA CODE IS 260 UNLESS OTHERWISE NOTED.
4. 8" TEE WITH BLIND FLANGE FOR CONNECTION OF TEMPORARY PIPE DURING START UP AND COMMISSIONING.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH

Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16563 ELECTRICAL STATE OF CALIFORNIA

2021.08.26 09:35:38-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	MMD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-260-Purified Water PS.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF POST TREATMENT
P&ID

DRAWING NUMBER
260-X-7002

SHEET NUMBER
345 OF 370

PLOTTED: 8/24/2021 11:10:42 AM
D10000

SCADA HMI

ESTOP PRESSED	IN REMOTE	RUNNING	COMMON FAIL	RUN CMD	SPEED CNTRL	SPEED INDCTN
YA 001A	YI 001	YIR 001	UA 001	UCR 001	SC 001	SI 001
YA 002A	YI 002	YIR 002	UA 002	UCR 002	SC 002	SI 002
YA 003A	YI 003	YIR 003	UA 003	UCR 003	SC 003	SI 003
YA 004A	YI 004	YIR 004	UA 004	UCR 004	SC 004	SI 004

PRESS
PI 001
PI 002

OZ-PLC270001

OZONE OPEN LOOP COOLING WATER PUMP SKID 1

480V

CWS-VFD273001 — LOR: HS 001A; RST: HMS 001; SS: HS 001B; SIC 001; YLR 001; UA 001 FAIL; I

CWS-VFD273002 — LOR: HS 002A; RST: HMS 002; SS: HS 002B; SIC 002; YLR 002; UA 002 FAIL; I

CWS-LCP273001

D | 230-X-7001
FROM RO FEED TANK

4"-CWS-PVC2-0001 — 3"-CWS-PVC2-0002 — 3"-CWS-CU-0003

3"-CWS-PVC2-0004

2"-CWS-CU-0001 — CWS-HV273002 — COOLING WATER PUMP NO. 1 CWS-P273001

SS: HS 001D; E-STOP: HS 001C

2"-CWS-CU-0004 — PI 001 — CWS-CKV273010 — CWS-HV273004

2"-CWS-CU-0002 — CWS-HV273003 — COOLING WATER PUMP NO. 2 CWS-P273002

SS: HS 002D; E-STOP: HS 002C

2"-CWS-CU-0005 — PI 002 — CWS-CKV273011 — CWS-HV273005

3"-CWS-CU-0006 — PIT 001

3"-CWS-PVC2-0007 — 4"-CWS-PVC2-0008 — 4"-CWS-HDPE-0001 — 4"-CWC-PVC2-0009

A/G B/G B/G A/G

A — TO OSS CLOSED LOOP COOLING WATER P&ID

FUTURE OZONE OPEN LOOP COOLING WATER PUMP SKID 2

CWS-VFD273003 — LOR: HS 003A; RST: HMS 003; SS: HS 003B; SIC 003; YLR 003; UA 003 FAIL; I

CWS-VFD273004 — LOR: HS 004A; RST: HMS 004; SS: HS 004B; SIC 004; YLR 004; UA 004 FAIL; I

CWS-LCP273002

3"-CWS-CU-0009

2"-CWS-CU-0007 — CWS-HV273006 — COOLING WATER PUMP NO. 3 CWS-P273003

SS: HS 003D; E-STOP: HS 003C

2"-CWS-CU-0010 — PI 003 — CWS-CKV273012 — CWS-HV273008

2"-CWS-CU-0008 — CWS-HV273007 — COOLING WATER PUMP NO. 4 CWS-P273004

SS: HS 004D; E-STOP: HS 004C

2"-CWS-CU-0011 — PI 004 — CWS-CKV273013 — CWS-HV273009

3"-CWS-CU-0012 — PIT 002

3"-CWS-PVC2-0010

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS CWS AND AREA CODE IS 273 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARK BY AN '*' ARE TO BE PROVIDED BY THE OZONE SYSTEM SUPPLIER.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:32:20 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRANL. BUTLER — NO. E 16564 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:35:28-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	MMD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF OZONE OPEN LOOP COOLING WATER PUMPS P&ID

DRAWING NUMBER
273-X-7001

SHEET NUMBER
346 OF 370

SCADA HMI

CL-RIO201002

TANK LEVEL LI 001

HI-HI LEVEL LAHH 001

EYEWASH FLOW HI FAH 001

SODIUM HYPOCHLORITE TRUCK UNLOADING PANEL NOCL-LCP281011

120V

SIL

HMS 001

LAHH 001

I

LSHH 001

LI 001

LAX 001

NOTE 6

1"-PW-CPVC2-0001

FROM POTABLE WATER SUPPLY

120V

FSH 001

NOCL28190-POLF-EMEW-0001

ROOF PENETRATION

INSECT SCREEN

1"-NOCL-CPVC1-0006

1"-NOCL-CPVC1-0007

1"-NOCL-CPVC1-0009

6"-NOCL-CPVC1-0002

2"-NOCL-CPVC1-0001

OFF-GAS VENT

1"-NOCL-CPVC1-0013 — A 281-X-7004 — TO VACUUM BREAKERS

1"-NOCL-CPVC1-0012 — A 281-X-7003 — TO VACUUM BREAKERS

A 281-X-7002 — TO VACUUM BREAKERS

281-X-7002 B — FROM RELIEF VALVES

1"-NOCL-CPVC1-0014 — 281-X-7003 B — FROM RELIEF VALVES

1"-NOCL-CPVC1-0015 — 281-X-7004 B — FROM RELIEF VALVES

OVERFLOW EL.

NOCL-HV281003

NOTE 4

1"

1"-NOCL-CPVC1-0009

SIGHT LEVEL GAUGE

LG 001

1"

NOCL-HV281004

3"-NOCL-CPVC1-0010

TRUCK UNLOADING CONNECTION WITH LOCKING DUST CAP

NOCL-HV281002

NOCL-HV281001

THREADED CAP (TYP)

MANWAY

NOCL-HV281005

2"-NOCL-CPVC1-0003

2"-NOCL-CPVC1-0003

1"-NOCL-CPVC1-0011 — C 281-X-7004 — TO METERING PUMPS

1"-NOCL-CPVC1-0010 — C 281-X-7003 — TO METERING PUMPS

1"-NOCL-CPVC1-0004 — C 281-X-7002 — TO METERING PUMPS

LSHH 001

LIT 001

2"-NOCL-CPVC1-0005

NOTE 5

NOCL-HV281006

SODIUM HYPOCHLORITE STORAGE TANK NOCL-T281001

DRAIN TO CONTAINMENT

CONTINUED ON DWG.NO.281-X-7002

CONTAINMENT AREA

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS NOCL AND AREA CODE IS 281 UNLESS OTHERWISE NOTED.
4. LOCATE P-TRAP FILL. VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR.
5. PROVIDE FLANGED VALVE TO CONNECT TO TANK FLANGE FOR ALL VALVES AT TANK.
6. LOCATE LOCAL LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK UNLOADING CONNECTION.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:50:43 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIANL. BUTLER — NO. E 16569 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:35:19-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

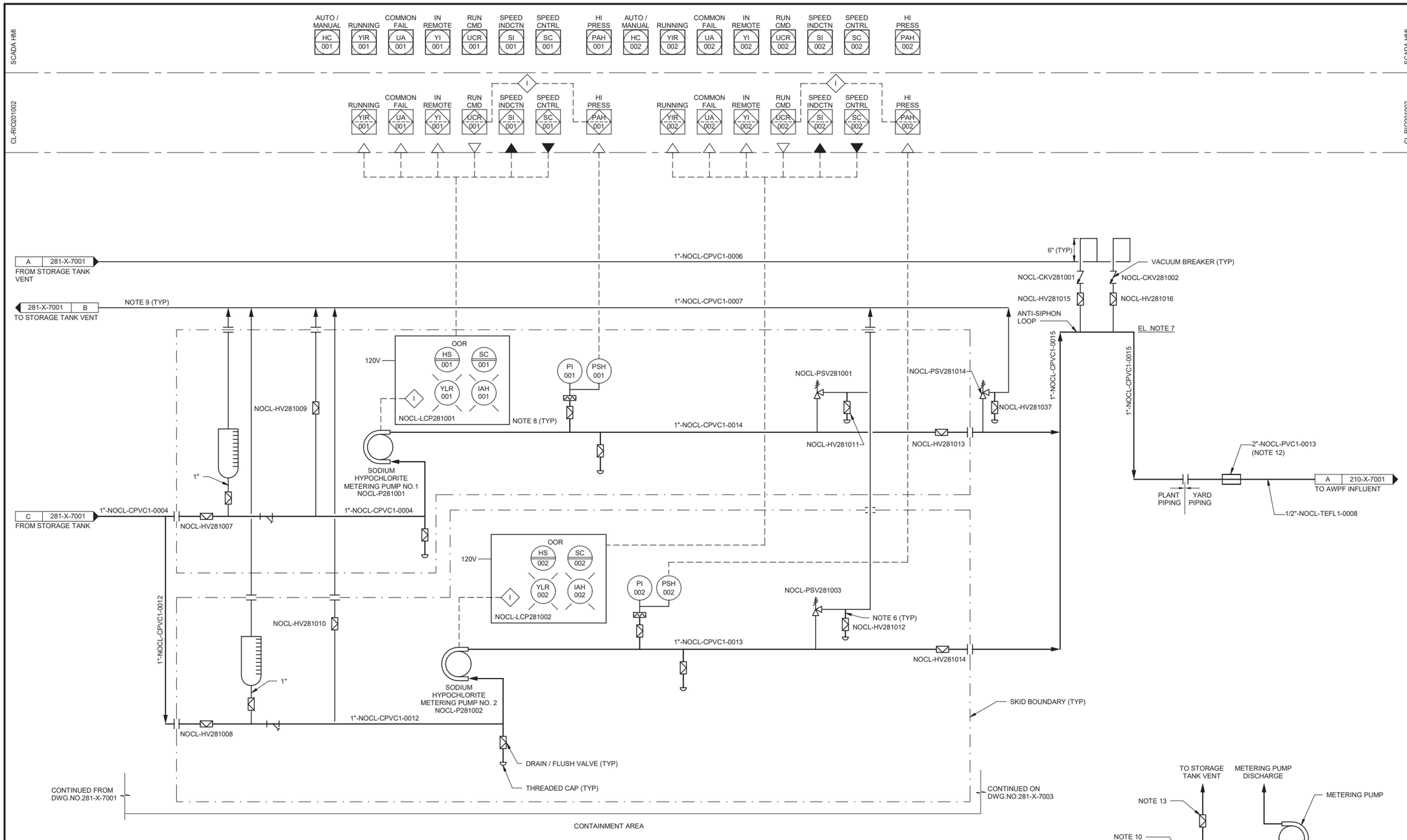
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF SODIUM HYPOCHLORITE STORAGE SYSTEM P&ID

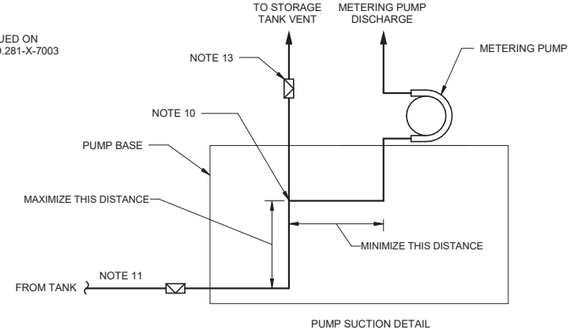
DRAWING NUMBER
281-X-7001

SHEET NUMBER
347 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS NOCL AND AREA CODE IS 281 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN STORAGE TANK OVERFLOW CONNECTION.
8. CONTROL PANEL IS INTEGRAL TO THE PUMP.
9. ROUTE VENT HEADERS 12 INCHES ABOVE STORAGE TANK OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHLL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWARD FROM THE STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
13. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.



PUMP SUCTION DETAIL

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:20:31 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
No. E 16081
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:35:10-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

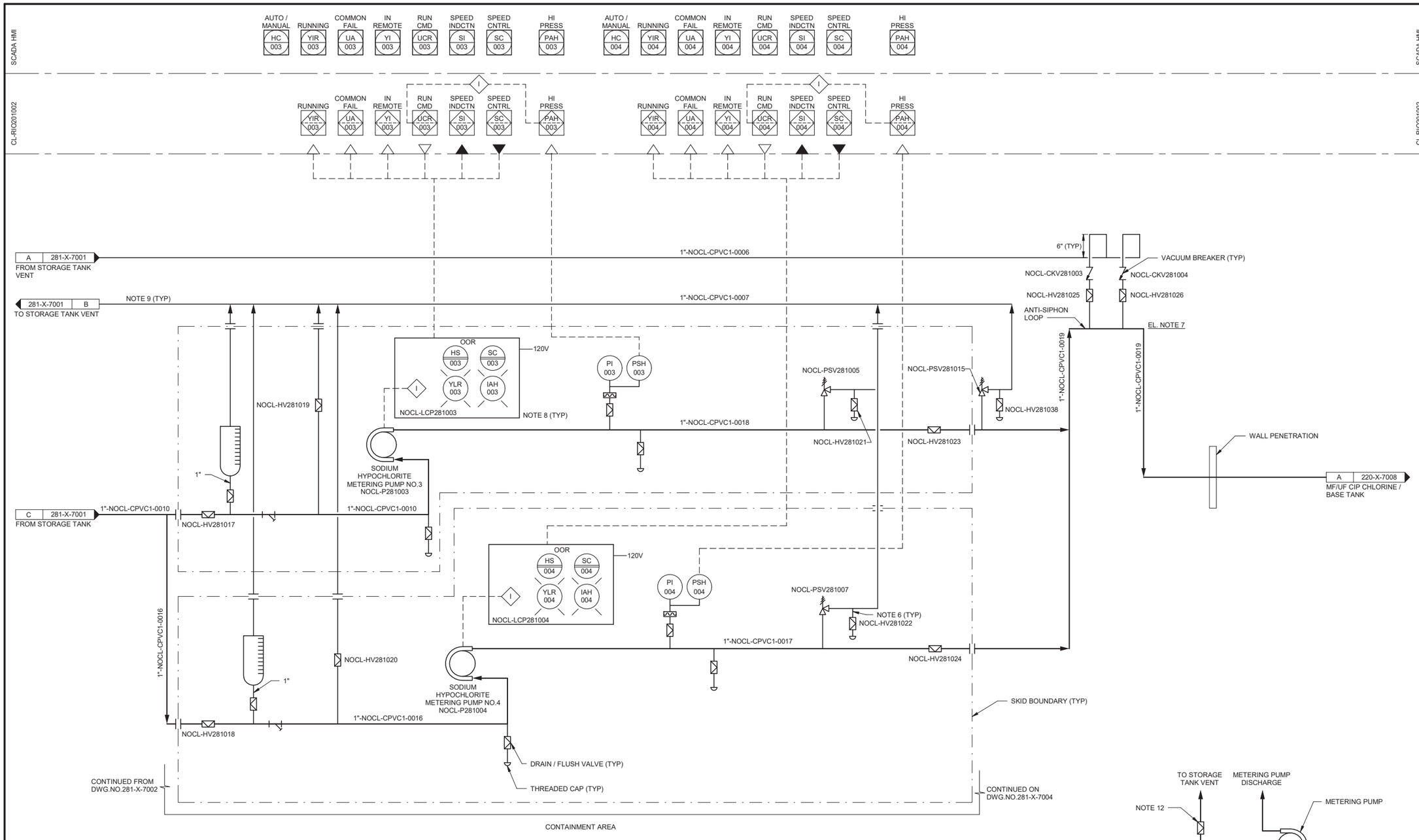
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF SODIUM HYPOCHLORITE FEED SYSTEM SHEET 1 OF 3 P&ID

DRAWING NUMBER
281-X-7002

SHEET NUMBER
348 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
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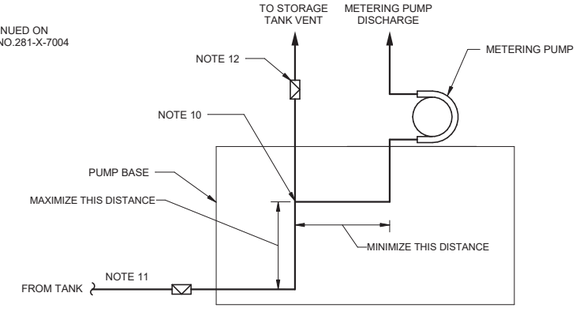
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN STORAGE TANK OVERFLOW CONNECTION.
8. CONTROL PANEL IS INTEGRAL TO THE PUMP.
9. ROUTE VENT HEADERS 12 INCHES ABOVE STORAGE TANK OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHLL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWARD FROM THE STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.
13. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.



PUMP SUCTION DETAIL

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:21:20 AM
D10000

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Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 18565 ELECTRICAL STATE OF CALIFORNIA
2021.08.20 08:00:00-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

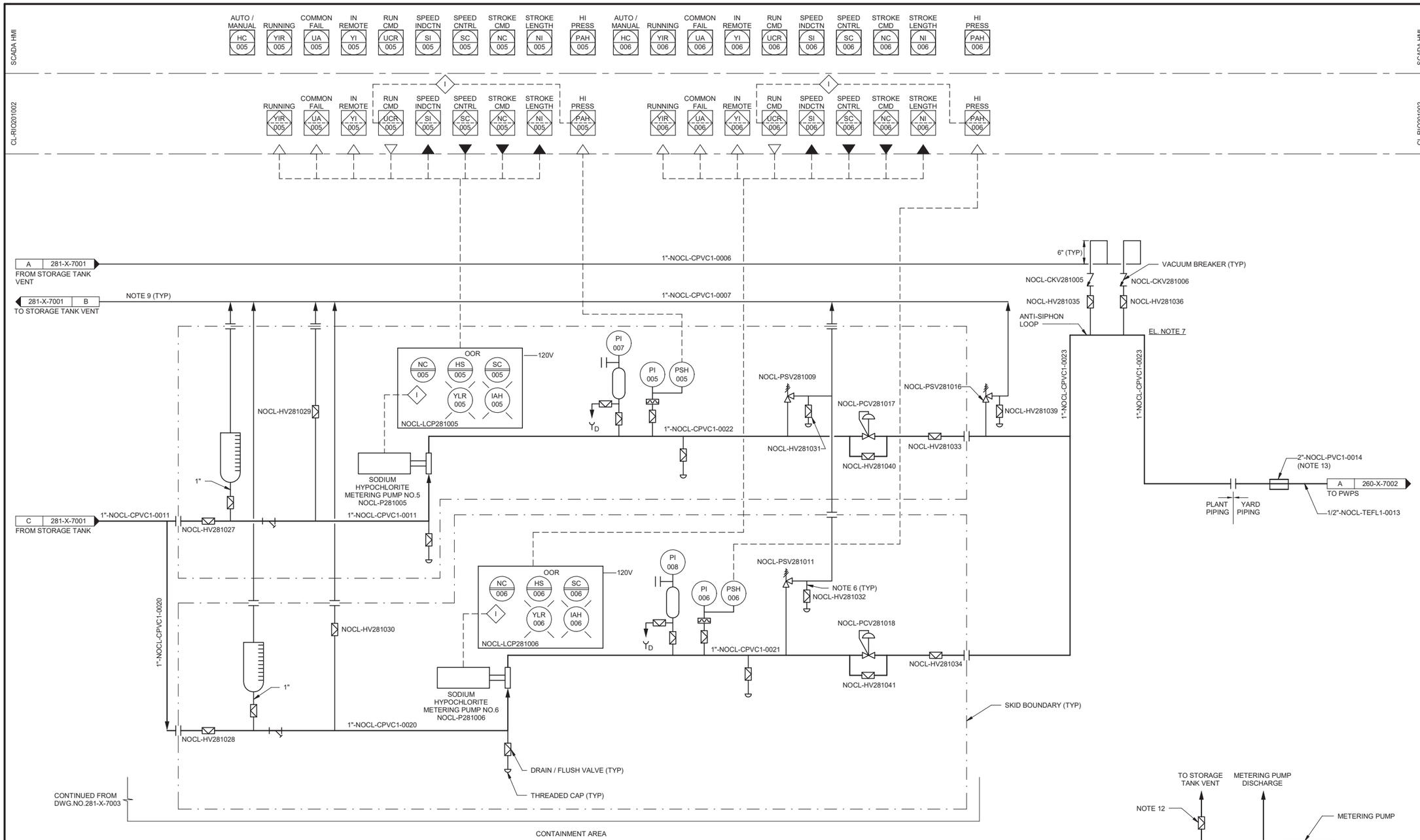
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM HYPOCHLORITE FEED SYSTEM
SHEET 2 OF 3
P&ID

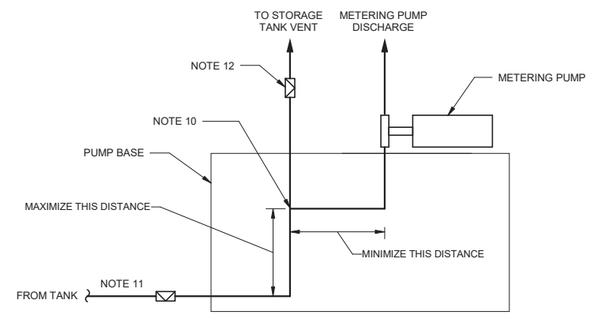
DRAWING NUMBER
281-X-7003

SHEET NUMBER
349 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS NOCL AND AREA CODE IS 281 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN STORAGE TANK OVERFLOW CONNECTION.
8. NOT USED.
9. ROUTE VENT HEADERS 12 INCHES ABOVE STORAGE TANK OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHLL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWARD FROM THE STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.
13. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.



PUMP SUCTION DETAIL

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:21:55 AM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRANL. BUTLER
NO. E 18568
ELECTRICAL
STATE OF CALIFORNIA
2021.08.20 08:44:50-00'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VSD, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

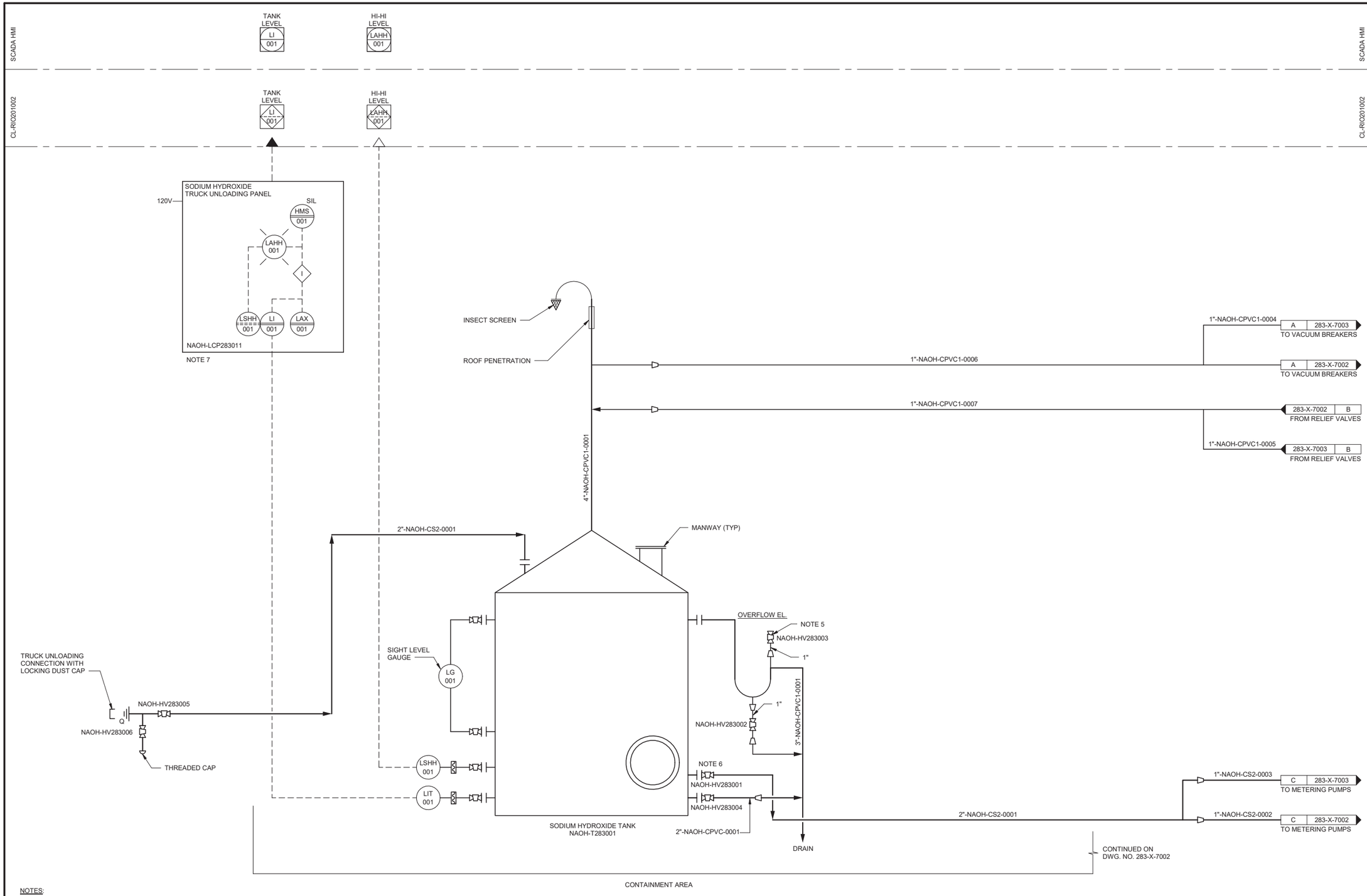
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM HYPOCHLORITE FEED SYSTEM
SHEET 3 OF 3
P&ID

DRAWING NUMBER
281-X-7004

SHEET NUMBER
350 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS NAOH AND AREA CODE IS 283 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. LOCATE P-TRAP FILL VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR.
6. PROVIDED FLANGED VALVE TO CONNECT TO TANK FLANGE FOR ALL VALVES AT TANK.
7. LOCATE LOCAL LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK UNLOADING CONNECTION.

ISSUED FOR CONSTRUCTION

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 16569
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:34:40-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

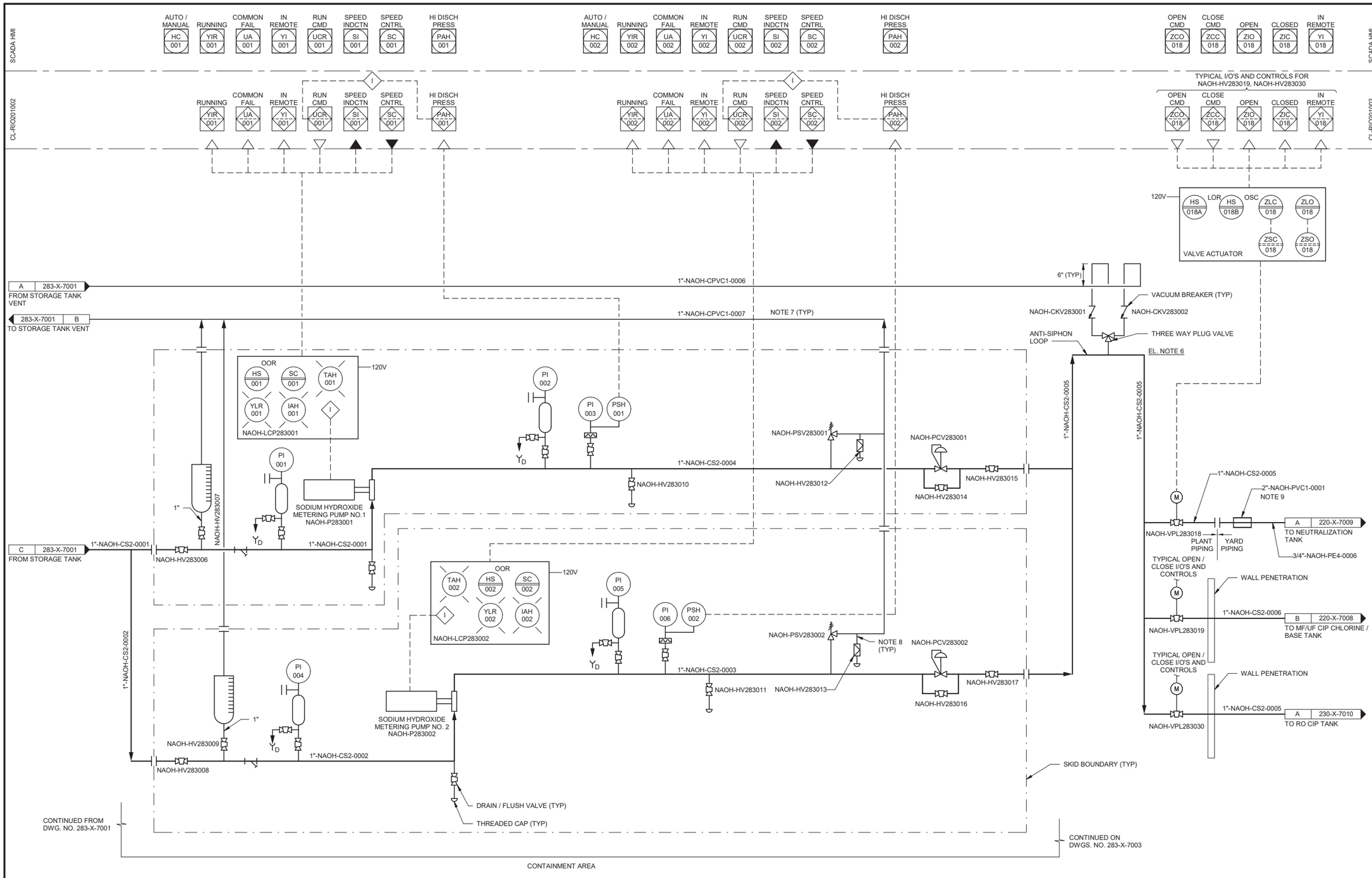
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM HYDROXIDE STORAGE SYSTEM
P&ID

DRAWING NUMBER
283-X-7001

SHEET NUMBER
351 OF 370

PLOTTED: 8/20/2021 10:53:15 AM
D10000



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY '\A-'.
3. PROCESS CODE IS NAOH AND AREA CODE IS 283 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO SOFTWARE CONTROL BLOCK DESCRIPTIONS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN STORAGE TANK OVERFLOW CONNECTION.
7. ROUTE VENT HEADERS 12 INCHES ABOVE STORAGE TANK OVERFLOW ELEVATION.
8. CLEAR PVC PIPE 6 INCHES LONG WITH THREADED CAP.
9. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:13:34 AM
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BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER No. E 16555 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:34:30-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

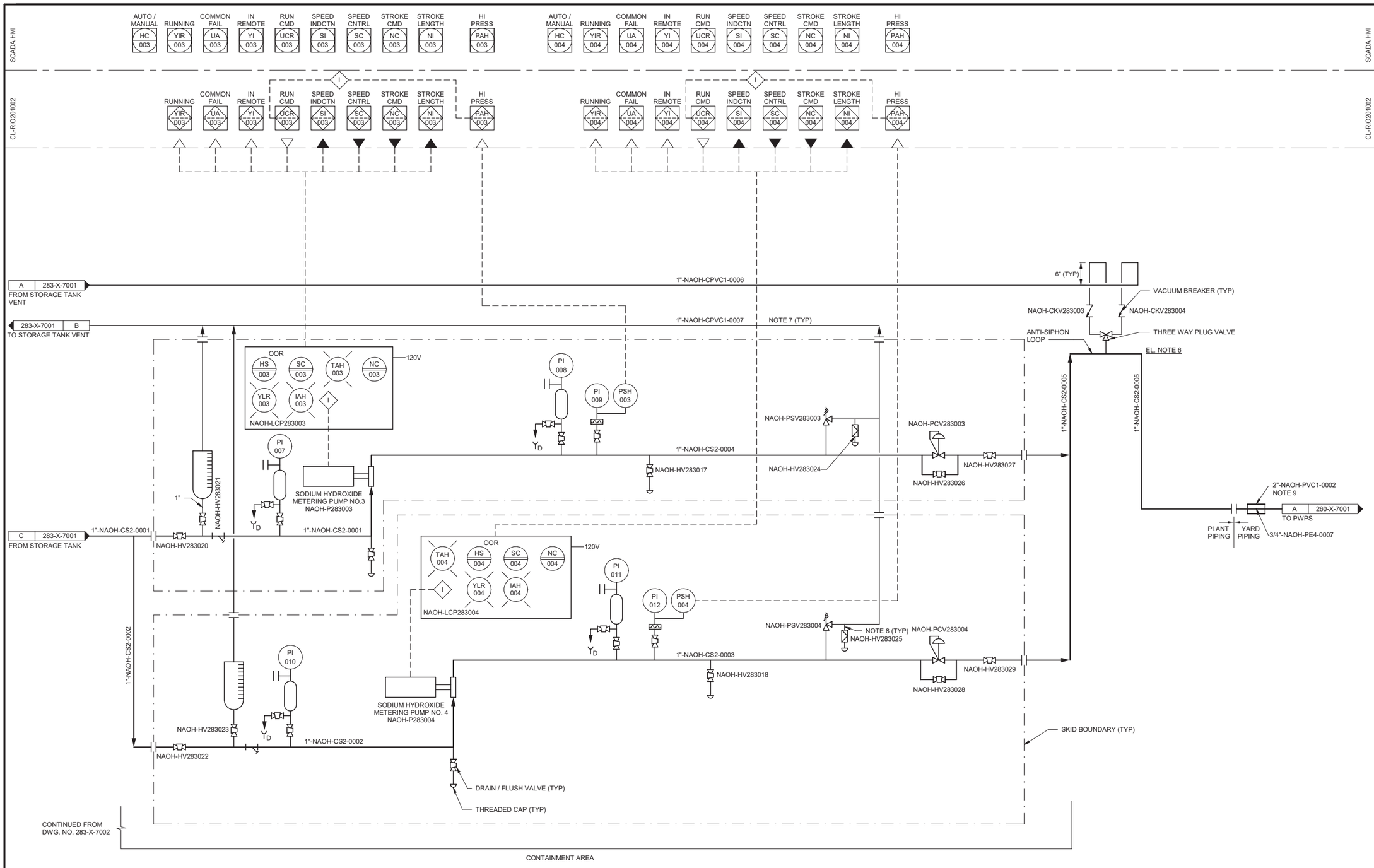
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM HYDROXIDE FEED SYSTEM
SHEET 1 OF 2
P&ID

DRAWING NUMBER
283-X-7002

SHEET NUMBER
352 OF 370



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ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 11:08:49 AM
D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRANL. BUTLER — NO. E 10565 — ELECTRICAL — STATE OF CALIFORNIA
2021.08.26 09:34:19-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

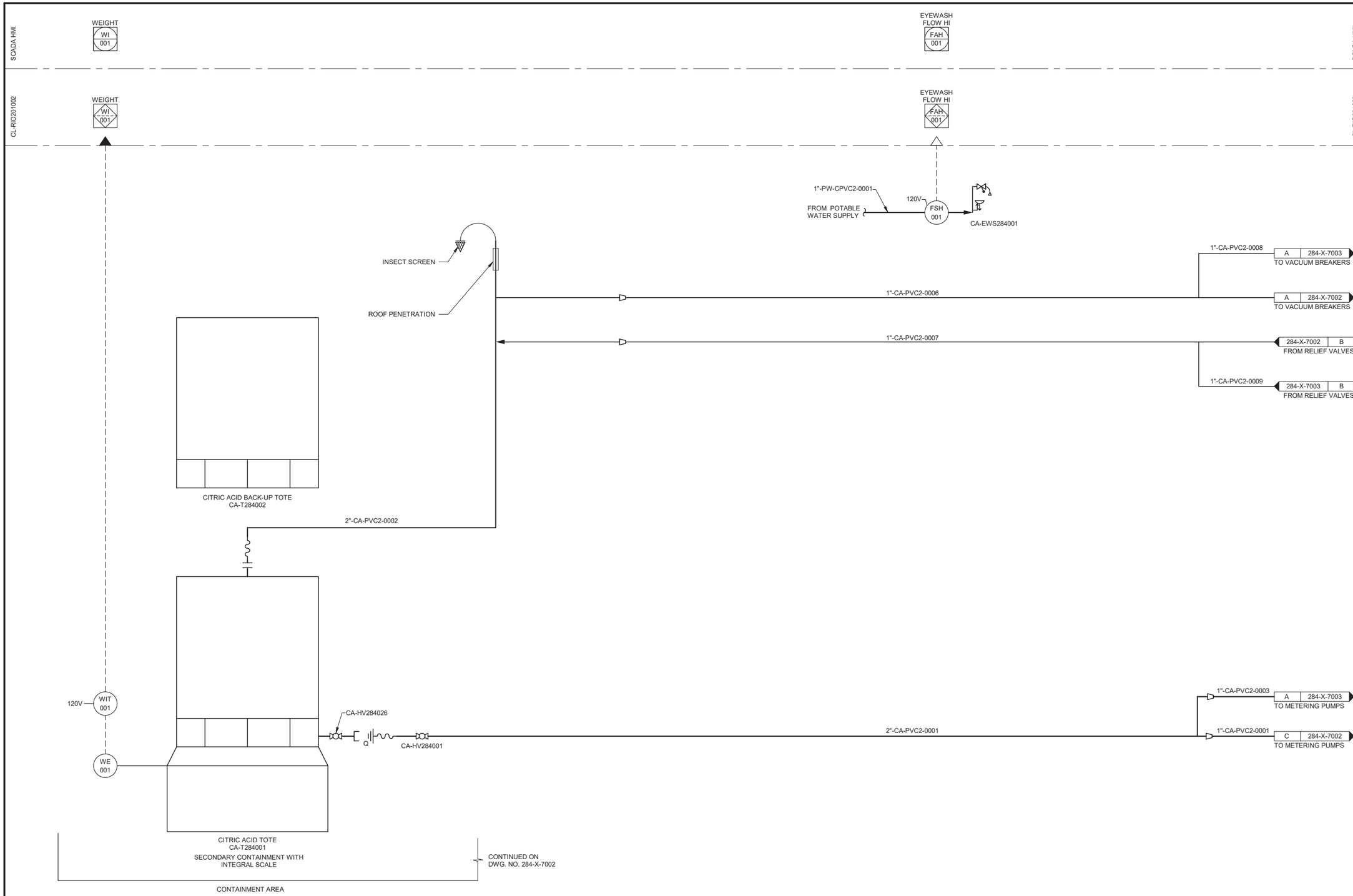
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM HYDROXIDE FEED SYSTEM
SHEET 2 OF 2
P&ID

DRAWING NUMBER
283-X-7003

SHEET NUMBER
353 OF 370



NOTES:

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRAN L. BUTLER
NO. E 16365
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:34:09-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
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DESIGNED:	JSL
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CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF CITRIC ACID
STORAGE SYSTEM
P&ID

DRAWING NUMBER
284-X-7001

SHEET NUMBER
354 OF 370

PLOTTED: 8/23/2021 6:00:42 PM
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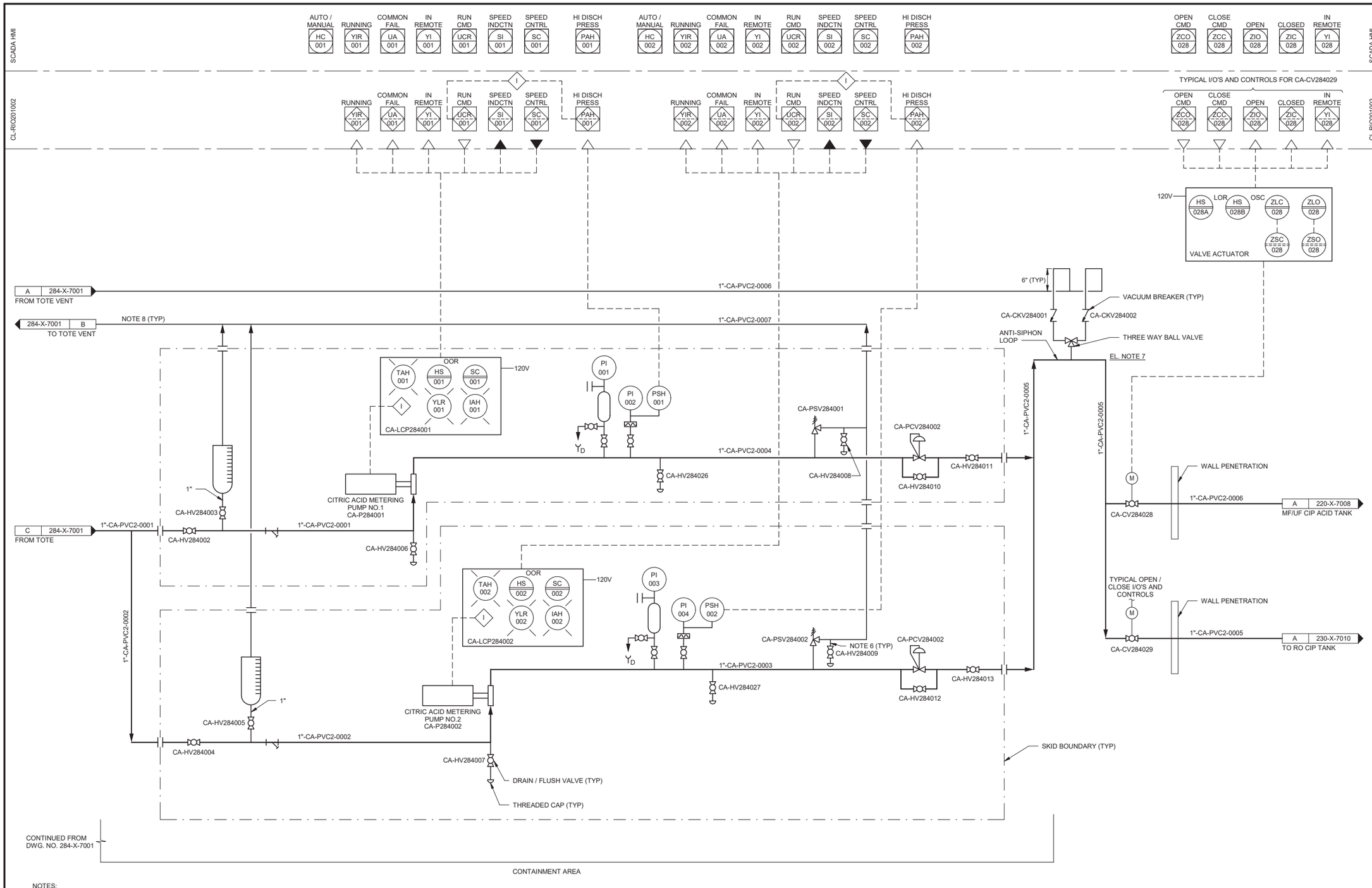

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7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN TOTE CONNECTION.
8. ROUTE VENT HEADERS 12 INCH ABOVE TOTE ELEVATION.

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:33:58-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

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CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

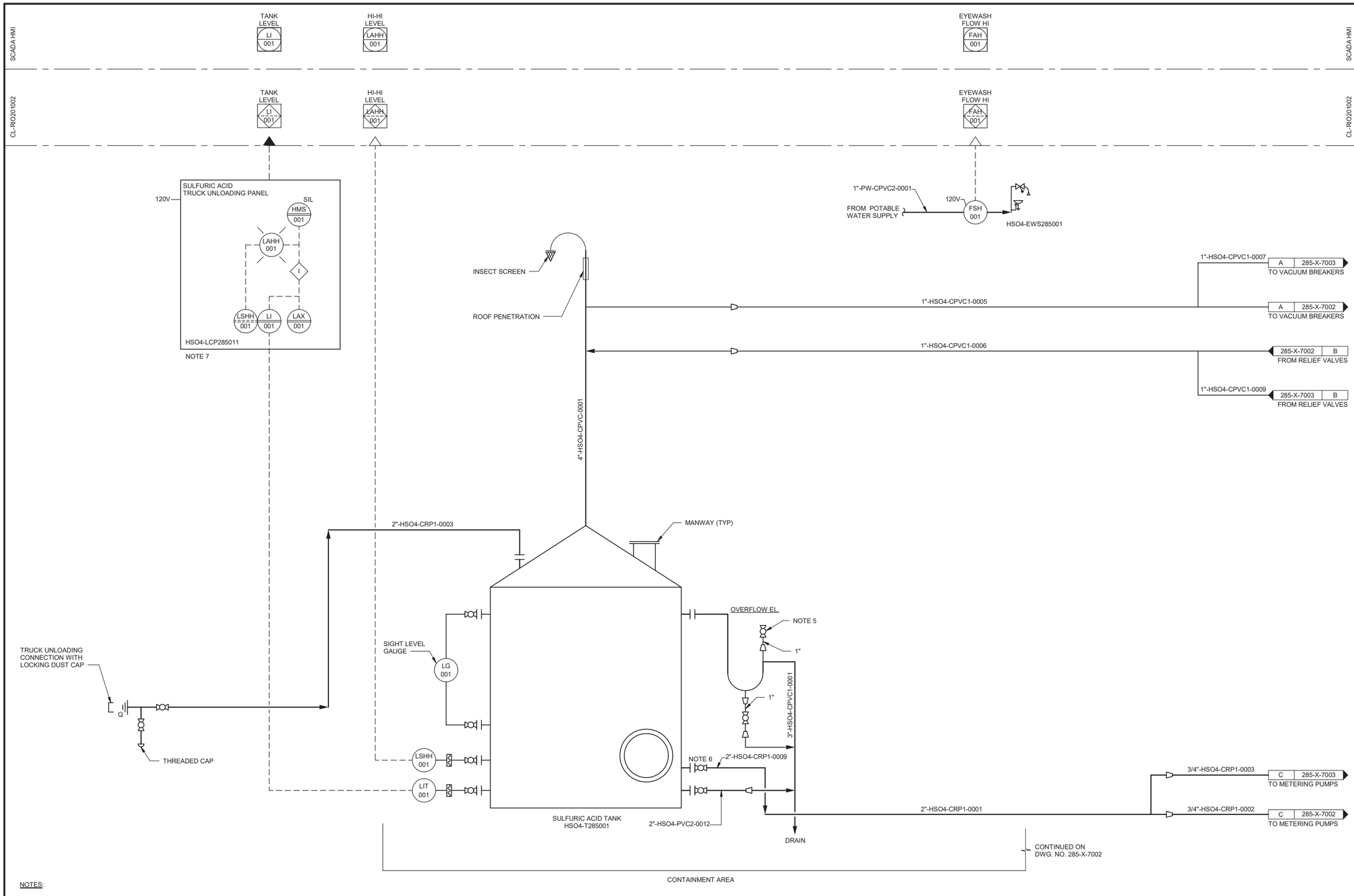
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF CITRIC ACID FEED SYSTEM
P&ID

DRAWING NUMBER
284-X-7002

SHEET NUMBER
355 OF 370



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5. LOCATE P-TRAP FILL VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR.
6. PROVIDED FLANGED VALVE TO CONNECT TO TANK FLANGE FOR ALL VALVES AT TANK.
7. LOCATE LOCAL LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK UNLOADING CONNECTION.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 16563 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:33:49-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

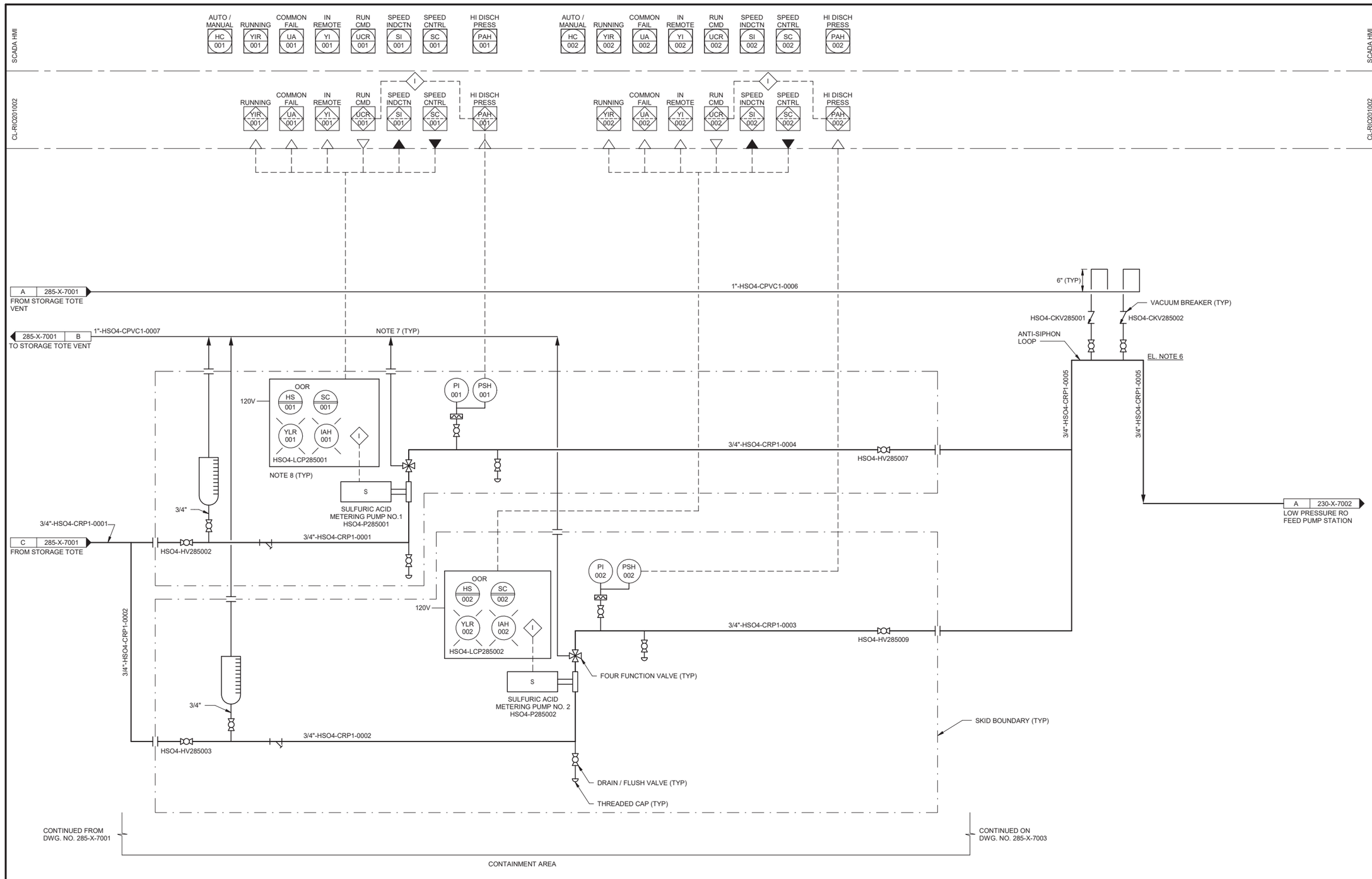
CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SULFURIC ACID STORAGE SYSTEM
P&ID

DRAWING NUMBER
285-X-7001

SHEET NUMBER
356 OF 370

PLOTTED: 8/20/2021 10:55:43 AM
D10000



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7. ROUTE VENT HEADERS 12 INCH ABOVE TOTE OVERFLOW ELEVATION.
8. CONTROL PANEL IS INTEGRAL TO THE PUMP.

ISSUED FOR CONSTRUCTION

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Walnut Creek, California

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2021.08.26 09:33:39-05'00'

SOQUEL CREEK WATER DISTRICT

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TREATMENT FACILITIES PROJECT

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CHECKED: KAB, BLB
APPROVED: BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SULFURIC ACID FEED SYSTEM
SHEET 1 OF 2
P&ID

DRAWING NUMBER
285-X-7002

SHEET NUMBER
357 OF 370

PLOTTED: 8/20/2021 10:56:07 AM
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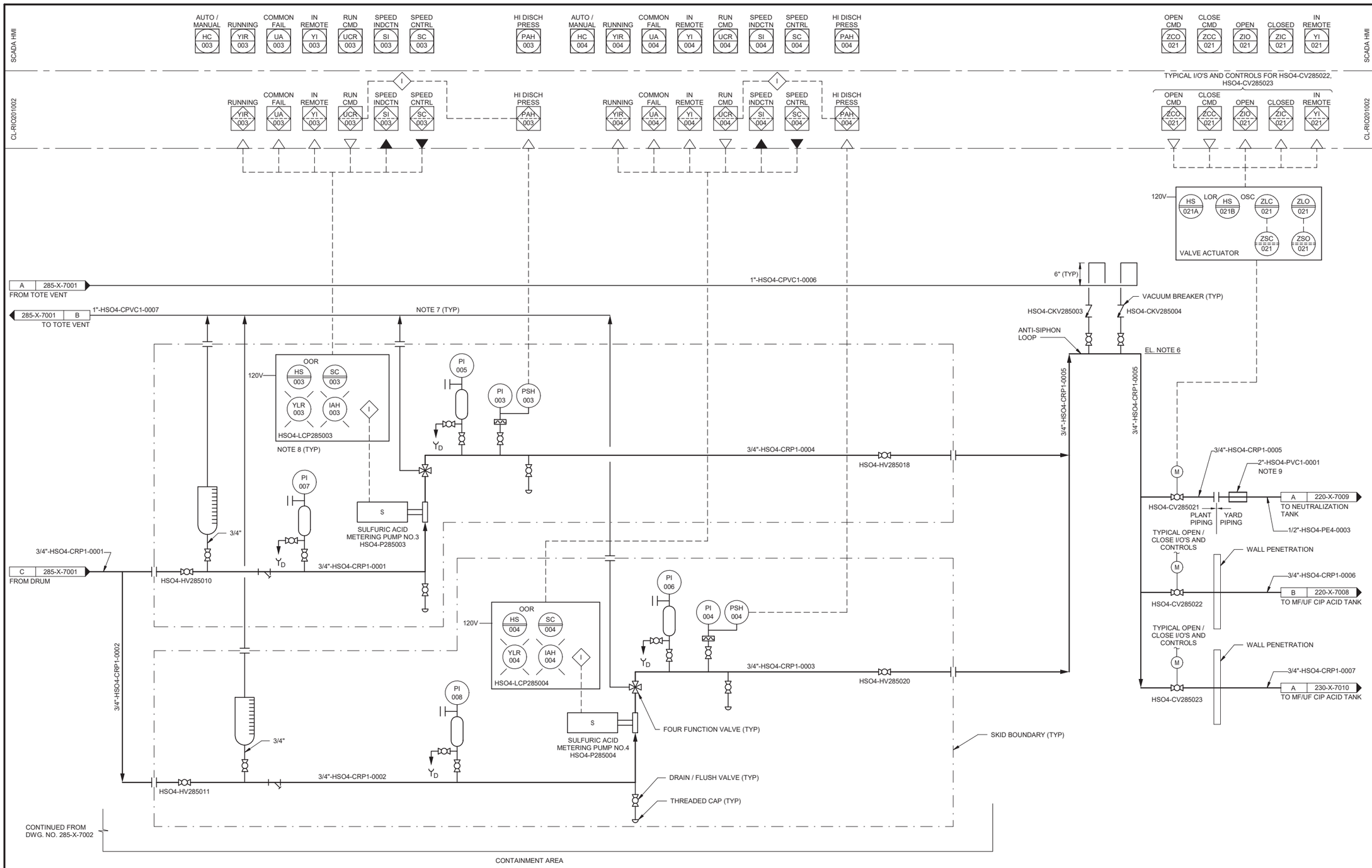

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8. CONTROL PANEL IS INTEGRAL TO THE PUMP.
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ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 10:56:28 AM
D10000

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Walnut Creek, California

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 19662
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:33:30-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

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APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SULFURIC ACID FEED SYSTEM
SHEET 2 OF 2
P&ID

DRAWING NUMBER
285-X-7003

SHEET NUMBER
358 OF 370

SCADA HMI

TANK 1 LEVEL LI 001

HI-HI LEVEL LAHH 001

EYEWASH FLOW HI FAH 001

HI LEVEL LAH 001

CL-RIO201001

CALCIUM CHLORIDE TRUCK UNLOADING PANEL

SIL

120V — HMS 001

LAHH 001

I

LSHH 001 — LI 001 — LAX 001

CACL-LCP286011

NOTE 6

1"-PW-CPVC2

FROM POTABLE WATER SUPPLY

120V — FSH 001

CAH-EWS286001

INSECT SCREEN

1"-CACL-PVC2-0006

A | 286-X-7002

TO VACUUM BREAKERS

1"-CACL-PVC2-0007

286-X-7002 | B

FROM RELIEF VALVES

4"-CACL-CPVC1-0002

2"-CACL-PVC2-0001

MANWAY

OVERFLOW EL.

NOTE 4

CACL-HV286006

1"

SIGHT LEVEL GAUGE

LG 001

1"

CACL-HV286005

3"-CACL-PVC2-0003

MANWAY

TRUCK UNLOADING CONNECTION WITH LOCKING DUST CAP

CACL-HV286002

Q

CACL-HV286001

THREADED CAP

LSHH 001

LIT 001

CACL-HV286003

2"-CACL-PVC2-0004

CACL-HV286004

2"-CACL-PVC2-0005

NOTE 5

CALCIUM CHLORIDE TANK

* CACL-T286001

DRAIN TO CONTAINMENT

1"-CACL-PVC2-0008

C | 286-X-7002

TO METERING PUMPS

120V — LSH 001

CONTINUED ON DWG.NO.286-X-7002

CONTAINMENT AREA

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
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4. LOCATE P-TRAP FILLE VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR.
5. PROVIDE FLANGED VALVE TO CONNECT TO TANK FLANGE FOR ALL VALVES AT TANK.
6. LOCATE LOCAL LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK UNLOADING CONNECTION.

ISSUED FOR CONSTRUCTION

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D10000

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIAN L. BUTLER — No. E 19662 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:33:19-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

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DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF CALCIUM CHLORIDE STORAGE SYSTEM
P&ID

DRAWING NUMBER
286-X-7001

SHEET NUMBER
359 OF 370

SCADA HMI

AUTO / MANUAL HC 001 | RUNNING YIR 001 | COMMON FAIL UA 001 | IN REMOTE YI 001 | RUN CMD UCR 001 | SPEED INDCTN SI 001 | SPEED CNTRL SC 001 | STROKE CMD NC 001 | STROKE LENGTH NI 001 | HI DISCH PRESS PAH 001

AUTO / MANUAL HC 002 | RUNNING YIR 002 | COMMON FAIL UA 002 | IN REMOTE YI 002 | RUN CMD UCR 002 | SPEED INDCTN SI 002 | SPEED CNTRL SC 002 | STROKE CMD NC 002 | STROKE LENGTH NI 002 | HI DISCH PRESS PAH 002

CL-RIO201001

RUNNING YIR 001 | COMMON FAIL UA 001 | IN REMOTE YI 001 | RUN CMD UCR 001 | SPEED INDCTN SI 001 | SPEED CNTRL SC 001 | STROKE CMD NC 001 | STROKE LENGTH NI 001 | HI DISCH PRESS PAH 001

RUNNING YIR 002 | COMMON FAIL UA 002 | IN REMOTE YI 002 | RUN CMD UCR 002 | SPEED INDCTN SI 002 | SPEED CNTRL SC 002 | STROKE CMD NC 002 | STROKE LENGTH NI 002 | HI DISCH PRESS PAH 002

120V — OOR — HS 001, SC 001, NC 001, YLR 001, IAH 001 — CACL-LCP286001

120V — OOR — HS 002, SC 002, NC 002, YLR 002, IAH 002 — CACL-LCP286002

A 286-X-7001 — FROM STORAGE TANK VENT

286-X-7001 B — TO STORAGE TANK VENT

NOTE 8 (TYP)

1"-CACL-PVC2-0006

1"-CACL-PVC2-0007

6" (TYP)

VACUUM BREAKER (TYP)

CACL-CKV286001

CACL-CKV286002

THREE WAY BALL VALVE

ANTI-SIPHON LOOP

EL. NOTE 7

1"-CACL-CPVC1-0012

1"-CACL-CPVC1-0012

PI 003

PI 001

PSH 001

CACL-PSV286001

CALC-PCV286003

1"-CACL-CPVC1-0011

CACL-HV286010

CACL-HV286009

CALC-HV286014

PI 005

1"

CACL-HV286008

CALCIUM CHLORIDE METERING PUMP NO.1 CALC-P286001

2"-CACL-PVC1-0001

1/2"-CACL-PE4-0012

NOTE 9

A 260-X-7002 — TO PWPS

PLANT PIPING

YARD PIPING

C 286-X-7001 — FROM STORAGE TANK

1"-CACL-PVC2-0008

CACL-HV286007

1"-CACL-PVC2-0008

1"-CACL-PVC2-0009

PI 004

PI 002

PSH 002

CACL-PSV286002

NOTE 6 (TYP)

CACL-HV286011

CALC-PCV286004

1"-CACL-CPVC1-0010

CACL-HV286012

CALC-HV286015

PI 006

1"

CACL-HV286009

CALCIUM CHLORIDE METERING PUMP NO.2 CALC-P286002

1"-CACL-PVC2-0009

CACL-HV286013

SKID BOUNDARY (TYP)

DRAIN / FLUSH VALVE (TYP)

THREADED CAP (TYP)

CONTINUED FROM DWG.NO.286-X-7001

CONTAINMENT AREA

NOTES:

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ISSUED FOR CONSTRUCTION

PLOTTED: 8/20/2021 1:34:02 PM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER — BRIAN L. BUTLER — No. E 19662 — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:33:08-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF CALCIUM CHLORIDE FEED SYSTEM
P&ID

DRAWING NUMBER
286-X-7002

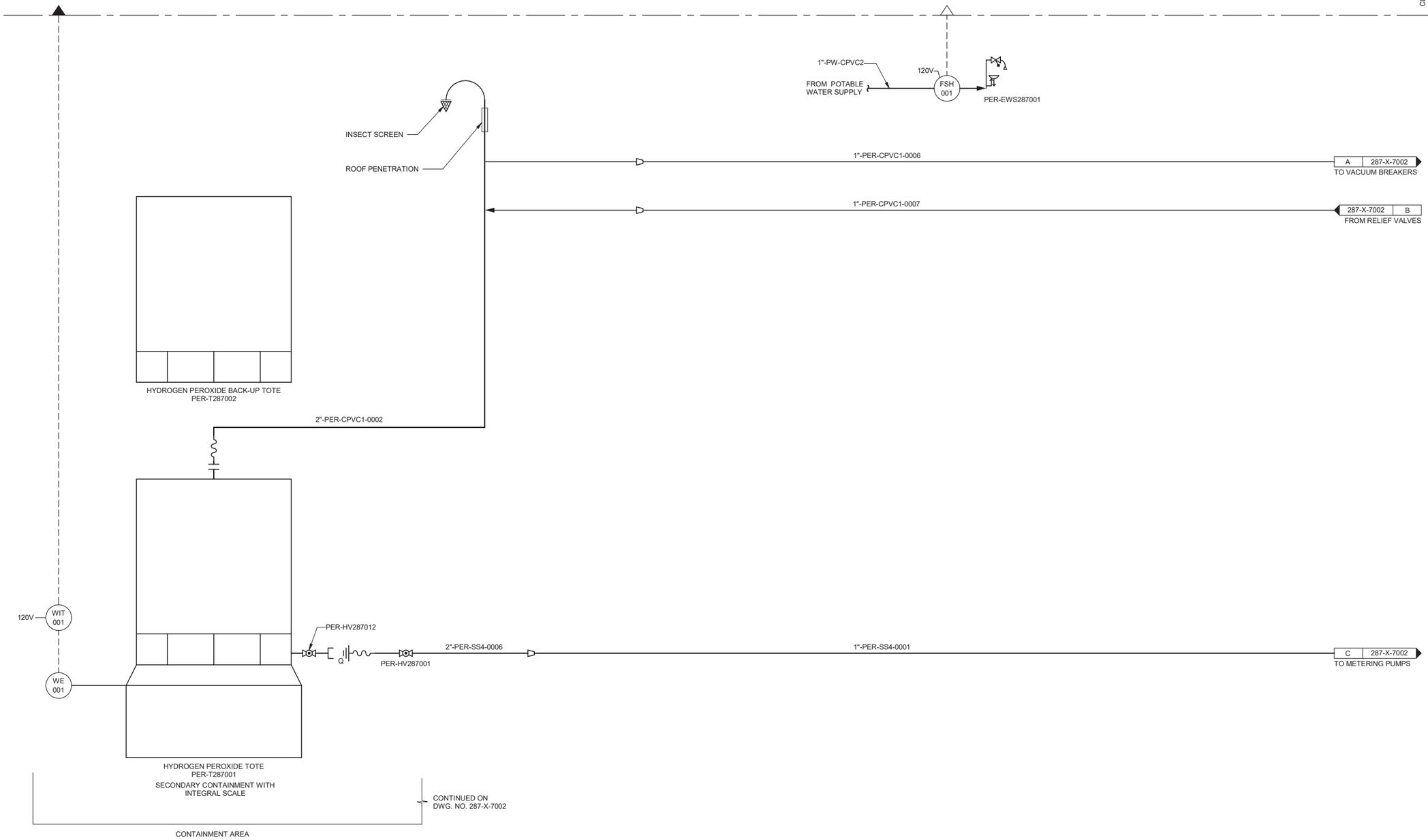
SHEET NUMBER
360 OF 370

SCADA HMI

WEIGHT
WI
001

EYEWASH
FLOW HI
FAH
001

CL-RIO201001



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS PER AND AREA CODE IS 287 UNLESS OTHERWISE NOTED.
4. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES LOCATED ON MCCS OR AT DRIVEN EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.

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Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
FRANK L. BUTLER
NO. E 16565
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:32:59-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
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CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

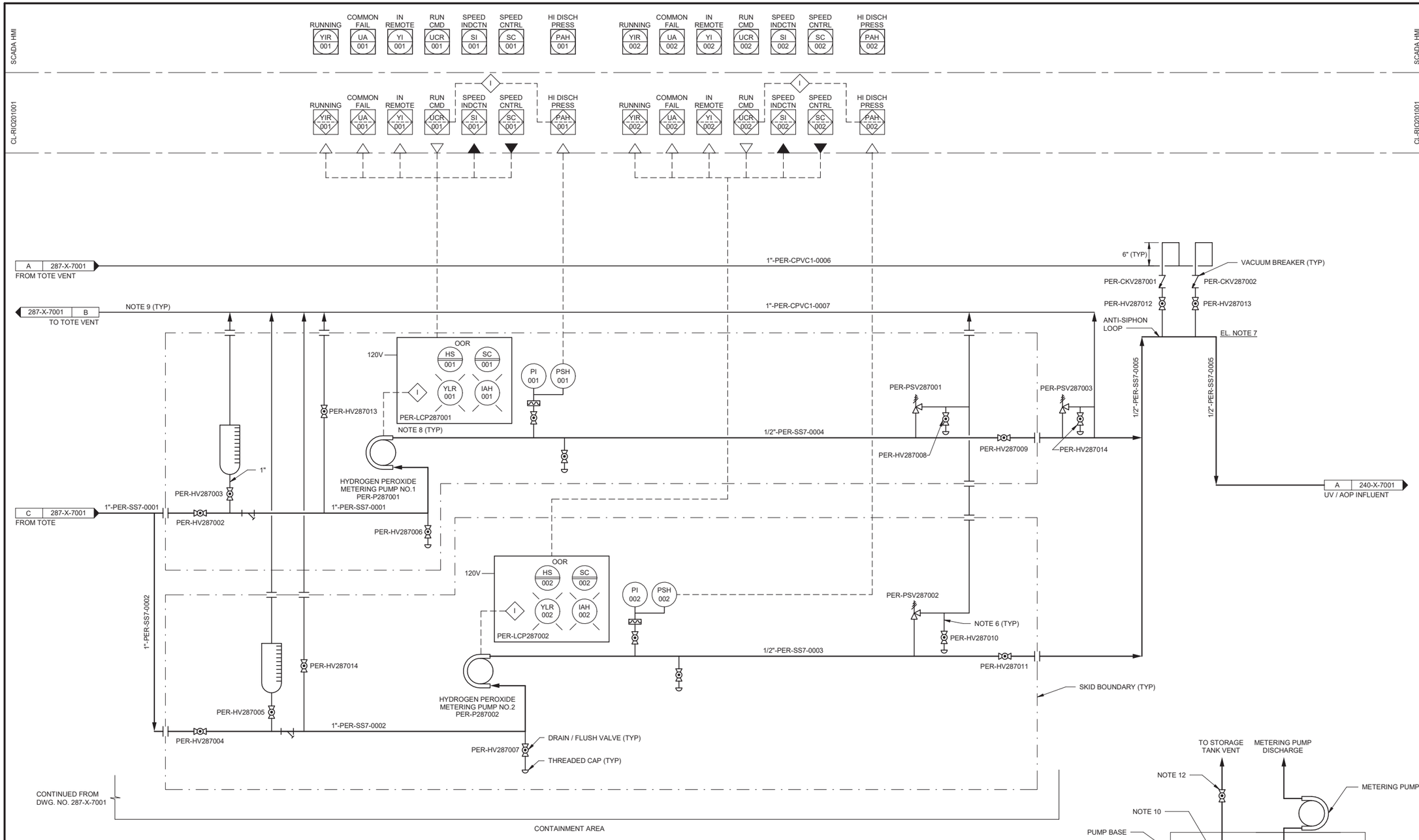
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF HYDROGEN PEROXIDE STORAGE SYSTEM P&ID

DRAWING NUMBER
287-X-7001

SHEET NUMBER
361 OF 370



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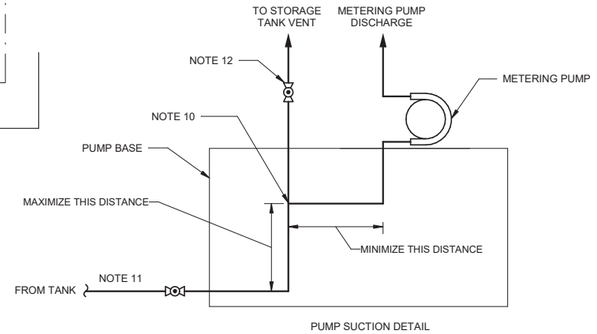
5. NOT ALL FUNCTIONS ARE SHOWN AT THE SCADA HMI LEVEL. REFER TO CONTROL BLOCK LOOP NUMBER PARAGRAPHS IN SECTION 40 68 83 FOR FURTHER DETAIL ON PLC, SCADA CONTROL AND MONITORING.
6. A 6 INCH LENGTH OF CLEAR PVC SHALL BE SUPPLIED AND SOLVENT WELDED IN PLACE AS SHOWN IN THE DRIP LEG.
7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN TOTE OVERFLOW CONNECTION.
8. CONTROL PANEL IS INTEGRAL TO THE PUMP.
9. ROUTE VENT HEADERS 12 INCHES ABOVE TOTE OVERFLOW ELEVATION.
10. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHALL BE CONNECTED TO THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
11. PUMP SUCTION PIPING IS TO SLOPE DOWNWARD FROM THE STORAGE TANK TO METERING PUMP WITHOUT HIGH POINTS OR LOW POINTS.
12. VALVE TO BE OPEN EXCEPT WHEN STORAGE TANK LEVEL IS BELOW PUMP CENTERLINE.



PUMP SUCTION DETAIL

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REGISTERED PROFESSIONAL ENGINEER BRANL. BUTLER NO. E 16569 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:32:41-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

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FILENAME
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BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF HYDROGEN PEROXIDE FEED SYSTEM P&ID

DRAWING NUMBER
287-X-7002

SHEET NUMBER
362 OF 370

SCADA HMI

CL-RIO201002

TANK LEVEL LI 001

HI-HI LEVEL LAHH 001

EYEWASH FLOW HI FAH 001

SODIUM BISULFITE TRUCK UNLOADING PANEL

120V

SIL HMS 001

LAHH 001

LSHH 001

LI 001

LAX 001

NHS-LCP288011

NOTE 6

1"-PW-CPVC2-0001

FROM POTABLE WATER SUPPLY

120V

FSH 001

288NHS-EWS288001

ROOF PENETRATION

INSECT SCREEN

1"-NHS-PVC2-0006

1"-NHS-PVC2-0007

4"-NHS-PVC2-0004

1"-NHS-PVC2-0013 — A | 288-X-7002 — TO VACUUM BREAKERS

1"-NHS-PVC2-0012 — A | 288-X-7002 — TO VACUUM BREAKERS

A | 288-X-7002 — TO VACUUM BREAKERS

288-X-7002 | B — FROM RELIEF VALVES

1"-NHS-PVC2-0011 — 288-X-7003 | B — FROM RELIEF VALVES

1"-NHS-PVC2-0010 — 288-X-7004 | B — FROM RELIEF VALVES

2"-NHS-PVC2-0005

OVERFLOW EL.

NOTE 4

NHS-HV288003

1"

SIGHT LEVEL GAUGE

LG 001

1"

NHS-HV288004

3"-NHS-PVC2-0003

TRUCK UNLOADING CONNECTION WITH LOCKING DUST CAP

NHS-HV288002

NHS-HV288001

THREADED CAP

MANWAY

NHS-HV288005

2"-NHS-PVC2-0001

2"-NHS-PVC2-0003

LSHH 001

LIT 001

NHS-HV288006

NOTE 5

SODIUM BISULFITE STORAGE TANK NHS-T288001

DRAIN TO CONTAINMENT

1"-NHS-PVC2-0001 — C | 288-X-7004 — TO METERING PUMPS

1"-NHS-PVC2-0001 — C | 288-X-7003 — TO METERING PUMPS

1"-NHS-PVC2-0001 — C | 288-X-7002 — TO METERING PUMPS

CONTINUED ON DWG. NO. 288-X-7002

CONTAINMENT AREA

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS NHS AND AREA CODE IS 288 UNLESS OTHERWISE NOTED.
4. LOCATE P-TRAP FILL VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR.
5. PROVIDE FLANGED VALVE TO CONNECT TO TANK FLANGE FOR ALL VALVES AT TANK.
6. LOCATE LOCAL LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK UNLOADING CONNECTION.

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REGISTERED PROFESSIONAL ENGINEER — FRANK L. BUTLER — ELECTRICAL — STATE OF CALIFORNIA

2021.08.26 09:32:29-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS

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APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

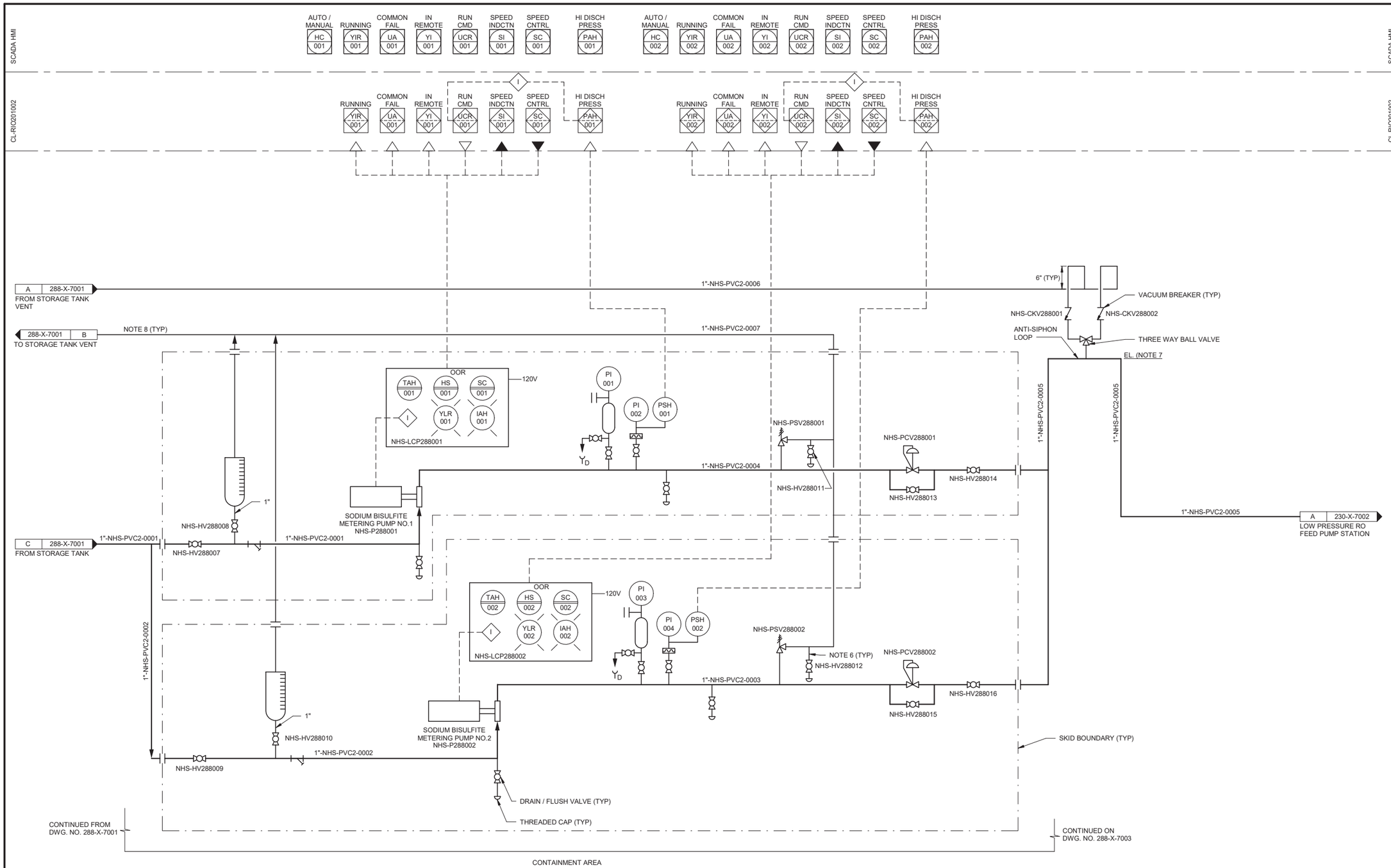
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF SODIUM BISULFITE STORAGE SYSTEM P&ID

DRAWING NUMBER
288-X-7001

SHEET NUMBER
363 OF 370



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7. TOP OF ANTI-SIPHON LOOP SHALL BE 2 FEET HIGHER THAN STORAGE TANK OVERFLOW CONNECTION.
8. ROUTE VENT HEADERS 12 INCHES ABOVE STORAGE TANK OVERFLOW ELEVATION.

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ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:32:18-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
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LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
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APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

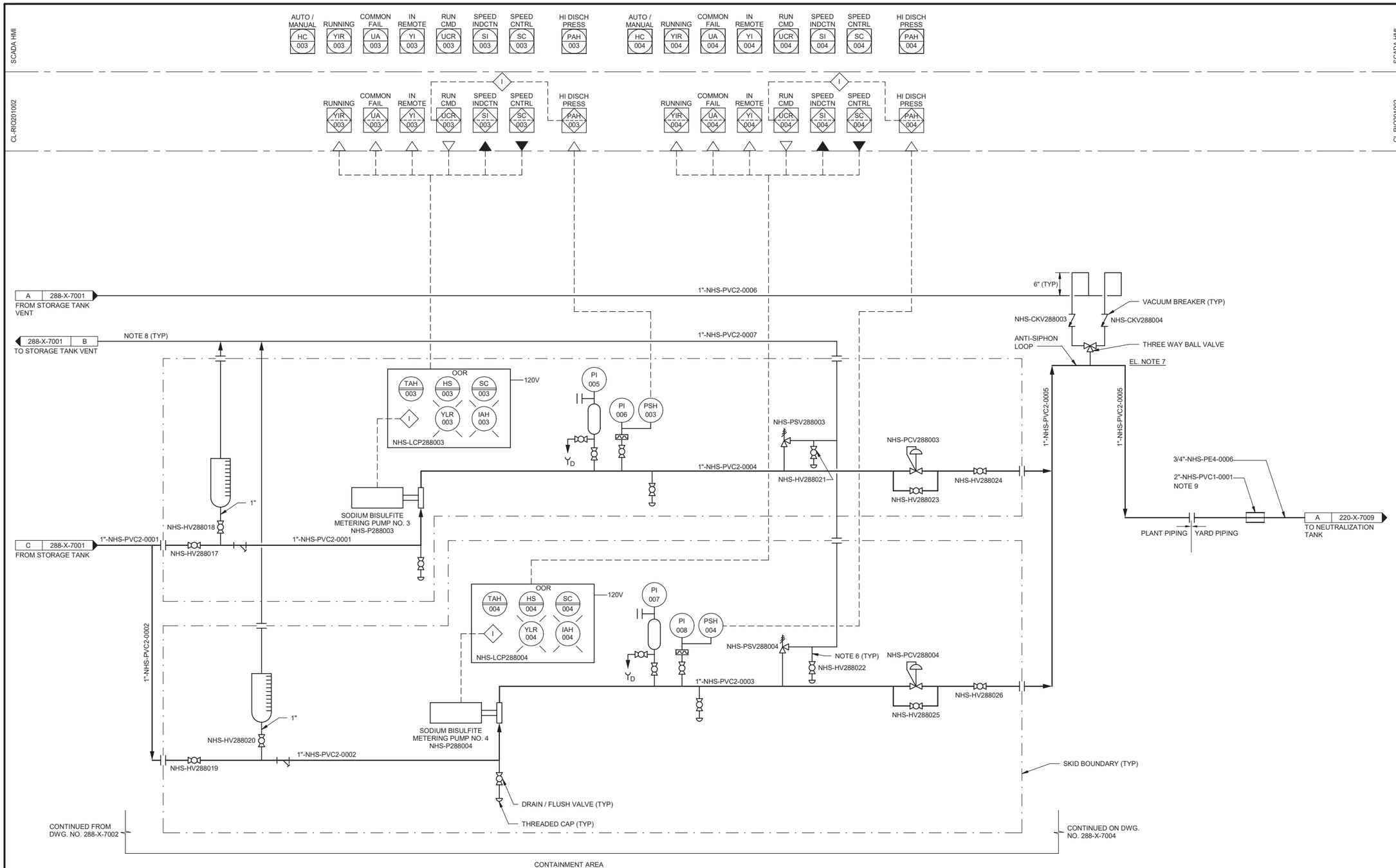
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM BISULFITE FEED SYSTEM
SHEET 1 OF 3
P&ID

DRAWING NUMBER
288-X-7002

SHEET NUMBER
364 OF 370



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9. CHEMICAL DUCT BANK TO CONSIST OF CARRIER PIPE WITH TUBING PULLED THROUGH.

ISSUED FOR CONSTRUCTION

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No. E 16583
ELECTRICAL
STATE OF CALIFORNIA
2021.08.20 08:56:08-07'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

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DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

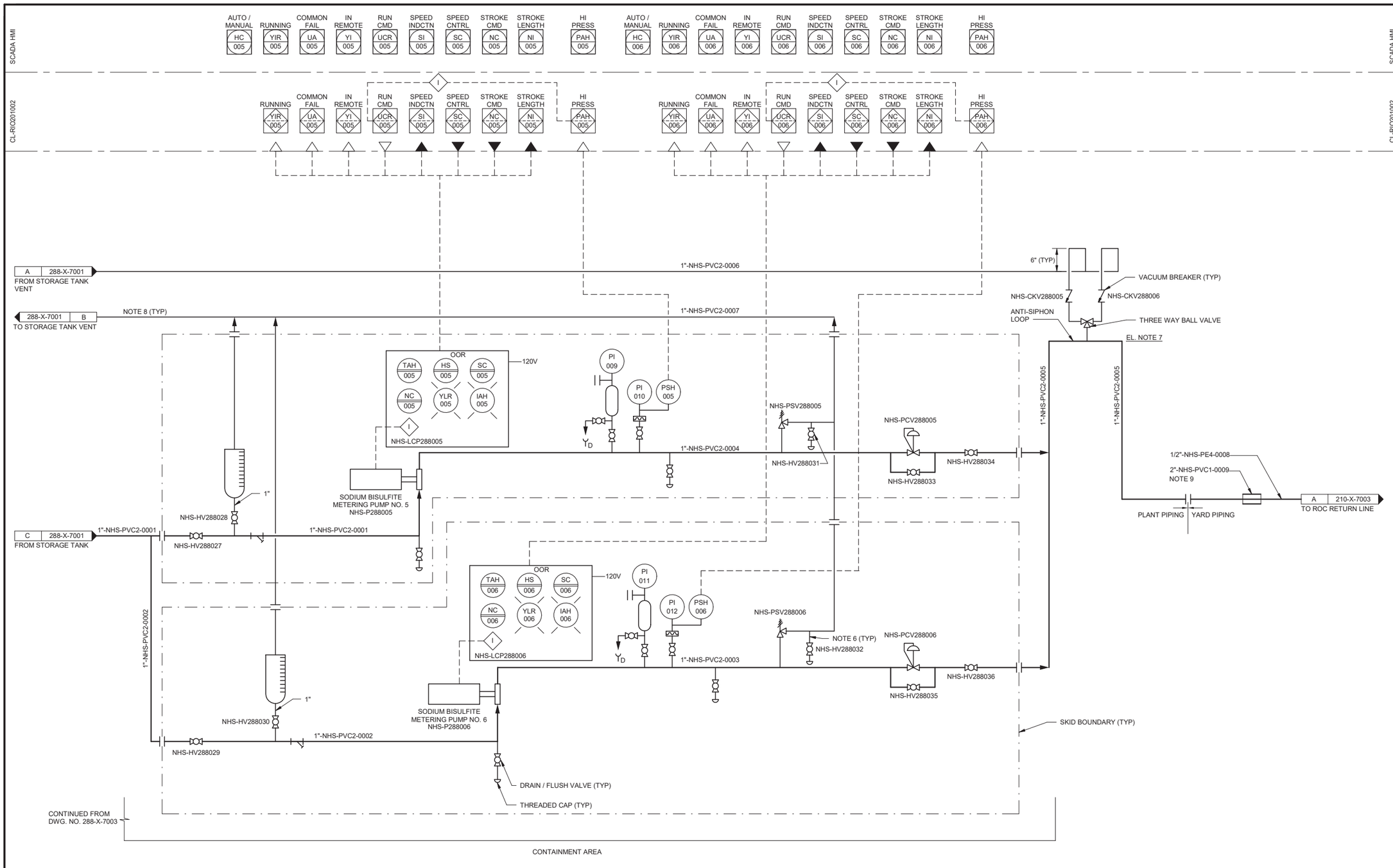
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM BISULFITE FEED SYSTEM
SHEET 2 OF 3
P&ID

DRAWING NUMBER
288-X-7003

SHEET NUMBER
365 OF 370



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BRIAN L. BUTLER
NO. E 18585
ELECTRICAL
STATE OF CALIFORNIA
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SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

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404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION
AWPF SODIUM BISULFITE FEED SYSTEM
SHEET 3 OF 3
P&ID

DRAWING NUMBER
288-X-7004

SHEET NUMBER
366 OF 370

SCADA HMI

WEIGHT
WI
001

CL-RIO201002

WEIGHT
WI
001

EYEWASH
FLOW HI
FAH
001

SCADA HMI

CL-RIO201002

EYEWASH
FLOW HI
FAH
001

1"-PW-CPVC2-0001

120V

FROM POTABLE
WATER SUPPLY

FSH
001

ANTI289ANTI-EWS0001

INSECT SCREEN

ROOF PENETRATION

1"-ANTI-PVC2-0007

A | 289-X-7002

TO VACUUM BREAKERS

1"-ANTI-PVC2-0008

289-X-7002 | B

FROM RELIEF VALVES

ANTISCALANT BACK-UP TOTE
ANTI-T289002

2"-ANTI-PVC2-0002

120V

WIT
001

WE
001

ANTI-HV289011

Q

ANTI-HV289001

2"-ANTI-PVC2-0006

1"-ANTI-PVC2-0001

C | 289-X-7002

TO METERING PUMPS

ANTISCALANT TOTE
ANTI-T289001
SECONDARY CONTAINMENT WITH
INTEGRAL SCALE

CONTINUED ON
DWG. NO. 289-X-7002

CONTAINMENT AREA

NOTES:

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No. E 18565
ELECTRICAL
STATE OF CALIFORNIA

2021.08.26 09:30:41-05'00'

SOQUEL CREEK WATER DISTRICT

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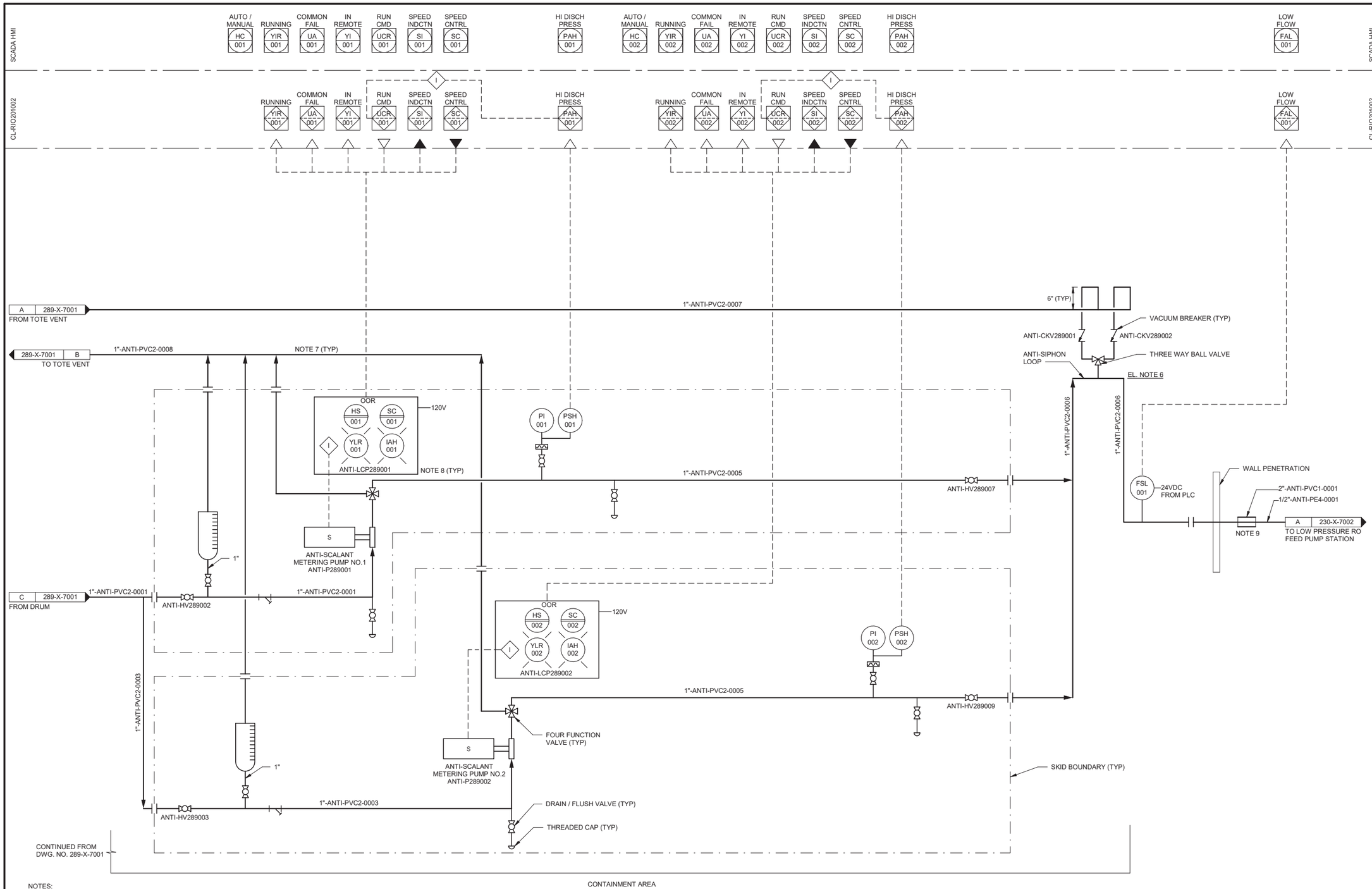
INSTRUMENTATION AWPF ANTISCALANT STORAGE SYSTEM P&ID

DRAWING NUMBER
289-X-7001

SHEET NUMBER
367 OF 370



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SOQUEL CREEK WATER DISTRICT

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TREATMENT FACILITIES PROJECT

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INSTRUMENTATION AWPF ANTISCALANT FEED SYSTEM P&ID

DRAWING NUMBER
289-X-7002

SHEET NUMBER
368 OF 370

SCADA HMI

CL-RIO201003

PUMP 1 RUNNING YIR 001 | PUMP 1 FAULT YA 001 | PUMP 2 RUNNING YIR 002 | PUMP 2 FAULT YA 002 | HI-HI LEVEL LAHH 001 | FLOW FI 001

PACKAGE SANITARY LIFT STATION

480V

SAN-LCP290001

	LOR	RST	SS
	HS 001A	HMS 001	HS 001B
	SIC 001	YLR 001	UA 001 FAIL
	HS 002A	HMS 002	HS 002B
	SIC 002	YLR 002	UA 002 FAIL

A 220-X-7009 FROM NEUTRALIZATION TANK

B 220-X-7009 FROM NEUTRALIZATION CONTAINMENT AREA DRAIN

FROM AWPF BUILDING DRAINS

LSHH 001, LSH 001, LSL 001, LSLL 001

ACCESS HATCH, NOTE 5

2"-SAN-PVC2-0003

2"-SAN-PVC2-0004

LIFT STATION VALVE VAULT

SAN-CKV290001, SAN-HV290001, SAN-HV290003, SAN-CKV290002, SAN-HV290002

2"-SAN-FLEXIBLE HOSE-0001

2"-SAN-FLEXIBLE HOSE-0002

ME 001, TE 001 — SANITARY LIFT STATION PUMP NO. 1 SAN-P290001

ME 002, TE 002 — SANITARY LIFT STATION PUMP NO. 2 SAN-P290002

SANITARY LIFT STATION

LIFT STATION METERING VAULT

FIT 001 120V

FE 001 M

SAN-HV290004, SAN-HV290005, 1/2"-SAN-PVC2-0005

3/8" BARBED FITTING SAMPLE CONNECTION

2"-SAN-PVC2-0001

4"-SAN-PVCPP-0001

TO COUNTY SANITARY SEWER SYSTEM

CS

NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT / INSTRUMENTS TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS SAN AND AREA CODE IS 290 UNLESS OTHERWISE NOTED.
4. ALL ITEMS MARK BY AN ' + ' ARE TO BE PROVIDED BY THE SEWER LIFT STATION SYSTEM SUPPLIER.
5. REFER TO SPECIFICATION SECTION 08 3119 - FLOOR ACCESS DOORS AND HATCHES FOR HATCH REQUIREMENTS.

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CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER BRIAN L. BUTLER NO. E 18565 ELECTRICAL STATE OF CALIFORNIA
2021.08.26 09:30:13-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	VDM, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-260-Purified Water PS.rvt

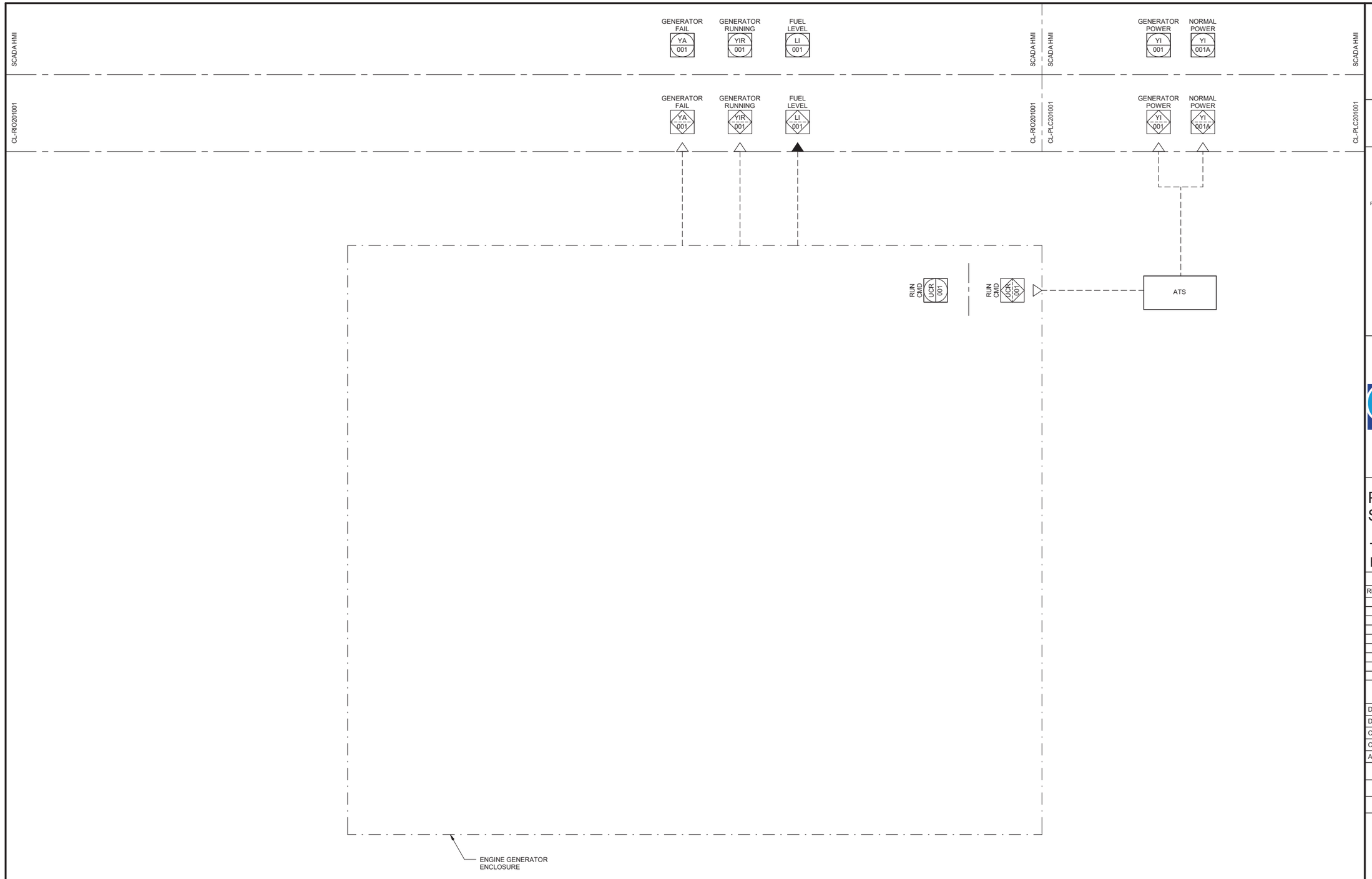
BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF SANITARY LIFT STATION P&ID

DRAWING NUMBER
290-X-7001

SHEET NUMBER
369 OF 370



NOTES:

1. SEE LEGEND AND ABBREVIATIONS ON DRAWINGS 000-X-0001, 000-X-0002 AND 000-X-0003.
2. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT TAGS ARE PRECEDED BY 'A-'.
3. PROCESS CODE IS GENE AND AREA CODE IS 299 UNLESS OTHERWISE NOTES.

ISSUED FOR CONSTRUCTION

PLOTTED: 8/24/2021 5:48:03 PM
D10000

BLACK & VEATCH
Black & Veatch Corporation
Walnut Creek, California

CONSULTANT

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REGISTERED PROFESSIONAL ENGINEER
BRIAN L. BUTLER
NO. E 16563
ELECTRICAL
STATE OF CALIFORNIA
2021.08.26 09:26:05-05'00'

SOQUEL CREEK WATER DISTRICT

PURE WATER SOQUEL

TREATMENT FACILITIES PROJECT

REVISIONS		
REV	DATE	DESCRIPTION
0	08/26	ISSUED FOR CONSTRUCTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	JSL
DRAWN:	BNG, AD
CHECKED:	BDS
CHECKED:	KAB, BLB
APPROVED:	BLB

FILENAME
404790-220-RO UV Building.rvt

BV PROJECT NUMBER
404790

CLIENT PROJECT NUMBER

INSTRUMENTATION AWPF EMERGENCY GENERATOR P&ID

DRAWING NUMBER
299-X-7001

SHEET NUMBER
370 OF 370

VALVE SYMBOLS

- GTV XXXX — GATE
- NV XXXX — NEEDLE
- S / SV XXXX — SOLENOID
- CKV XXXX — CHECK
- BV XXXX — BALL
- DCKV XXXX — DOUBLE-DOOR CHECK
- GV XXXX — GLOBE
- AUTOMATIC AIR RELEASE VALVE
- BFV XXXX — BUTTERFLY
- FRV XXXX — FLOW RESTRICTING VALVE
- S — 3 - WAY VALVE
- PV XXXX — PLUG VALVE

REGULATING AND BACK PRESSURE VALVE

SET TO XX PSIG — PRV XXXX

SET TO XX PSIG — PRV XXXX

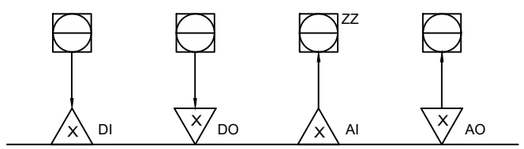
PRESSURE SAFETY VALVE

SET TO XX PSIG — PSV XXXX

XX IN H2O XX IN H2O — VPSV XXXX

PLC SYMBOLS

ZZ : HH = HIGH-HIGH
H = HIGH
L = LOW
LL = LOW-LOW



COMPRESSOR 1 RUNNING

START/STOP COMPRESSOR 2

FEED GAS PRESSURE

CONTROL VALVE POSITION COMMAND

X — OUTPUT

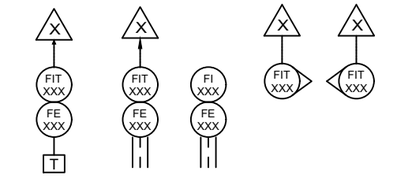
X — INPUT

X : AI = ANALOG INPUT
AO = ANALOG OUTPUT
DI = DIGITAL INPUT
DO = DIGITAL OUTPUT

AUXILIARY SYMBOLS

- INSTRUMENTATION FILTER
- DRAIN
- SIL — SILENCER
- M — ROTARY MOTOR
- S — SOLENOID
- STRAINER
- DIAPHRAGM SEAL
- PULSATION DAMPENER / SNUBBER
- S — MUFFLER
- CENTRIFUGAL PUMP W / MOTOR
- EXPANSION JOINT
- OZONE GAS INJECTOR
- LIQUID TRAP — WATER TRAP
- 6" X 4" — CONCENTRIC REDUCER
- P — PNEUMATIC

FLOW MEASUREMENT

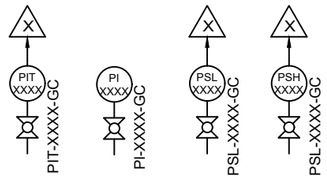


THERMAL MASS

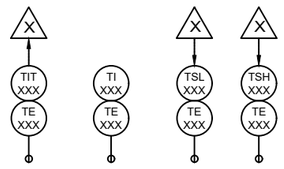
ORFICE PLATE

VARIABLE AREA FLOW INDICATOR

PRESSURE MEASUREMENT



TEMPERATURE MEASUREMENT



SKID, ENCLOSURE, & PLC LINES

- SKID BOUNDARY AND WEDECO SCOPE OF SUPPY
- ENCLOSURES
- DATA LINK
- PNEUMATIC
- ELECTRIC SIGNAL

INSTRUMENT IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USERS CHOICE			CONTROL	CLOSED
D	USERS CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME; RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPENED
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

NOTES:
1. A (*) DENOTES ITEMS NOT SUPPLIED BY WEDECO.
2. ALL PIPING AND FITTINGS EXTERNAL TO SKID BOUNDARY ARE SUPPLIED BY OTHERS.
3. ALL SIGNALS ARE TRANSFERRED VIA ETHERNET FROM LOCAL CONTROL PANEL TO MOCP. FIBER OPTIC FROM MOCP TO PLANT CONTROL SYSTEM.
4. ALL EQUIPMENT, INSTRUMENTATION AND VALVES ON THE VSA/PSA ARE ESTIMATED.

TAG NO. DESCRIPTION

01 = FEED GAS
02 = OZONE PRODUCTION
03 = OZONE GAS
06 = OFF-GAS
07 = COOLING WATER
08 = PLANT WATER SERVICE
09 = OZONATED WATER
20 = SUPPLEMENTAL AIR
34 = SAFETY
SUBASSEMBLY.LINE.COUNTER
07.0.10

LEGEND

SYMBOL FOR MEASUREMENT AND CONTROL, MAIN PLC - MOCP

SYMBOL FOR MEASUREMENT AND CONTROL, LOCAL PLC

SYMBOL FOR MEASUREMENT AND CONTROL, DISPLAY UNIT

SCOPE

WEDECO / CUSTOMER

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°

THIRD ANGLE PROJECTION

DESIGNER	DATE
A. HARTMANN	08/12/2022
APPROVED BY	DATE
M. MCBRIDE	08/12/2022

WEDECO
a xylem brand
www.xyleminc.com

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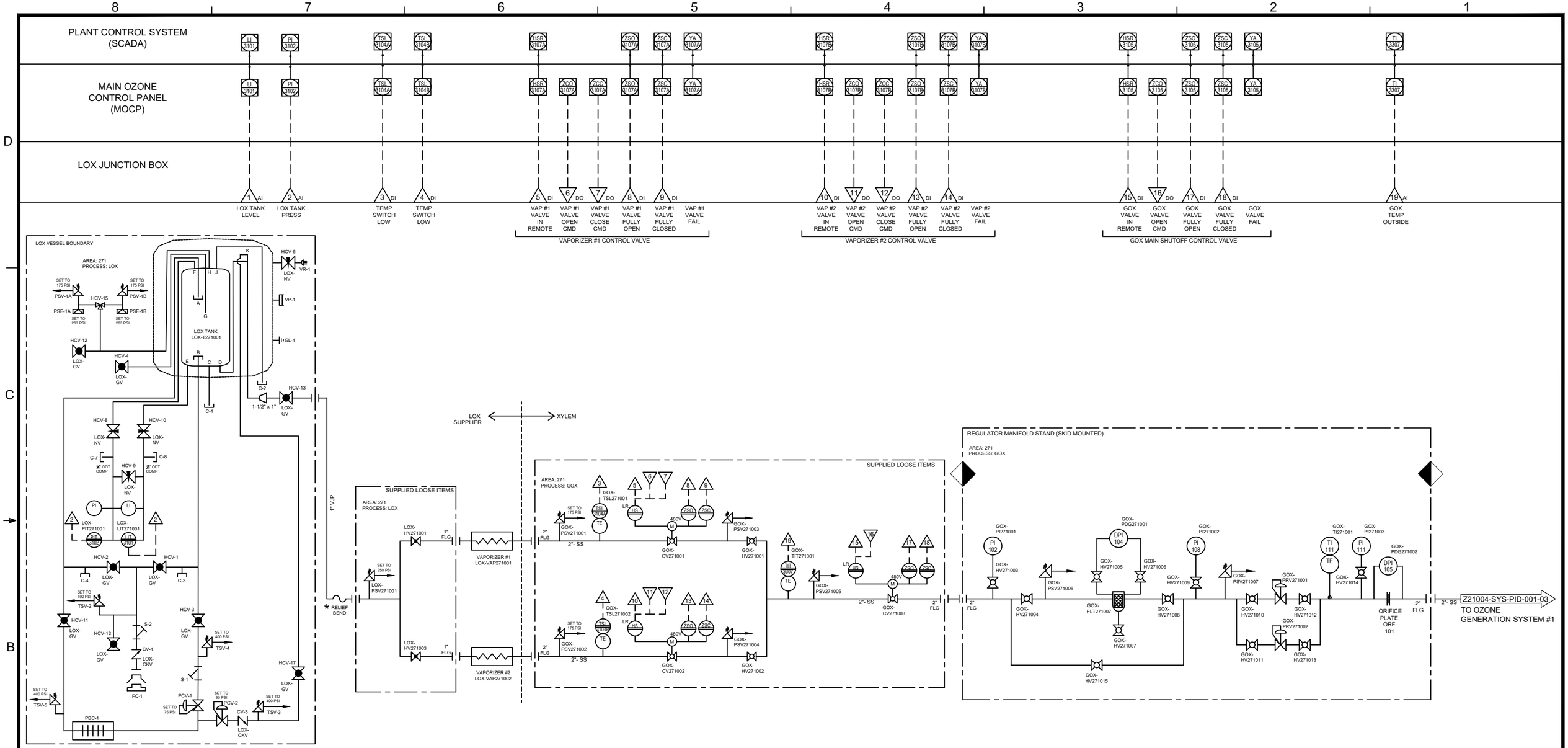
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
LEGEND

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				1 OF 14



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3. ALL SIGNALS ARE HARDWIRED FROM LOCAL CONTROL PANEL TO MOCP, AND FIBER OPTIC FROM MOCP TO PLANT CONTROL SYSTEM.
4. ALL EQUIPMENT, INSTRUMENTATION AND VALVES ON THE VSA/PSA ARE ESTIMATED.
5. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT/INSTRUMENT TAGS ARE PRECEDED BY "A-".
6. PROCESS CODE IS LOX UPSTREAM OF THE VAPORIZER EQUIPMENT AND GOX DOWNSTREAM OF THE VAPORIZER EQUIPMENT UNLESS OTHERWISE NOTED.
7. AREA CODE IS 271 UNLESS OTHERWISE NOTED.

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°
THIRD ANGLE PROJECTION

DESIGNER	DATE
A. HARTMANN	08/12/2022
APPROVED BY	DATE
M. MCBRIDE	08/12/2022

WEDECO a xylem brand
www.xyleminc.com

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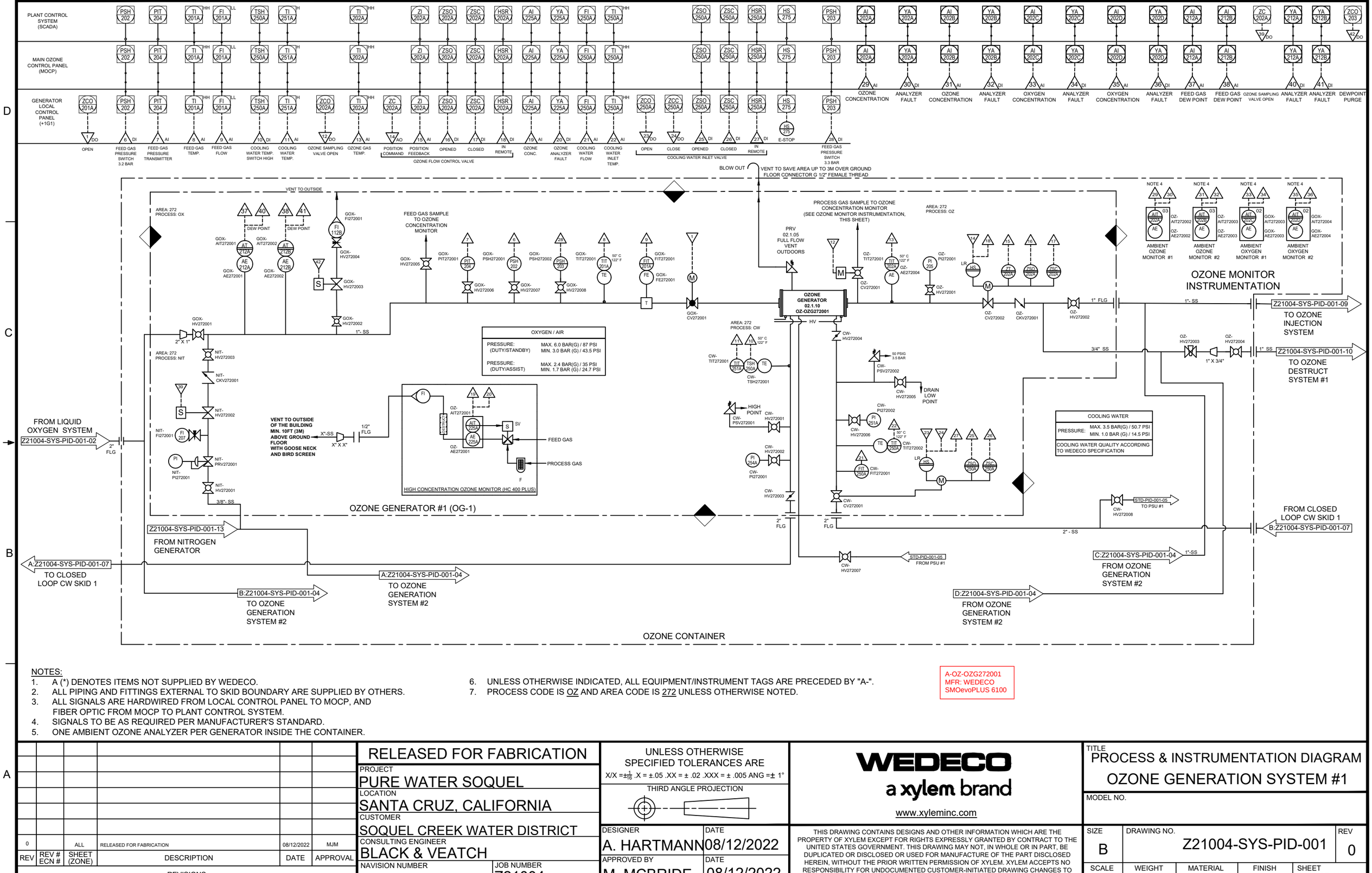
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
LIQUID OXYGEN SYSTEM

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				2 OF 14



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3. ALL SIGNALS ARE HARDWIRED FROM LOCAL CONTROL PANEL TO MOCP, AND FIBER OPTIC FROM MOCP TO PLANT CONTROL SYSTEM.
4. SIGNALS TO BE AS REQUIRED PER MANUFACTURER'S STANDARD.
5. ONE AMBIENT OZONE ANALYZER PER GENERATOR INSIDE THE CONTAINER.
6. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT/INSTRUMENT TAGS ARE PRECEDED BY "A-".
7. PROCESS CODE IS OZ AND AREA CODE IS 272 UNLESS OTHERWISE NOTED.

A-OZ-OZG272001
MFR: WEDECO
SMOevoPLUS 6100

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°
THIRD ANGLE PROJECTION

DESIGNER: A. HARTMANN — DATE: 08/12/2022
APPROVED BY: M. MCBRIDE — DATE: 08/12/2022

WEDECO a xylem brand
www.xyleminc.com

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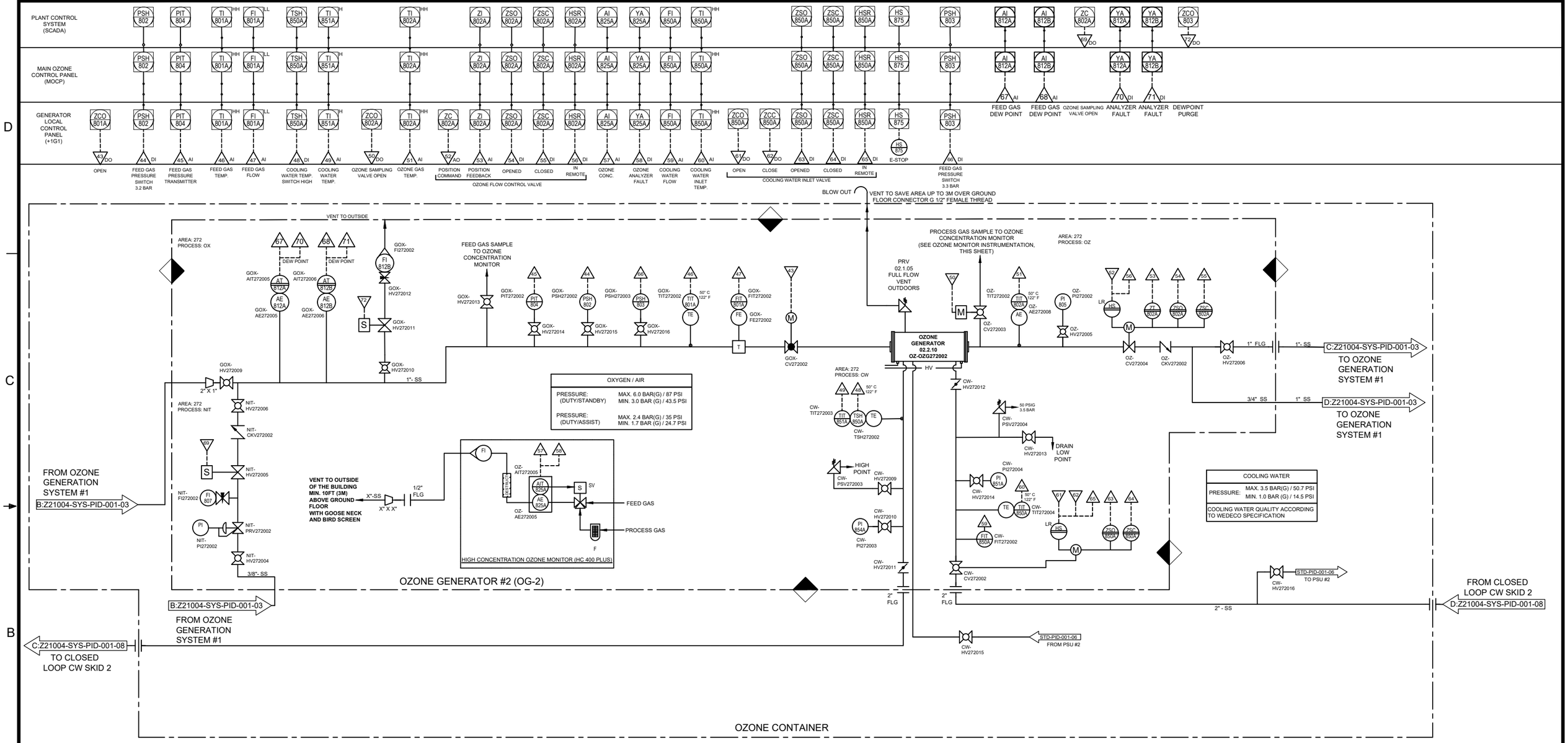
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OZONE GENERATION SYSTEM #1

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				3 OF 14



NOTES:

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3. ALL SIGNALS ARE HARDWIRED FROM LOCAL CONTROL PANEL TO MOCP, AND FIBER OPTIC FROM MOCP TO PLANT CONTROL SYSTEM.
4. SIGNALS TO BE AS REQUIRED PER MANUFACTURER'S STANDARD.
5. ONE AMBIENT OZONE ANALYZER PER GENERATOR INSIDE THE CONTAINER.
6. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT/INSTRUMENT TAGS ARE PRECEDED BY "A-".
7. PROCESS CODE IS OZ AND AREA CODE IS 272 UNLESS OTHERWISE NOTED.

A-OZ-OZG272002
MFR: WEDECO
SMOevoPLUS 6100

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°
THIRD ANGLE PROJECTION

DESIGNER: A. HARTMANN — DATE: 08/12/2022
APPROVED BY: M. MCBRIDE — DATE: 08/12/2022

WEDECO a xylem brand
www.xyleminc.com

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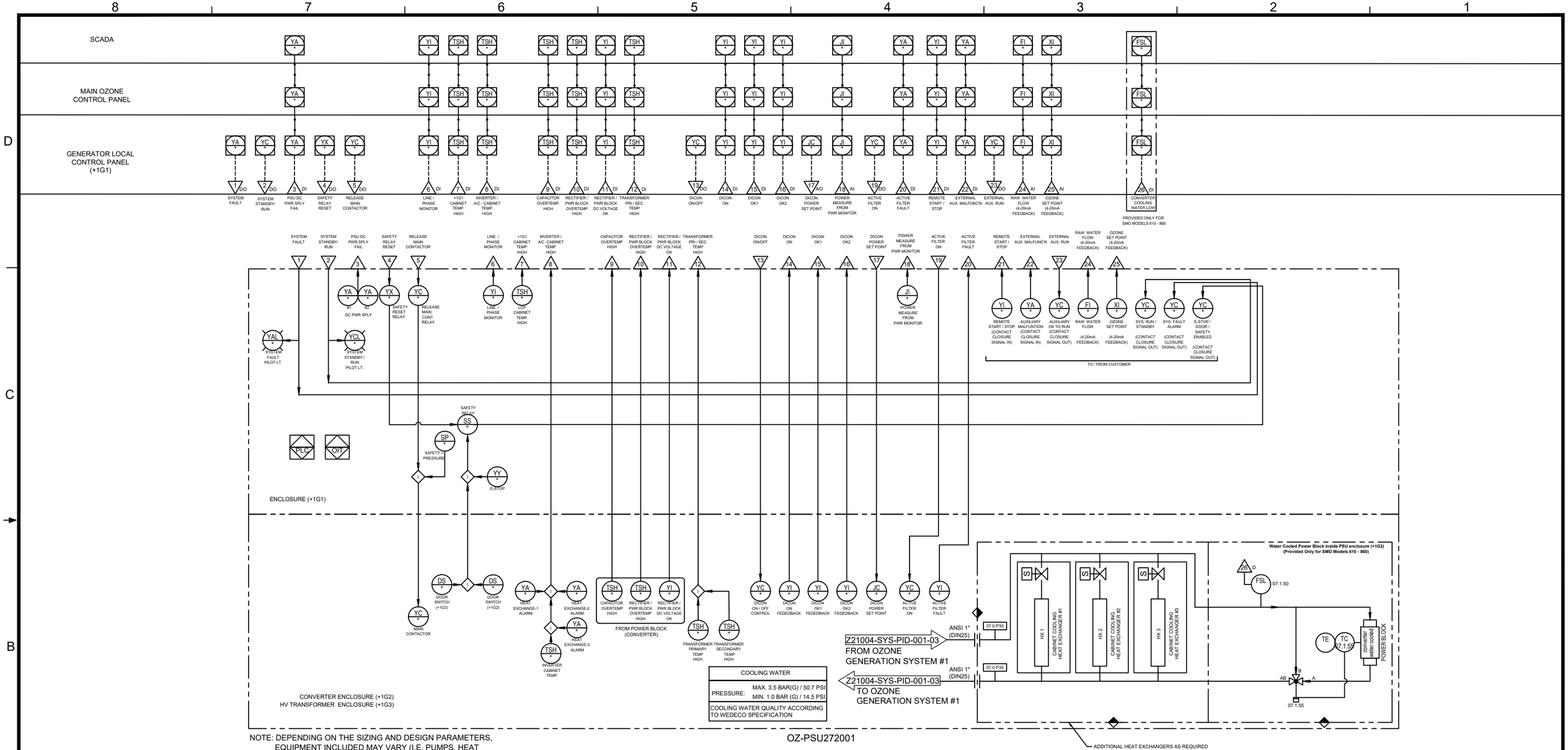
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OZONE GENERATION SYSTEM #2

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				4 OF 14



NOTE: DEPENDING ON THE SIZING AND DESIGN PARAMETERS, EQUIPMENT INCLUDED MAY VARY (I.E. PUMPS, HEAT EXCHANGERS, SIGNALS, ETC.)

NOTES:
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3. ALL SIGNALS ARE HARDWIRED FROM LOCAL CONTROL PANEL TO MOCP, AND FIBER OPTIC FROM MOCP TO PLANT CONTROL SYSTEM.

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

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THIRD ANGLE PROJECTION

DESIGNER	DATE
A. HARTMANN	08/12/2022
APPROVED BY	DATE
M. MCBRIDE	08/12/2022

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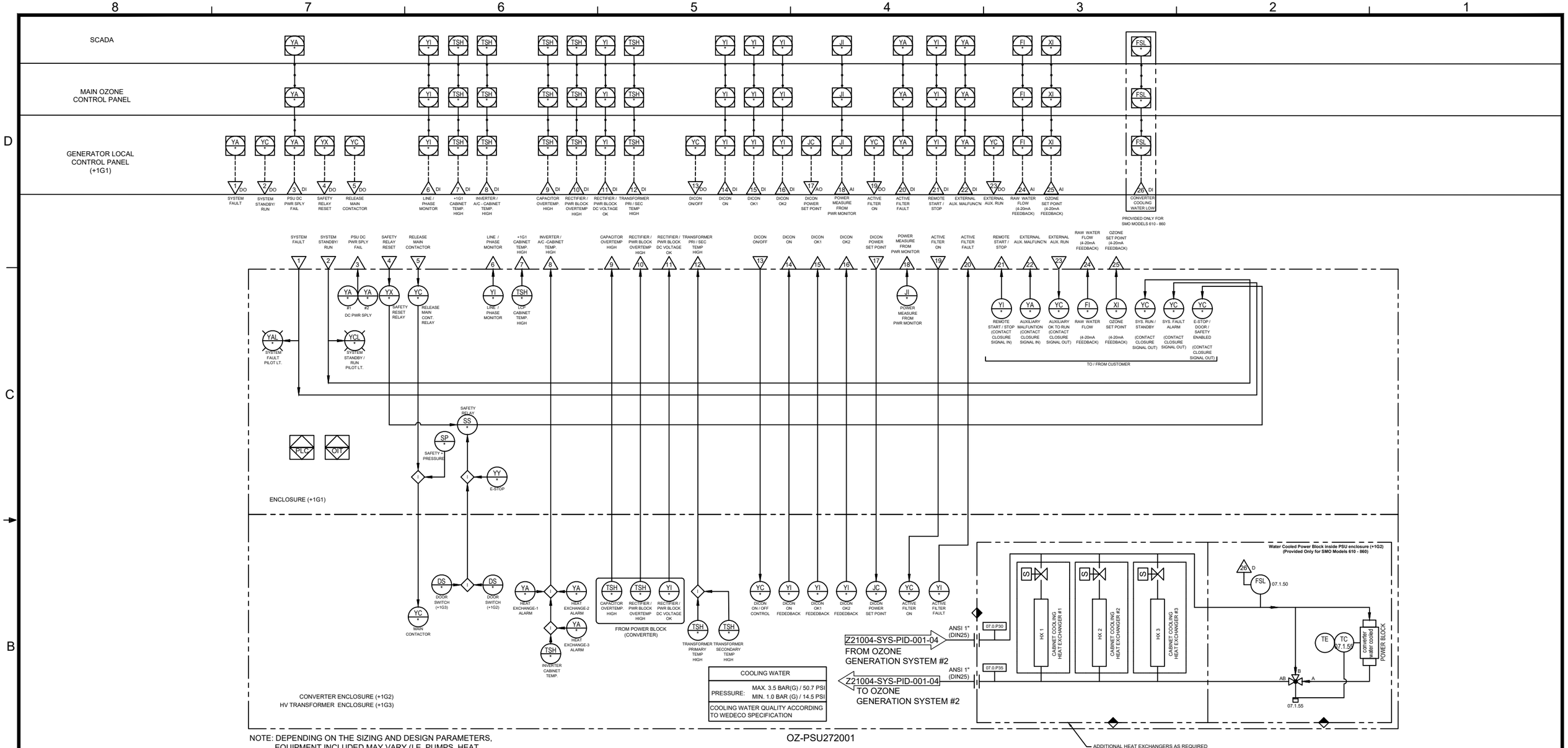
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
POWER SUPPLY SYSTEM #1

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				5 OF 14



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REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°
THIRD ANGLE PROJECTION

DESIGNER	DATE
A. HARTMANN	08/12/2022
APPROVED BY	DATE
M. MCBRIDE	08/12/2022

WEDECO
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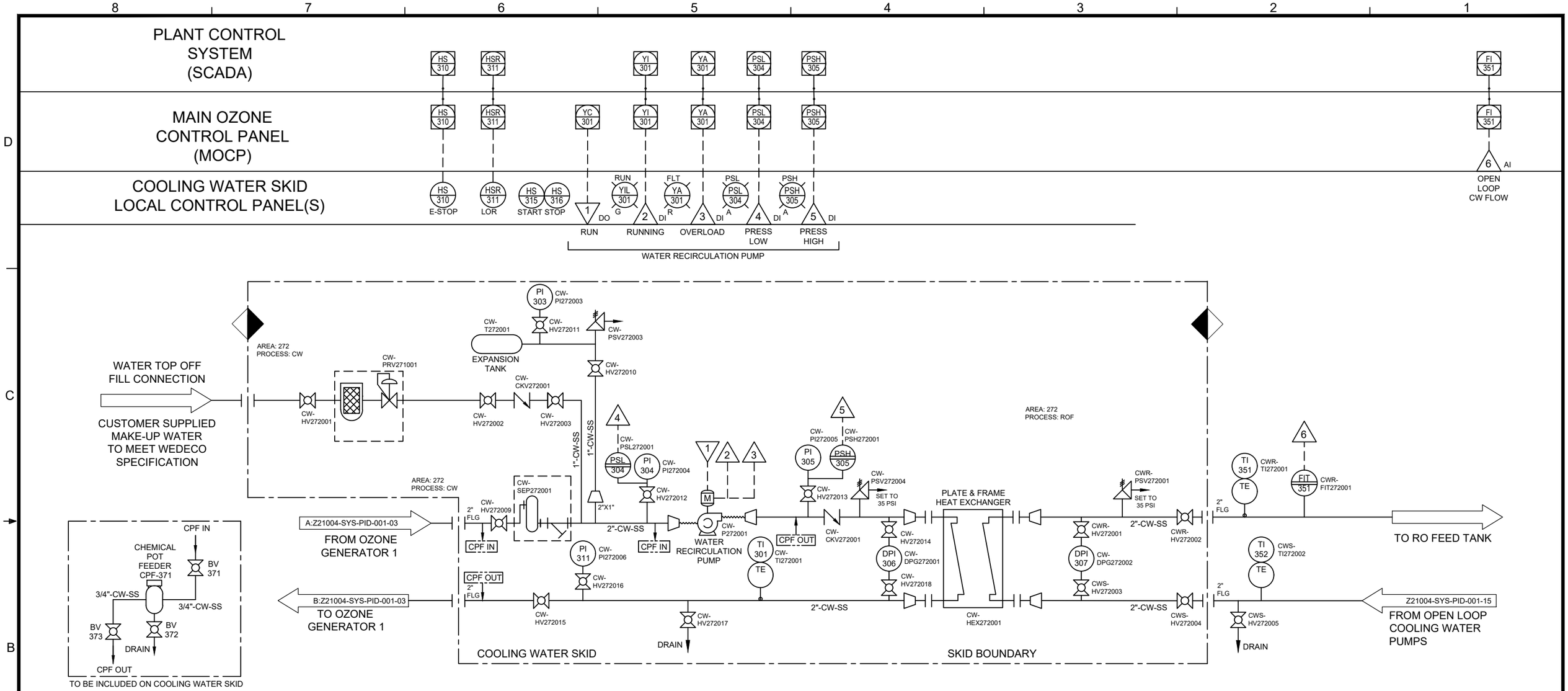
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
POWER SUPPLY SYSTEM #2

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				6 OF 14



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5. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT/INSTRUMENT TAGS ARE PRECEDED BY "A-".
6. PROCESS CODE IS CW AND AREA CODE IS 272 UNLESS OTHERWISE NOTED.

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL

LOCATION: SANTA CRUZ, CALIFORNIA

CUSTOMER: SOQUEL CREEK WATER DISTRICT

CONSULTING ENGINEER: BLACK & VEATCH

NAVISION NUMBER:

JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°

THIRD ANGLE PROJECTION

DESIGNER: A. HARTMANN — DATE: 08/12/2022

APPROVED BY: M. MCBRIDE — DATE: 08/12/2022

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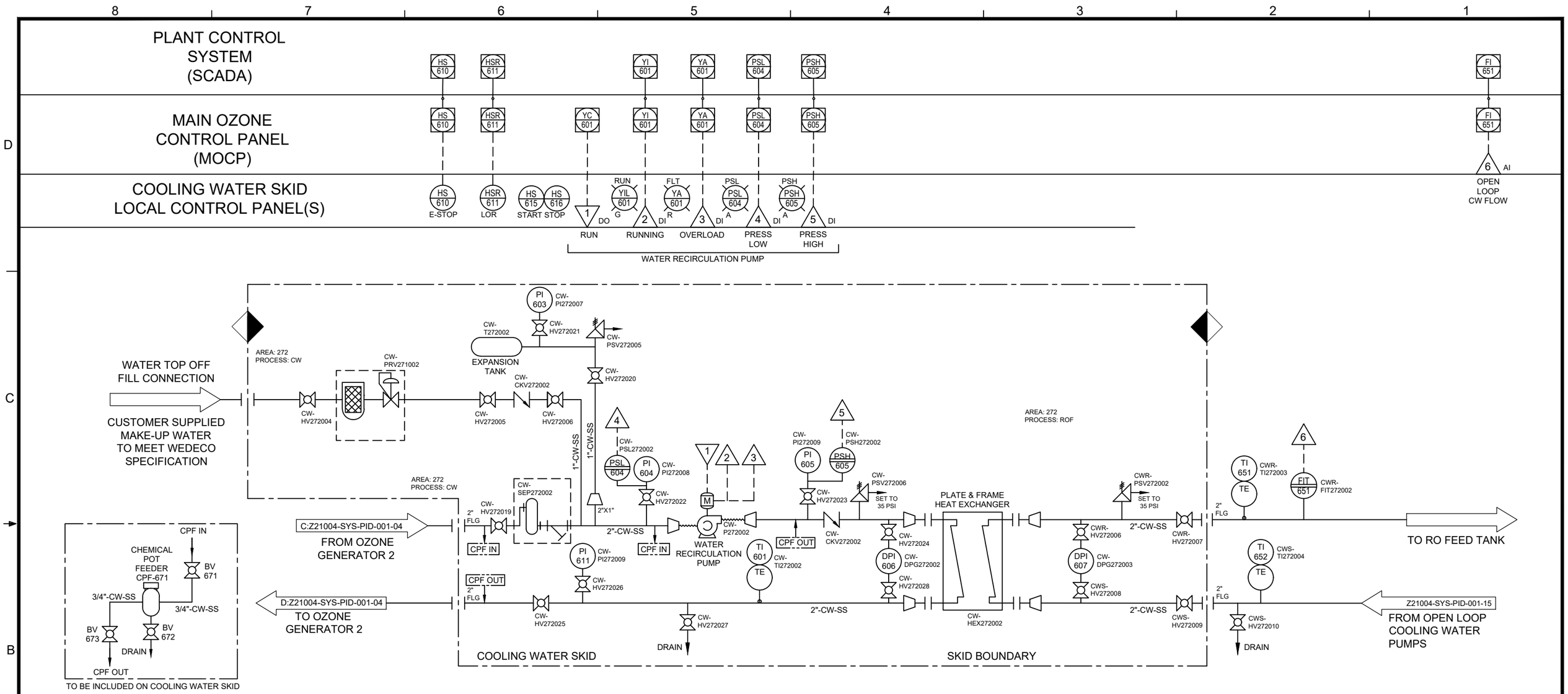
TITLE: PROCESS & INSTRUMENTATION DIAGRAM COOLING WATER SYSTEM NO. 1

MODEL NO.

SIZE: B — DRAWING NO.: Z21004-SYS-PID-001 — REV: 0

SCALE: NTS — WEIGHT — MATERIAL — FINISH — SHEET: 7 OF 14



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6. PROCESS CODE IS CW AND AREA CODE IS 272 UNLESS OTHERWISE NOTED.

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

RELEASED FOR FABRICATION

PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°
THIRD ANGLE PROJECTION

DESIGNER: A. HARTMANN — DATE: 08/12/2022
APPROVED BY: M. MCBRIDE — DATE: 08/12/2022

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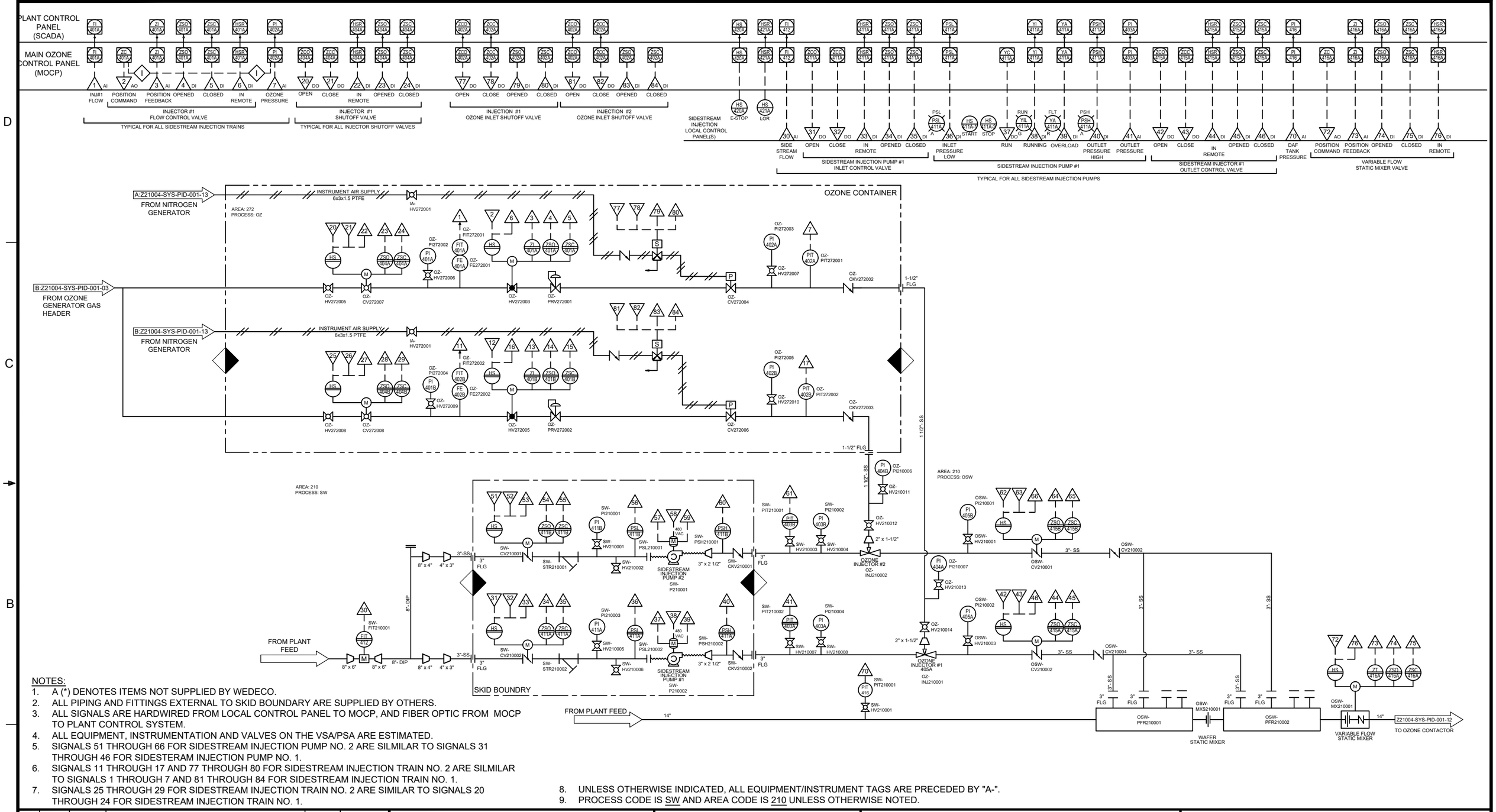
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
COOLING WATER SYSTEM NO. 2

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				8 OF 14



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4. ALL EQUIPMENT, INSTRUMENTATION AND VALVES ON THE VSA/PSA ARE ESTIMATED.
5. SIGNALS 51 THROUGH 66 FOR SIDESTREAM INJECTION PUMP NO. 2 ARE SILMILAR TO SIGNALS 31 THROUGH 46 FOR SIDESTERAM INJECTION PUMP NO. 1.
6. SIGNALS 11 THROUGH 17 AND 77 THROUGH 80 FOR SIDESTREAM INJECTION TRAIN NO. 2 ARE SILMILAR TO SIGNALS 1 THROUGH 7 AND 81 THROUGH 84 FOR SIDESTREAM INJECTION TRAIN NO. 1.
7. SIGNALS 25 THROUGH 29 FOR SIDESTREAM INJECTION TRAIN NO. 2 ARE SIMILAR TO SIGNALS 20 THROUGH 24 FOR SIDESTREAM INJECTION TRAIN NO. 1.
8. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT/INSTRUMENT TAGS ARE PRECEDED BY "A-".
9. PROCESS CODE IS SW AND AREA CODE IS 210 UNLESS OTHERWISE NOTED.

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL
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REVISIONS

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PROJECT: PURE WATER SOQUEL
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CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

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THIRD ANGLE PROJECTION

DESIGNER: A. HARTMANN — DATE: 08/12/2022
APPROVED BY: M. MCBRIDE — DATE: 08/12/2022

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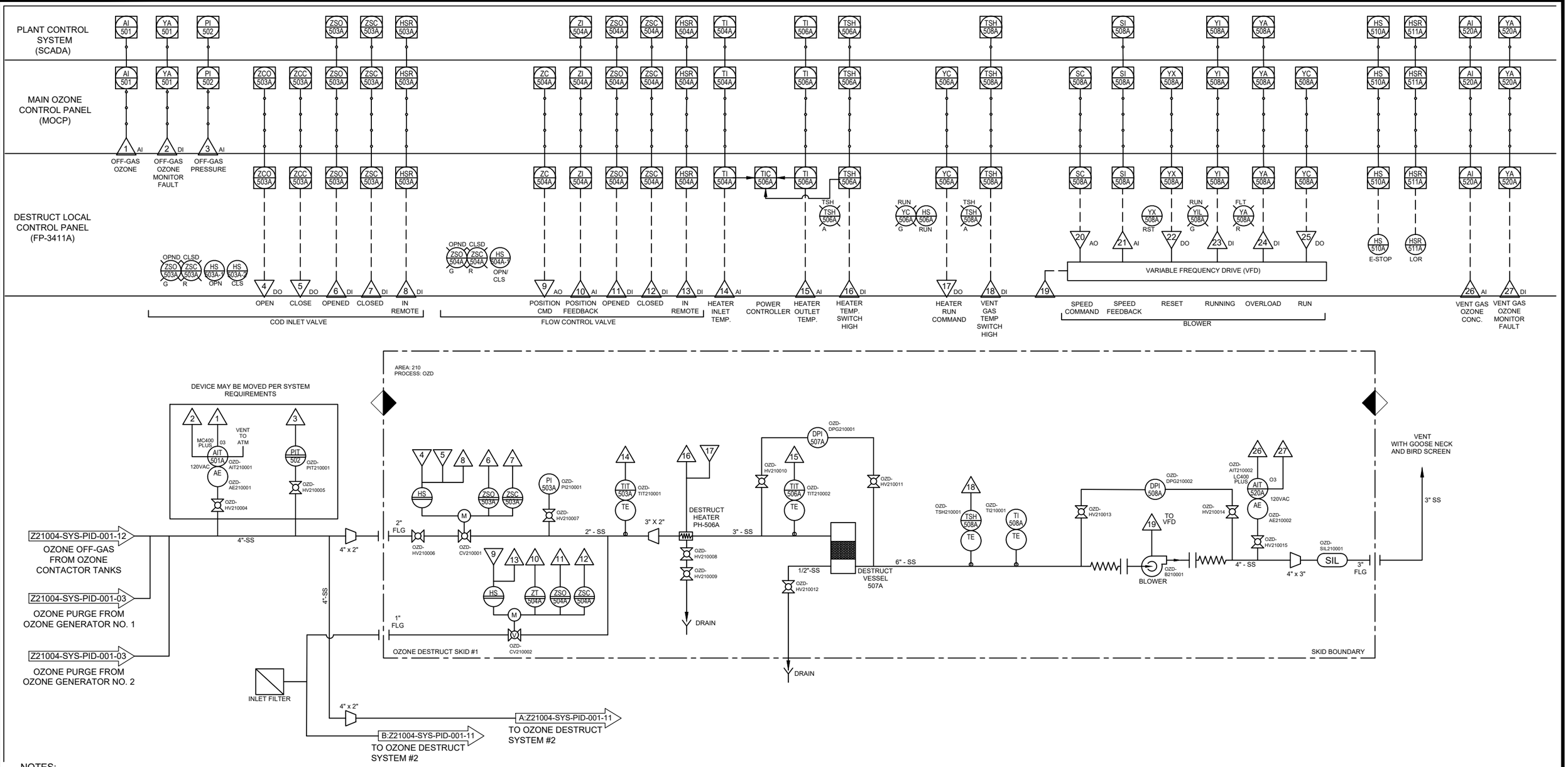
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
INJECTION SYSTEM

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				9 OF 14



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0		ALL	RELEASED FOR FABRICATION	08/12/2022	MJM

REVISIONS

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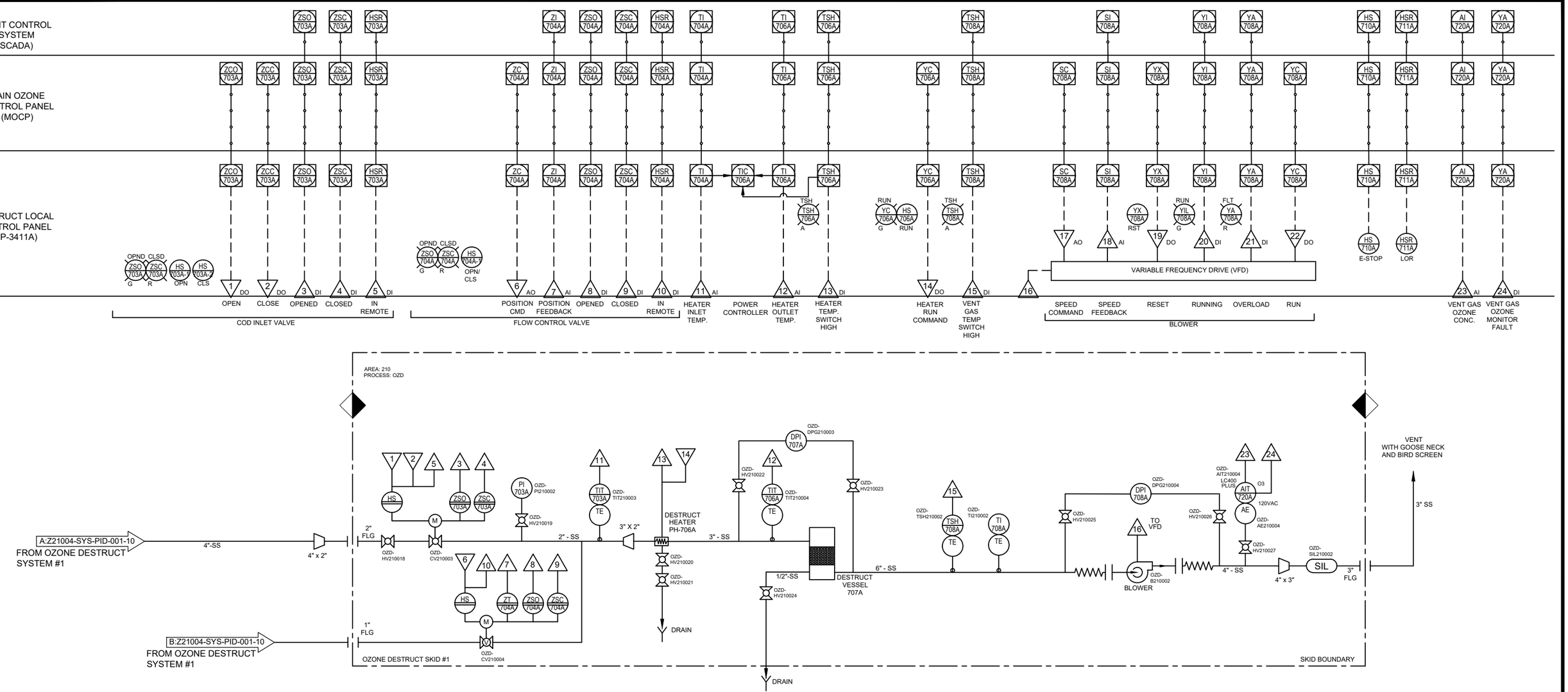
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OZONE DESTRUCT SYSTEM #1

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				10 OF 14



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REVISIONS

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PROJECT: PURE WATER SOQUEL
LOCATION: SANTA CRUZ, CALIFORNIA
CUSTOMER: SOQUEL CREEK WATER DISTRICT
CONSULTING ENGINEER: BLACK & VEATCH
NAVISION NUMBER:
JOB NUMBER: Z21004

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THIRD ANGLE PROJECTION

DESIGNER	DATE
A. HARTMANN	08/12/2022
APPROVED BY	DATE
M. MCBRIDE	08/12/2022

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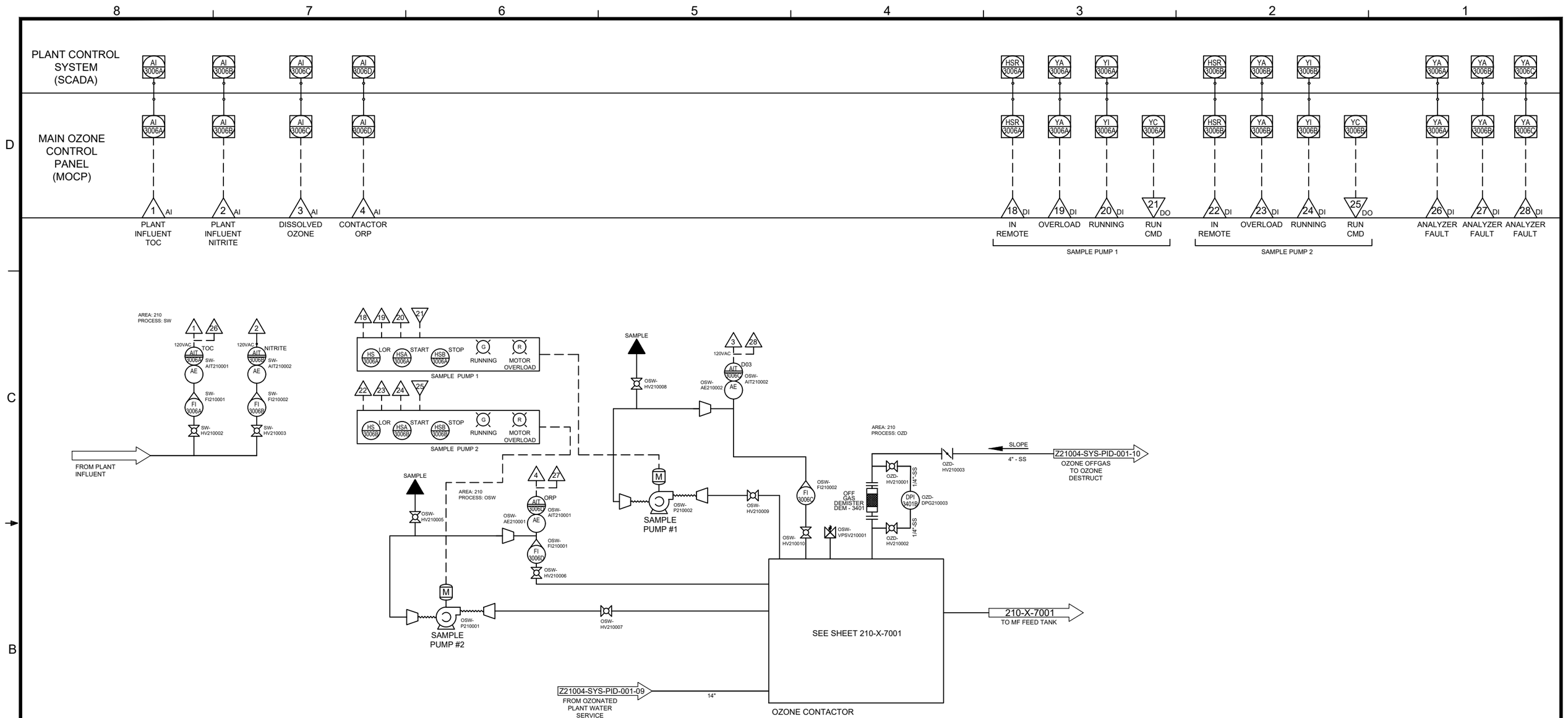
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OZONE DESTRUCT SYSTEM #2

MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				11 OF 14



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CONSULTING ENGINEER: BLACK & VEATCH
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TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OZONE CONTACTOR SYSTEM
MODEL NO.

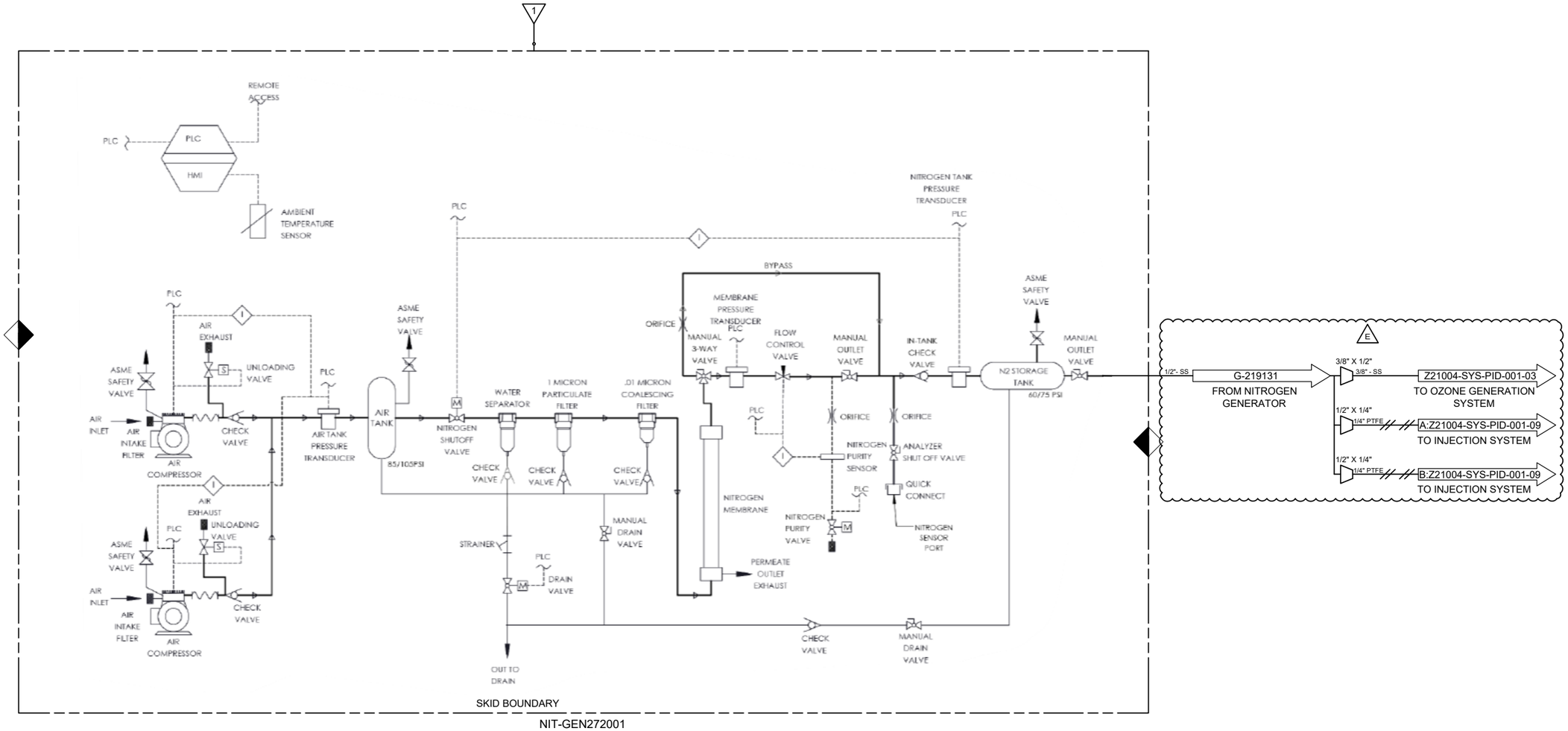
SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				12 OF 14

SCADA

MAIN OZONE CONTROL PANEL (MOCP) — YC 300

COMPRESSOR LOCAL CONTROL PANEL — 1 DO START/STOP



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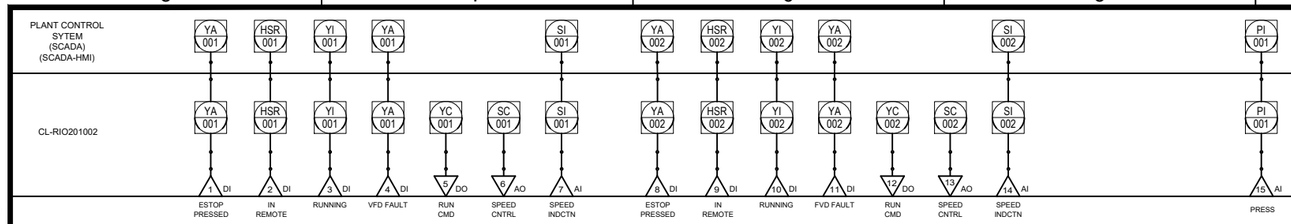
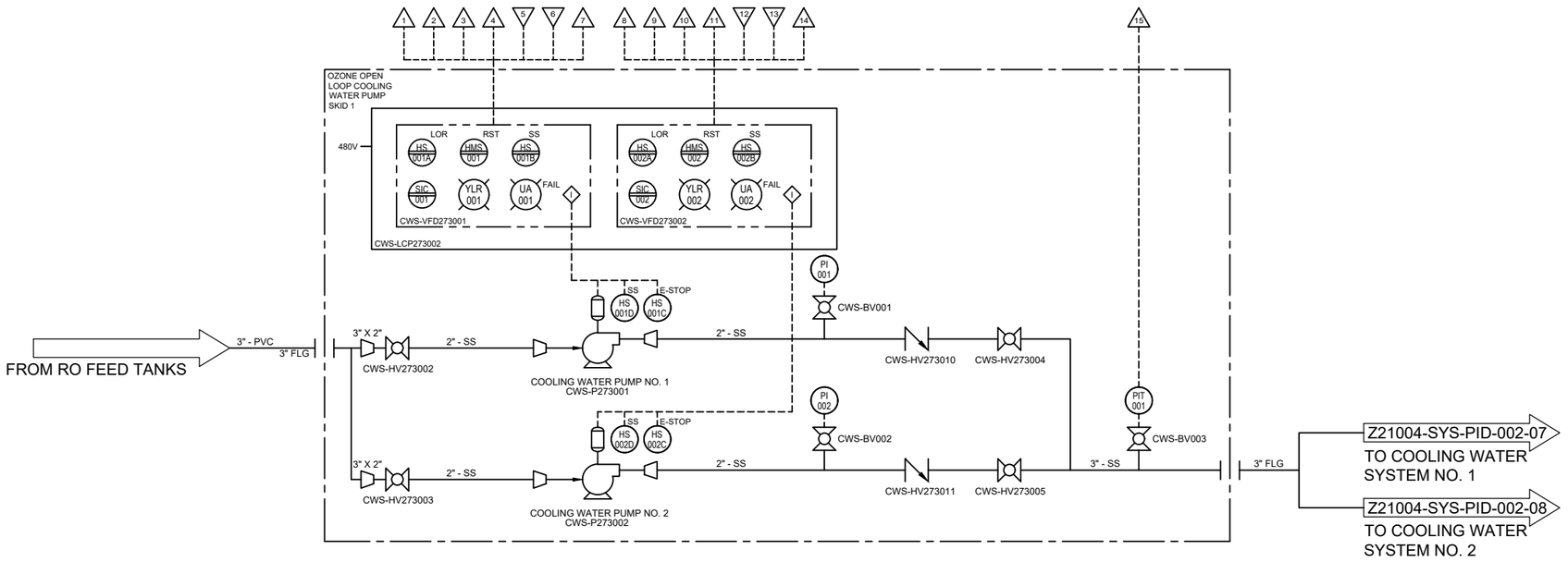
TITLE: PROCESS & INSTRUMENTATION DIAGRAM
SUPPLEMENTAL AIR (USING N2 GENERATOR)
MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				13 OF 14





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TITLE: PROCESS & INSTRUMENTATION DIAGRAM
OPEN LOOP COOLING WATER PUMPS
MODEL NO.

SIZE	DRAWING NO.	REV
B	Z21004-SYS-PID-001	0

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				14 OF 14

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Appendix D: MF Approval Letters

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State of California—Health and Human Services Agency
California Department of Public Health

MARK B. HORTON, M.D., M.S.P.H.
Director

ARNOLD SCHWARZENEGGER
Governor

July 17, 2008

Ms. Kelly Lange-Haider, P.E.
Market Development Leader
Dow Water Solutions – UF Components
Dow Chemical Company
5400 Dewey Hill Road
Edina, MN 55439

Dear Ms. Lange-Haider,

Conditional Acceptance of the Dow Omexell UF Membrane

On behalf of the Water Treatment Committee (WTC) of the California Department of Public Health (CDPH), Drinking Water Program, I would like to thank you for the opportunity to review test data from pathogen challenge studies on your ultrafiltration system as outlined in the report "Revised Final Report, Conditional Acceptance Testing for Dow Omexell UF Membrane," prepared by MWH for the Dow Chemical Company, dated May 2008. Dow's Omexell UF system uses an ultrafiltration pressure-driven polyvinylidene fluoride (PVdF) hollow fiber membrane with direct flow (dead-end mode), outside-in operation.

Based on the results of testing conducted at the Water Treatment Authority's Agua de Lejos Water Treatment Plant (Upland, CA), the WTC has determined that the Omexell UF membrane can be used as an alternative filtration technology to meet the physical removal requirements of the California Surface Water Treatment Rule (SWTR) (California Code of Regulations, Title 22, Division 4, Environmental Health Chapter 17, Article 2, Section 64653(f)), as well as the federal Long Term 1 and Long Term 2 Enhanced Surface Water Treatment Rules (LT1ESWTR, LT2ESWTR), for use on any approved surface source water when used as the core of a complete and well designed, constructed and operated filtration system. The results from the virus pathogen challenges, in combination with the microsphere challenge testing (using 0.5 µm fluorescent latex microspheres from Duke Scientific) and the particle counting data, provided the WTC with valuable insight on the performance characteristics of the membrane system and aided the WTC in their decision to accept your system as an alternative filtration technology.

The WTC hereby accepts the Omexell UF membrane system as an alternative filtration technology for compliance under the California SWTR, LT1ESWTR and the LT2ESWTR.

Drinking Water Technical Operations Section
1040 E. Herndon Avenue, Suite 205, Fresno, CA 93720
Telephone: (559) 447-3485 Fax: (559) 447-3304
Internet Address: http://www.cdph.ca.gov/programs/Pages/DWP.aspx

In reviewing the data submitted as part of the final report, the WTC found that the Omexell UF membrane meets the minimum alternative technology requirements of demonstrating 2-log *Giardia* and 1-log virus removal as set forth in Section 64653(f). As such, your technology can be used in systems serving more than 500 persons. Furthermore, based on MS-2 bacteriophage and fluorescent microsphere challenge results, the WTC credits the Omexell UF membrane with having demonstrated at least 4-log *Cryptosporidium*, 4-log *Giardia* and 2.5-log virus removal at least 95 percent of the time for the water quality and operating conditions under which the testing at the Agua de Lejos Water Treatment Plant was conducted. The testing was performed at the temperature corrected flux of 60 gfd (at 20°C) (23 gpm), a maximum TMP of 30 psi, and no coagulant was used.

Table 1 provides the pathogen removal credit assigned by CDPH to the Omexell UF membrane system and Table 2 presents the operating and quality control values that the membrane system cannot exceed as a condition of this acceptance.

Table 1 – Pathogen Removal Credit

Target Organism	Removal Credit
Giardia lamblia	4-log
Cryptosporidium	4-log
Virus	2.5-log

Table 2 – System Operating & Quality Control Parameters

Operating Parameter	***Maximum* Value**
Flux [1] (corrected to 20°C)	60 gfd
Transmembrane Pressure (TMP)	30 psi
Turbidity Performance Standards	0.1 NTU based on 95% of monthly measurements; Not to exceed 0.5 NTU
Quality Control Release Value (QCRV)	0.10 psi/min
Upper Control Limit (UCL) [2]	0.14 psi/min

[1] Based on outside surface area
[2] The UCL that signifies the highest allowable pressure decay during a direct integrity test that demonstrates a 4-log *Cryptosporidium* removal

Specifications for the Omexell UF membrane system are provided in Table 3 below.

Table 3 – Omexell UF Membrane Specifications		
Specification	**Units**	**Value**
Membrane Model Number		SFX2860
Membrane Element Part Number		270709506
Material		Polyvinylidene fluoride (PVdF)
Flow direction		Outside-in
Maximum pore size	µm	0.05
Nominal pore size	µm	0.03
Fiber Dimensions (OD/ID)	mm	1.3 / 0.7
Nominal membrane area per module (based on OD)	ft^2	549
Overall dimensions of module:	inch	73 L x 9 D
Chlorine Tolerance	ppm-hrs	>5,000,000

Direct integrity testing conducted during the challenge study demonstrated a Log Reduction Value (LRV) of 4.0 using the Darcy Pipe Flow model and 4.4 using the Hagan-Poiseuille model, for turbulent and laminar flow regimes, respectively. The most conservative values allowable for pore shape correction factor (κ) and liquid-membrane contact angle (θ) were used, which correlate to $\kappa = 1$ and $\theta = 0$. By utilizing these more rigorous derivation values, the LRV calculations ensure the most conservative theoretical evaluation.

The Upper Control Limit (UCL) signifies the highest allowable pressure decay during a direct integrity test that demonstrates 4-log removal. Based on the calculations provided in the study report the allowable pressure decay is 0.14 psi/min, assuming turbulent conditions. The calculations are made assuming maximum anticipated water temperature of 86°F (30°C).

The Quality Control Release Value (QCRV) is the minimum nondestructive performance test established by the manufacturer for the membrane module production that ensures that the module will attain the targeted LRV demonstrated during the challenge testing, and is demonstrated by conducting a pressure decay test on each manufactured module as a pass/fail test. The report indicates that the manufacturer had specified a QCRV of 0.14 psi/min. Table 4-8 of the report shows the pressure decay rate (PDR) for each pressure decay test conducted on the single test module. This showed that 12 tests had a PDR of <0.05 psi/min, 17 tests had a PDR in the range of 0.05-0.12 psi/min, and 1 test showed a PDR of 0.14 psi/min. This data showed that the membrane module selected for the challenge study was in fact tighter than the manufacturer-specified QCRV, which may skew the results by providing greater log reduction than a production line membrane module that had a PDR at the QCRV of 0.14 psi/min. Based on CDPH inquiry on this issue, a lower QCRV of 0.10 psi/min was selected by Dow for the Omexell UF manufacturing line. This QCRV is reflected in Table 2 above.

As part of the study, a cut fiber test was conducted that showed an increase in filtrate particle concentration of 0.5-log with 1 cut fiber and 1.0-log with 3 cut fibers. There was no significant change in filtrate turbidity that correlated to the log particle increase as a result of the cut fibers.

Approval for the design and use of your technology in any drinking water application will be handled on a case-by-case basis by Drinking Water Program (DWP) district offices or by local primacy agencies (LPA) and is granted through the domestic water supply permitting process. Information such as shop drawings and specifications may be requested to aid in the development of the water supply permit. A commissioning study to assess performance, integrity and membrane durability on start-up may be required in an effort to ensure the final system is functioning as expected. The DWP district office or LPA is responsible for evaluating the source water quality to be treated, and they will set the overall removal and inactivation requirements that must be met for a given source water.

The minimum log removal requirements established by the SWTR, LT1ESWTR and LT2ESWTR are to be met using multiple treatment barriers. Design engineers proposing to use your alternative filtration technology should be aware that the minimum log removal requirements established by the surface water treatment rules and the water supply permit are to be met using multiple treatment barriers. Your technology is recognized as being *one* component of this multiple barrier.

After any alternative filtration technology installation has been in operation for one year, a report outlining the performance of the installation is to be submitted by the water utility to the DWP or LPA as required by Section 64653(i), Title 22, California Code of Regulations. This report is due within 60 days after the first year of operation. The report is to include, as a minimum, results of all water quality tests performed, an evaluation of compliance with established performance standards under actual operating conditions, an assessment of problems experienced and corrective actions taken or needed, and a schedule for providing needed improvements. These reports should be comprehensive, detailing problems encountered during the first year of operation as well as during startup and commissioning. Membrane equipment failures, fiber breakage rates, dates, and causes are to be adequately covered in the report and should cover the period immediately following unpacking and installation (commissioning; troubleshooting) through the first year of production.

Any changes to any feature, formulation, part or product used in the Dow Omexell UF membrane system should be reported (in writing) to CDPH in advance of making the changes to any production version of your membrane system sold in California. This includes any changes in the physical attributes (including changes to the specifications for any component), manufacturing practice, or character of the membranes or modules, including quality control practices such as the Quality Control Release Value. The detail of your written notification will be reviewed to determine if additional performance testing will be required. Consequently, the letter and its appendices

should provide sufficient detail for the reviewing body to render such a decision. Should additional testing be required, the CDPH WTC will review all study protocols proposed to be used as a condition of accepting the final report. Upon reviewing the final report, the WTC will make a recommendation regarding acceptance of the identified changes to the design and/or operating criteria.

Be advised that any chemicals used in the operation of your system will need to be certified under NSF/ANSI Standard 60. The plant-specific operations plan must assure CDPH that all cleaning chemicals are removed from the system before the unit is returned to production. It is also required that all materials used in the construction of your system that come into contact with the raw or treated water be NSF/ANSI Standard 61 certified.

Should you have any questions regarding the content of this letter, please feel free to contact me at betsy.lichti@cdph.ca.gov (phone 559.447.3485).

Sincerely,

Betsy Lichti, P.E.
Senior Sanitary Engineer
Technical Operations Section

cc: Water Treatment Committee

Terry L. Catlin, Plant Manager
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1775 N. Benson Avenue
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State of California—Health and Human Services Agency
California Department of Public Health

MARK B HORTON, MD, MSPH
Director

ARNOLD SCHWARZENEGGER
Governor

December 3, 2009

Ms. Kelly Lange-Haider, P.E.
Dow Water Solutions
7600 Metro Blvd.
Edina, MN 55439

Subject: Use of the Dow upsized SFX 2880 Pressurized Ultrafiltration Membrane Technology to Comply With the California Water Recycling Criteria

Dear Ms Lange-Haider:

By letter dated October 30, 2009, Dow Water Solutions requested Departmental acceptance of the Dow upsized SFX 2880 Pressurized Ultrafiltration Membrane Technology as an acceptable filtration technology for compliance with the California Water Recycling Criteria (Title 22).

This technology utilizes the same 0.03 micron polyvinylidene fluoride (PVDF) hollow fiber membrane that was demonstrated and approved as a compliant filtration technology under the California Surface Water Treatment Rule (letter from CDPH dated July 17, 2008), and accepted as a compliant technology for Title 22 water recycling applications (letter from CDPH dated September 8, 2008).

As outlined in your letter, the upsized SFX 2880 UF module is identical to the previously accepted technology identified as the SFX 2860 module, with exception of having an additional 20 inches of length and 25 m^2 of membrane surface area while maintaining the same footprint.

The Department has reviewed your request and hereby accepts the SFX 2880 module as an acceptable technology for recycled water filtration applications. Any proposed changes made in the physical attributes or character of this membrane shall be

Technical Operations Branch – Recycled Water Unit
1180 Eugenia Place, Suite 200 Carpinteria, CA 93013-2000
(805) 566-9767; (805 745-8196 fax

reviewed in advance by the Department to determine whether the modifications will require additional testing.

The Department will continue to review all proposed projects on a case-by-case basis to determine full compliance with all applicable treatment and reliability features required by the Water Recycling Criteria. This will include the collective review of all treatment unit processes, operational controls (e.g. loading rates, TMP, frequency of integrity tests), 'O&M' procedures, etc.

If you have any questions concerning this letter, please contact the undersigned at (805) 566-9767.

Sincerely,

Jeffrey L. Stone, Chief
Recycled Water Unit
Division of Drinking Water

cc: Recycled Water Committee

Treatment\DOW-UFupsized#2880Apprltr

DuPont Water Solutions
7600 Metro Boulevard
Edina, MN 55439

13 May 2022

Mr. Lee Portillo
Project Manager – Sr Process Technologist
Black & Veatch
500 S. Hope Street
Suite 2250
Los Angeles, CA 90017
PortilloLM@bv.com

Dear Mr. Portillo:

Thank you for your recent inquiry regarding our SFD-2880XP ultrafiltration (UF) membrane module. In your email to me on 20 April 2022, you provided a refence to a September 2014 report from the California Division of Drinking Water (DDW) which identified the SFX-2880 and our SFD-2860 as an accepted alternative technology for recycled water. This letter seeks to clarify how the SFX-2880 and SFD-2860 relate to the SFD-2880XP UF module.

A September 2014 California DDW Alternative Treatment Technology Report for Recycled Water identifies our SFD-2860 and SFX-2880 UF modules as an acceptable technology for deployment in reuse applications. Our SFD-2880XP offered for the Soquel Creek project provides an equivalent to the SFX-2880 and can be used in the indirect potable reuse project. Additionally, the SFD-2860 product identified in the DDW report uses the same PVDF 0.03 micron membrane as the SFD-2880XP product. The SFD-2880XP membrane product can and should be considered an equivalent to the products identified in the DDW report for deployment in this reuse application.

Our SFD-2880XP module provides an equivalent to the SFX-2880, both have a 77m2 and are dimensionally the same. Per the DDW 2014 report, on page 4 of 67, the following criteria are established:

‘(b) Has been passed through a microfiltration, ultrafiltration, nanofiltration or reverse osmosis membrane

.

so that the turbidity of the filtered water does not exceed any of the following:
(1) 0.2 NTU more than 5 percent of the time within a 24-hour period; and
(2) 0.5 NTU at any time.'

The SFD-2880XP will meet the above requirements just as the SFX-2880 would have. Additionally, the SFD-2880XP UF module comes with NSF 61 and 419 listing typically required for drinking water use.

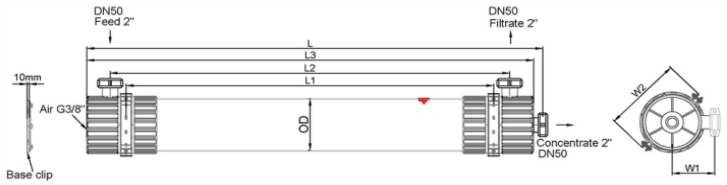
At this point I would like to highlight the differences between the SFD-2860 (2860) and SFD-2880XP (2880). The SFD-2880XP uses the same PVDF membrane as the SFD-2860 product as identified by the California DDW's September 2014 report.

The table below, which is an extract from our product literature, presents the differences between the 2860 and 2880 modules:

		Membrane Area		Volume		Weight (empty/water filled)	
Product	**Type**	**m^2**	**ft^2**	**liters**	**gallons**	**kg/lbs**	**kg/lbs**
SFP-2860XP	Industrial	51	549	35	9.3	48/83	106/183
SFD-2860XP	NSF/ANSI 61 and 419	51	549	35	9.3	48/83	106/183
SFP-2880XP	Industrial	77	829	39	10.3	61/100	135/220
SFD-2880XP	NSF/ANSI 61 and 419	77	829	39	10.3	61/100	135/220

The difference in active membrane area in the module will be expressed in the different lengths of the 2860 and 2880 respectively. The graphic below presents the dimensional differences of the two modules in question; as you will see the only difference is the module length:

Dimensions SFP-2860XP, SFD-2860XP, SFP-2880XP, and SFD-2880XP (8-inch diameter)



Product	Units	Length				Diameter	Width	
		L	L1	L2	L3	D	W1	W2
SFP-2860XP and SFD-2860XP	SI (mm)	1860±3	1500	1630±3	1820±3	225	180	342
	US (inch)	73.2±0.1	59.1	64.2±0.1	71.7±0.1	8.9	7.1	13.5
SFP-2880XP and SFD-2880XP	SI (mm)	2360±3	2000	2130±3	2320±3	225	180	342
	US (inch)	92.9±0.1	78.7	83.9±0.1	91.3±0.1	8.9	7.1	13.5

We trust this explanation establishes the equivalency of the SFD-2880XP product in question to the products listed in the 2014 report and addresses the outstanding questions you have on this matter. If not please do not hesitate to contact me at your earliest convenience.

Sincerely,

Russ Swerdfeger
Russ Swerdfeger
Global Municipal Marketing Manger
DuPont Water Solutions
+1 719 331 5822
Russell.swerdfeger@dupont.com

Cc: Brandon Coombs, Wigen Water Technologies

Appendix E: Pure Water Soquel Phase 2 Modeling Report

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MONTGOMERY
& ASSOCIATES
Water Resource Consultants

July 30, 2020

Pure Water Soquel Phase 2 Modeling

Prepared for:

Soquel Creek Water District

Prepared by:

Montgomery & Associates

1970 Broadway, Oakland, California

Funding has been provided in full or in part through an agreement with the State Water Resources Control Board using funds from Proposition 1. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendation for use

MONTGOMERY & ASSOCIATES

Contents

1 EXECUTIVE SUMMARY 5
1.1 Introduction 5
1.2 Updating Basin Model 5
1.3 Simulation of Pure Water Soquel Flow Distribution 6
1.4 Long Term Fate of Recharged Purified Water 7
1.5 Retention Time Estimates 7
2 INTRODUCTION 9
3 UPDATING BASIN MODEL 10
3.1 Results of TLC Pilot well Completion Report 10
3.1.1 Lithology Consistent with Model Layering 10
3.1.2 Flowmeter Results 15
3.1.3 Aquifer Parameters Based on Constant-Rate Pumping Tests 17
3.2 Modeling Flow Distribution 18
3.3 Updated Model Calibration Results 24
3.3.1 Groundwater Hydrographs 24
4 SIMULATION OF PURE WATER SOQUEL FLOW REDISTRIBUTION 31
4.1 Flow Distributions at Recharge and Production Wells 31
4.2 Pumping Redistribution 32
4.3 Expected Benefits from Pure Water Soquel 36
4.4 Groundwater Elevation Contours in Baseline and PWS Scenarios 47
5 LONG-TERM FATE OF RECHARGED PURIFIED WATER 60
5.1 MODPATH Setup for Particle Tracking based on GSFLOW Model 60
5.2 Results for Long-Term Fate of Recharged Water 61
5.2.1 Estimates of Purified Water Contribution to Wells and Aquifer 62
5.3 Particle Velocities for MODPATH Results 67
6 RETENTION TIME ESTIMATES 72
6.1 Modeling Refined Flow Fields for Particle Tracking 73
6.2 Particle Tracking Analysis 79
6.3 Refined Particle Tracking Results 79
6.4 Comparison of Retention Times with Other Methodologies 83
6.4.1 Comparison with MODPATH Particle Tracking Simulation 83
6.4.2 Comparison with Using Analytical Equations 84
6.4.3 Estimates with Analytical Equations for a 0.25 Credit 85

7 REFERENCES 90
8 ACRONYMS & ABBREVIATIONS 93

Tables

Table 1. Aquifer Parameters at TLC in Purisima A and BC Units 17
Table 2. Updated Aquifer Parameters at TLC Grid Cell used in Phase 2 Model Simulations 19
Table 3. Modeled Flow Distribution in TLC and Nearby Wells 31
Table 4. PWS Phase 2 Pumping and Recharge Redistribution by Well 36
Table 5. Recharge Recharged Volumes and Particle Distribution Assumed for PWS Phase 2 Modeling 61
Table 4. Estimated Total Amount of Purified Water Captured at Wells through end of Water Year 2047 64
Table 5. Fate of Purified Water at End of Water Year 2047 by Aquifer Unit 64
Table 8. Average Particle Velocities by Capture Point, for End of Water Years 2025 and 2047 68
Table 9. Comparison of Retention Time Estimate Method and Corresponding Credits 72
Table 10. Average Aquifer Properties Assigned to Each AEM Model Tranmissivity Zone for Each Aquifer Unit 76
Table 11. Travel Times in A Aquifer Unit To Assumed Locations Of Private Wells 80
Table 12. Equivalent Retention Times Based on Average Particle Velocities from MODPATH and Actual Distances Between Wells vs. Refined Particle Tracking 83
Table 13. Estimates of Retention Time from TLC to Estates for Range of Qw Values using Analytical Equations 85
Table 14. Estimates of Retention Times based on Analytical Equations Compared to Refined Particle Tracking 88
Table 15. Retention Time Requirements for Pure Water Soquel Monitoring Wells 89

Figures

Figure 1. Location of Cross-Sections A-A' and B-B' 12
Figure 2. Cross-Section A-A' Based on Basin Model Layer Elevations 13
Figure 3. Cross-Section B-B' Based on Basin Model Layer Elevations 14
Figure 4. Spinner Flowmeter Log Results during Recharge Test of Twin Lakes Church Pilot well (adapted from B&C, 2020) 16
Figure 5. Updated K_x in Purisima BC unit (model layer 5) 20
Figure 6. Updated Kx in Purisima A Unit (model layer 7) 21
Figure 7. Updated S_s (dimensionless) in Purisima BC unit (model layer 5) 22
Figure 8. Updated S_s (dimensionless) in Purisima A unit (model layer 7) 23
Figure 9. Calibration Hydrographs at Coastal Monitoring Wells in Aromas and Purisima F Units 25
Figure 10. Calibration Hydrographs at Coastal Monitoring Wells in Purisima BC and A Units 26
Figure 11. Calibration Hydrographs at Coastal Monitoring Wells in Purisima A and AA Units and Tu Unit 27

Figure 12. Calibration Hydrographs at Coastal Monitoring Wells in Purisima A and AA Units 28
Figure 13. PWS Phase 2 Calibration Groundwater Hydrographs, Stream Alluvium 29
Figure 14. PWS Phase 2 Calibration Groundwater Hydrographs, Stream Alluvium 30
Figure 15. Schematic GSP Pumping and Recharge Redistribution 34
Figure 16. Schematic PWS Phase 2 Pumping and Recharge Redistribution 35
Figure 17. SqCWD and City of Santa Cruz Coastal Monitoring Wells Used as Representative Monitoring Points for Seawater Intrusion 40
Figure 18. Groundwater Hydrographs at City of Santa Cruz Coastal Monitoring Wells Screened in Purisima A and AA 41
Figure 19. Groundwater Hydrographs at Soquel Creek Water Distict Coastal Monitoring Wells Screened in Purisima A and AA units 42
Figure 20. Groundwater Hydrographs at Soquel Creek Water District Coastal Monitoring Wells Screened in Purisima BC and A units 43
Figure 21. Groundwater Hydrographs for Purisima AA unit and the Tu unit at Coastal Monitoring Well Locations 44
Figure 22. Groundwater Hydrographs at Soquel Creek Water District Monitoring Wells Screened in Purisima F unit and Aromas Red Sands 45
Figure 23. Hydrographs at SWIP Wells 46
Figure 24. Simulated Baseline Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2025 49
Figure 25. Simulated Baseline Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2025 50
Figure 26.Simulated Baseline Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2047 51
Figure 27. Simulated Baseline Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2047 52
Figure 28. Simulated PWS Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2025 53
Figure 29. Simulated PWS Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2025 54
Figure 30. Simulated PWS Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2047 55
Figure 31. Simulated PWS Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2047 56
Figure 32. Observed Groundwater Elevations (feet msl) in Purisima BC-Unit, Fall 2016 (Reproduced from Santa Cruz Mid-County Basin GSP) 57
Figure 33. Observed Groundwater Elevations (feet msl) in Purisima A and AA Units, Fall 2016 (Reproduced from Santa Cruz Mid-County Basin GSP) 58
Figure 34. MODPATH Particle Tracking in Purisima BC Unit, End of Water Year 2047 65
Figure 35. MODPATH Particle Tracking in Purisima A Unit, End of Water Year 2047 66
Figure 36. MODPATH Particle Tracking in Purisima BC Unit, End of Water Year 2025 69
Figure 37. MODPATH Particle Tracking in Purisima A Unit, End of Water Year 2025 70
Figure 38. Basin Model Purisima BC Unit (Layer 5) Transmissivity Field and Boundaries of High- And Medium-Transmissivity Zones Defined for Use in Refined Particle Tracking 77
Figure 39. Basin Model Purisima A Unit (Layer 7) Transmissivity Field and Boundaries of High- and Medium-Transmissivity Zones Defined for Use in Refined Particle Tracking 78
Figure 40. Refined Particle Tracking Results in Purisima BC Unit (Layer 5) 81

Figure 41. Refined Particle Tracking Results in Purisima A Unit (Layer 7) 82

Appendices

APPENDIX A. Refined Particle Tracking Simulations

1 EXECUTIVE SUMMARY

1.1 Introduction

This report describes the Phase 2 groundwater modeling conducted by Montgomery & Associates (M&A) for the Soquel Creek Water District's (SqCWD) Pure Water Soquel (PWS) Seawater Intrusion Prevention (SWIP) project. The Phase 2 modeling incorporates the updated understanding of the hydrogeologic setting developed from the drilling, construction, development, and testing of the Twin Lakes Church (TLC) Pilot well (B&C, 2020) into the Basin Model. The Basin Model is a numerical model of the Santa Cruz Mid-County Groundwater Basin (Basin) using U.S. Geological Survey GSFLOW software (M&A, 2019a). The Basin Model has been used to evaluate projects such as PWS to achieve sustainability for the Basin's Groundwater Sustainability Plan (MGA, 2019). These model updates improve the Basin Model's ability for simulating actual conditions in the recharge area, particularly with respect to recharge flow distribution between aquifers and the travel time and pathways for recharged waters.

The modeling is used to evaluate the expected benefits of the PWS project for seawater intrusion prevention and to estimate retention times and long-term fate of purified water recharged at PWS SWIP wells. In addition to using the TLC Pilot well as a SWIP well to recharge the Purisima BC and A units of the Basin, SWIP wells are planned at the Monterey and Willowbrook sites to recharge the Purisima A unit. The PWS project includes planned pumping redistribution to reduce pumping in other productive aquifer units to provide expected benefits throughout SqCWD's area. The model results of the PWS project will be used to fulfill requirements for the Title 22 engineering report and anti-degradation analysis.

1.2 Updating Basin Model

The Basin Model is updated locally in the PWS project area to incorporate finalized well construction information, site specific aquifer parameters and observed distribution of flow between the Purisima BC and A units documented in the TLC Pilot hydrogeologic characterization and completion report. Most notably, spinner flow meter surveys conducted during pumping and recharge testing of the TLC pilot well indicates that between 93% to 95% of total flow contribution is through the Purisima A unit, with only between 5% to 7% through the Purisima BC unit. Therefore, the aquifer parameters for the model layers representing the Purisima A and BC units in the Basin Model grid cells in the region around the TLC well were modified from their previously calibrated values to more closely match the flow distribution and estimates for aquifer parameters derived from TLC well tests.

To evaluate the impacts of the updated parameters on the overall Basin Model calibration, groundwater hydrographs of observed historical water levels and simulated water levels for the same simulated historical period from the updated Basin Model and from the previously calibrated Basin Model are compared. The updated model hydrographs are almost identical to the original calibration hydrographs and show that there is almost no change to the overall model calibration.

1.3 Simulation of Pure Water Soquel Flow Distribution

The PWS project includes redistribution of pumping by SqCWD so that risk of further seawater intrusion is reduced throughout SqCWD, not just in the aquifer units and area where SWIP wells recharge purified water. This is accomplished by increasing pumping in the aquifer unit and area where SWIP wells recharge purified water. This facilitates reduction of pumping in aquifer units and areas where recharge of purified water does not occur. This reduction of pumping is designed to raise groundwater levels and prevent further seawater intrusion where SWIP wells are not located.

The new information on the flow distribution of recharge into the Purisima BC and A unit wells also impacts the SqCWD pumping distribution under the PWS project. Based on results of testing the Twin Lakes Church Pilot well, less recharge into the BC unit is expected and while this lower recharge can help prevent seawater intrusion in the BC unit, it is unlikely to support increasing pumping from the BC unit as previously planned. Predictive simulations of a pumping distribution without increases in BC unit pumping are included in this part of the Phase 2 modeling.

The expected seawater intrusion prevention benefits of the PWS project are evaluated based on simulated groundwater elevations at the representative monitoring points designated in the Basin Groundwater Sustainability Plan (MGA, 2019) with groundwater elevation proxies for protecting the Basin from seawater intrusion[1]. The simulation of the PWS project with the Phase 2 modeling pumping redistribution under projected future climate conditions demonstrates expected Basin sustainability benefits include raising groundwater levels at coastal monitoring wells throughout SqCWD's service area to reduce the risk of further seawater intrusion.

[1] *As indicated in the SGMA Regulations Section §354.36(b) "groundwater elevations may be used as a proxy for monitoring other sustainability indicators." The Basin Groundwater Sustainability Plan uses groundwater elevation proxies for seawater intrusion in addition to monitoring chloride concentrations. The groundwater elevation proxies are based on cross-sectional SEAWAT models of density-dependent flow and transport to estimate heads at coastal monitoring wells needed to prevent seawater intrusion into productive aquifer units. Using Monte Carlo uncertainty analysis based on uncertainty of aquifer characteristics, a range of protective groundwater levels were developed for each coastal monitoring well cluster (HydroMetrics LLC, 2009). The minimum threshold at a coastal monitoring well is the groundwater elevation that represents at least 70% of cross-sectional model simulations being protective, while the measurable objective at the well is the groundwater elevation that represents greater than 99% of cross-sectional model simulations being protective.*

1.4 Long Term Fate of Recharged Purified Water

The long-term spatial extent of recharged water is evaluated using USGS MODPATH particle tracking based on results of the simulation of the PWS project with updated pumping distribution using the Basin Model. The primary purpose of the MODPATH particle tracking is to evaluate the long-term fate of recharged purified water. The long-term fate of recharged purified water is evaluated based on where the purified water travels to in the Basin including which wells eventually extract purified water. These updated results are planned for incorporation into a revision of the project anti-degradation study (B&C, 2018).

The number of particles released at each of the three SWIP wells is proportional to the recharge flow rate and is proportional to the recharged mass of purified water. Maps showing the long-term spatial extent of recharged water in Purisima A and BC units are presented based on particle locations at the end of Water Year 2047, displaying the fate of 25 years of recharged water. The spatial extent of recharged purified water even over this long period is much smaller than the area where recharge by the PWS project increases groundwater elevations. Approximately 37% of recharged purified water is captured by SqCWD production wells. Approximately 0.3% of recharged purified water is captured by non-municipal wells simulated in the Basin Model. The remaining approximately 63% remains in the aquifer system after 25 years of recharge. Water remains in the same aquifer unit that they are recharged indicating flow is two-dimensional for the spatial extent of the recharged purified water simulation.

Basin Model MODPATH particle tracking is not used to estimate retention times of recharged purified water from the SWIP wells to production wells for the Title 22 engineering report. The 800x800 foot grid cell size of the Basin Model is not used for these estimates because the grid-cell size does not allow for releasing and capturing particles at actual well locations within the grid cell and does not represent the steeper gradients near the SWIP wells and production wells accurately. An alternative refined particle tracking approaches described below in Section 1.5.

1.5 Retention Time Estimates

Modeled retention time estimates are necessary for the purpose of siting SWIP wells during project planning to meet California regulations for Groundwater Replenishment with Recycled Water until a tracer study is performed. The regulations provide different levels of virus log reduction and response time credit per month of modeled retention time. A virus log reduction and response time credit of 0.50 per month is assigned for retention times estimated using numerical modeling consisting of calibrated finite element or finite difference models using validated and verified computer codes used for simulating groundwater flow. A log reduction and response time credit of 0.25 per month is assigned for analytical calculations using existing

academically accepted equations such as Darcy's Law to estimate groundwater flow conditions based on simplifying aquifer assumptions.

The calibrated finite difference Basin Model does not have a fine enough grid resolution to accurately represent short term travel times between recharge and extraction wells because of limitations previously discussed. In addition, the Basin Model using GSFLOW requires setup of the integrated PRMS watershed component model on the same grid and resolution as used for the MODFLOW groundwater model, so refinement of the Basin Model grid itself is not a simple or straightforward process. Therefore, a refined particle tracking simulation approach is presented which combines the hydraulic heads resulting from the calibrated Basin Model with analytic elements positioned at the actual locations of each well and which can more accurately represent the steeper near-well hydraulic gradients on a refined grid using the Analytic Element Method (AEM).

The refined particle tracking indicates that no particles released at any of the SWIP wells in either the Purisima A or BC units reach any municipal pumping wells within 3 years. In the Purisima A unit, particles released from the Monterey SWIP well reach the horizontal locations of two of the assumed private domestic wells identified in the Monitoring Network Analysis (B&C, 2019) approximately 32 months into the three-year refined particle tracking period. The closest private domestic well to the Monterey SWIP well is screened to a depth of 360 feet and therefore extracts water from the Purisima A unit that the Monterey SWIP well would recharge.

The refined particle tracking approach utilizes the same updated spatially varying hydraulic conductivity field from the Basin Model. The approach incorporates both the regional flow patterns and the intra-well gradients between the recharge wells and nearby pumping wells from the Basin Model while simulating more accurate near-well gradients. Therefore, the 0.5 credit that applies for the Basin Model should apply to travel times estimated by the refined particle tracking simulation. To provide additional support for this credit, retention times estimated by the refined particle tracking simulation are shown to be similar to retention times based on MODPATH results for the Basin Model (Section 5.5) and a simplified analytical solution that represents what would appropriately be assigned the 0.25 credit. Based on meriting the 0.5 credit, the retention times estimated by the refined particle tracking would result in a credited retention time exceeding six months for recharge at all three SWIP wells in both the Purisima A and BC units.

Results using a simplified analytical solution and applying a 0.25 credit also shows credited retention time exceeding six months for recharge at all three SWIP wells. Retention time estimates are also presented for proposed monitoring well locations.

2 INTRODUCTION

This report describes procedures undertaken by Montgomery & Associates (M&A) for conducting Phase 2 of groundwater modeling for evaluating Soquel Creek Water District's (District) Pure Water Soquel (PWS) Seawater Intrusion Prevention (SWIP) program. Phase 2 modeling incorporates updated hydrogeologic understanding developed from the drilling, construction, development, and testing of the Twin Lakes Church (TLC) Pilot well Project (B&C, 2020). The modeling is used to evaluate the expected benefits of the PWS project for seawater intrusion prevention, and to estimate retention times and long-term fate of purified water recharged at PWS SWIP wells. These results will be used to fulfill requirements for the Title 22 engineering report and anti-degradation analysis.

Phase 2 modeling is conducted primarily using the Santa Cruz Mid-County Groundwater Basin three-dimensional GSFLOW groundwater model (Basin Model), which has been developed and calibrated to support understanding and management of the Basin (M&A, 2019a). Additionally, a refined particle tracking simulation based on the analytic element method (AEM) was developed for analysis of retention times on a locally refined grid centered on the project area. The refined particle tracking simulation incorporates the regional Basin Model results with refined analytic elements in the SWIP well area to gain increased precision in retention time estimates. All modeling is performed based on the Climate Catalog scenario of future conditions simulated (M&A, 2019b) used for the recent Groundwater Sustainability Plan (GSP) developed for the Basin (MGA, 2019).

The evaluation of the expected benefits of the PWS SWIP program are based primarily on comparisons between groundwater elevations in model runs which simulate PWS recharge and a baseline no-project scenario. Simulated groundwater elevations are also compared with groundwater elevation proxies for the sustainable management criteria (SMC) developed as part of the GSP to evaluate whether the PWS SWIP recharge helps prevent or eliminate undesirable results for seawater intrusion.

The results from the pumping and recharge tests at the TLC Pilot well reported in the well completion report (B&C, 2020) were utilized to update the Basin Model to more accurately match the updated understanding of the hydrogeologic conditions near the well. Updated well construction and aquifer parameters are utilized throughout Phase 2 groundwater flow modeling and particle tracking. These model updates improve the Basin Model's ability for simulating actual conditions in the recharge area, particularly with respect to recharge flow distribution between aquifers and the travel time and pathways for recharged waters.

3 UPDATING BASIN MODEL

3.1 Results of TLC Pilot well Completion Report

Whereas previous model simulations generically assigned recharge at the TLC Pilot well[2] to the Purisima BC and A aquifer units, finalized well construction details allow for model input of actual well screen elevations. The screen elevations used are based on ground surface elevation of 130.24 feet mean sea level (msl) (NGVD 29) and screen interval depths of 220-415 feet and 566-840 feet below ground surface (bgs) (B&C, 2020).

Results from TLC Pilot well indicate aquifer parameters in the Basin Model needed to be revised. The flow distribution between the A and BC aquifer units observed during recharge and pumping tests of the TLC Pilot well (B&C, 2020) differed significantly from the previously simulated flow distributions in modeling for the EIR and the GSP. Aquifer parameters estimated from pumping tests of the TLC Pilot well (B&C, 2020) also differed from existing model inputs in the modeled area around the TLC Pilot well location. As part of Phase 2 Modeling, these results are incorporated into the current Basin Model and refined particle tracking simulations.

Recharge testing was performed primarily to obtain an evaluation of a practical long-term recharge rate at the TLC Pilot well. During this test a recharge rate of approximately 470 gallons per minute (gpm) was determined to be feasible, which translates to about 742 acre-feet per year (AF/yr) when accounting for the planned near-24/7 run time. Pumping tests were conducted to evaluate well performance and to improve estimates of local aquifer transmissivity and storativity.

3.1.1 Lithology Consistent with Model Layering

Lithologic conditions encountered during the TLC Pilot well construction are consistent with the hydrogeologic conceptual model (Johnson et al., 2004) that form the basis of the layering of the Basin Model (HydroMetrics WRI, 2015). At the TLC Pilot well, the Purisima D aquitard unit was encountered at approximately 10 to -85 feet msl, the Purisima BC aquifer unit was encountered at approximately -85 to -330 feet msl, the Purisima B aquitard unit was encountered at approximately -330 to -425 feet msl, and the Purisima A aquifer unit was encountered at approximately -425 to -730 feet msl. These elevations are consistent with layer elevations in the Basin Model for the dipping Purisima Formation units though the coarse 800x800 foot grid of the Basin Model does not represent exact elevations at the specific TLC Pilot well location.

[2] *In the Environmental Impact Report (EIR) for the project, the SWIP well for this area was referred to as the Cabrillo College well, because a nearby site on Cabrillo College property was assumed for the EIR.*

Cross-sections of the hydrostratigraphy through the TLC Pilot well show the structure of the dipping Purisima Formation units where the TLC Pilot well and other planned SWIP wells will be screened. Figure 1 shows the locations of the west-east cross-section A-A' and the south-north cross-section B-B'. The cross-sections are based on the Basin Model layer elevations. Figure 2 and Figure 3 show the cross-sections including screen intervals of SWIP wells, SqCWD production wells, and the coastal monitoring well SC-5A along the cross-sections. SC-5A along cross-section B-B' is the nearest coastal representative monitoring point identified in the GSP with established groundwater level proxies to prevent seawater intrusion in the Purisima A unit. Cross-section B-B' extends offshore where aerial geophysics has identified salty water just offshore in the Purisima A aquifer unit (M&A, 2018 and Ramboll, 2018).

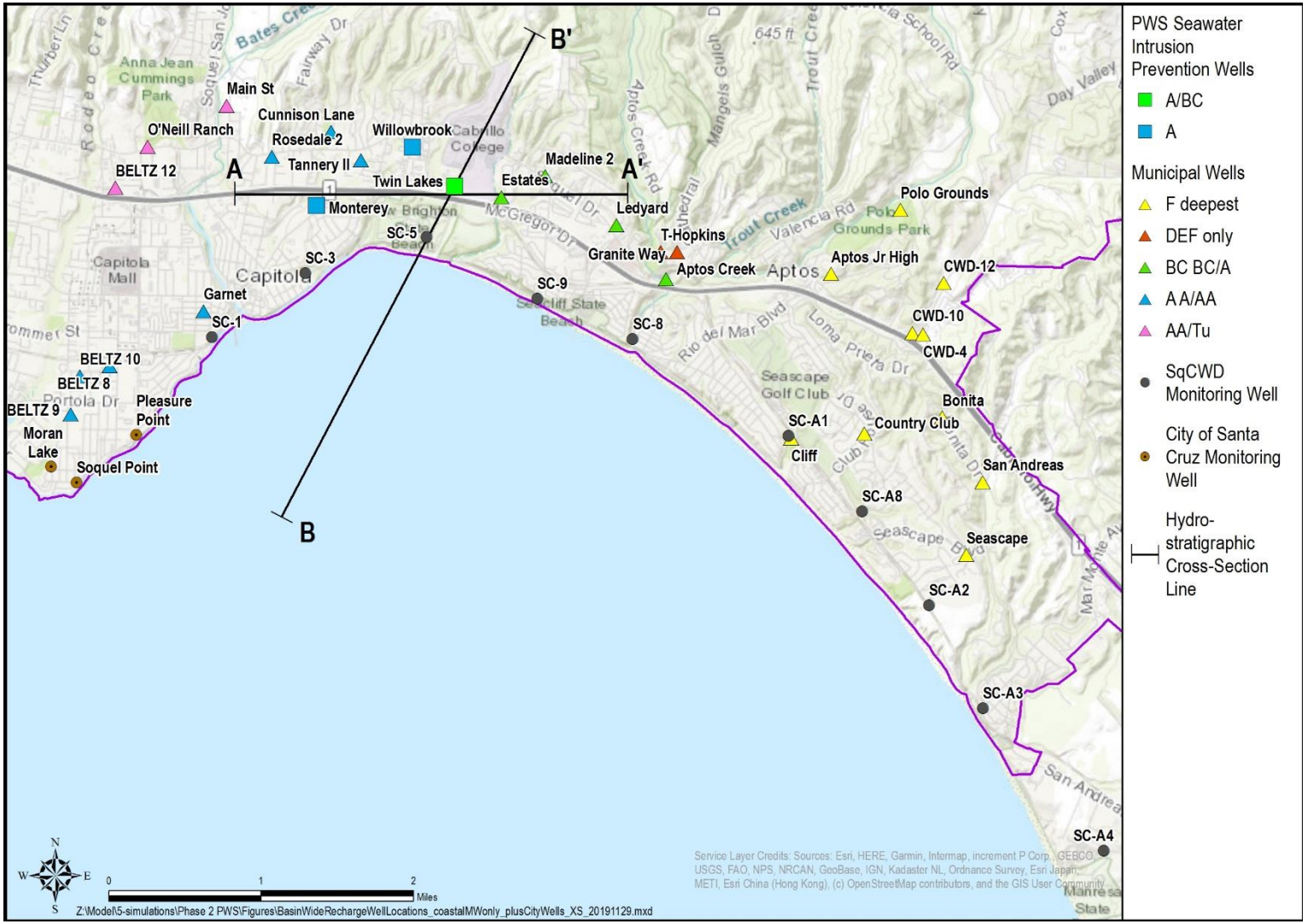

Figure 1. Location of Cross-Sections A-A' and B-B'

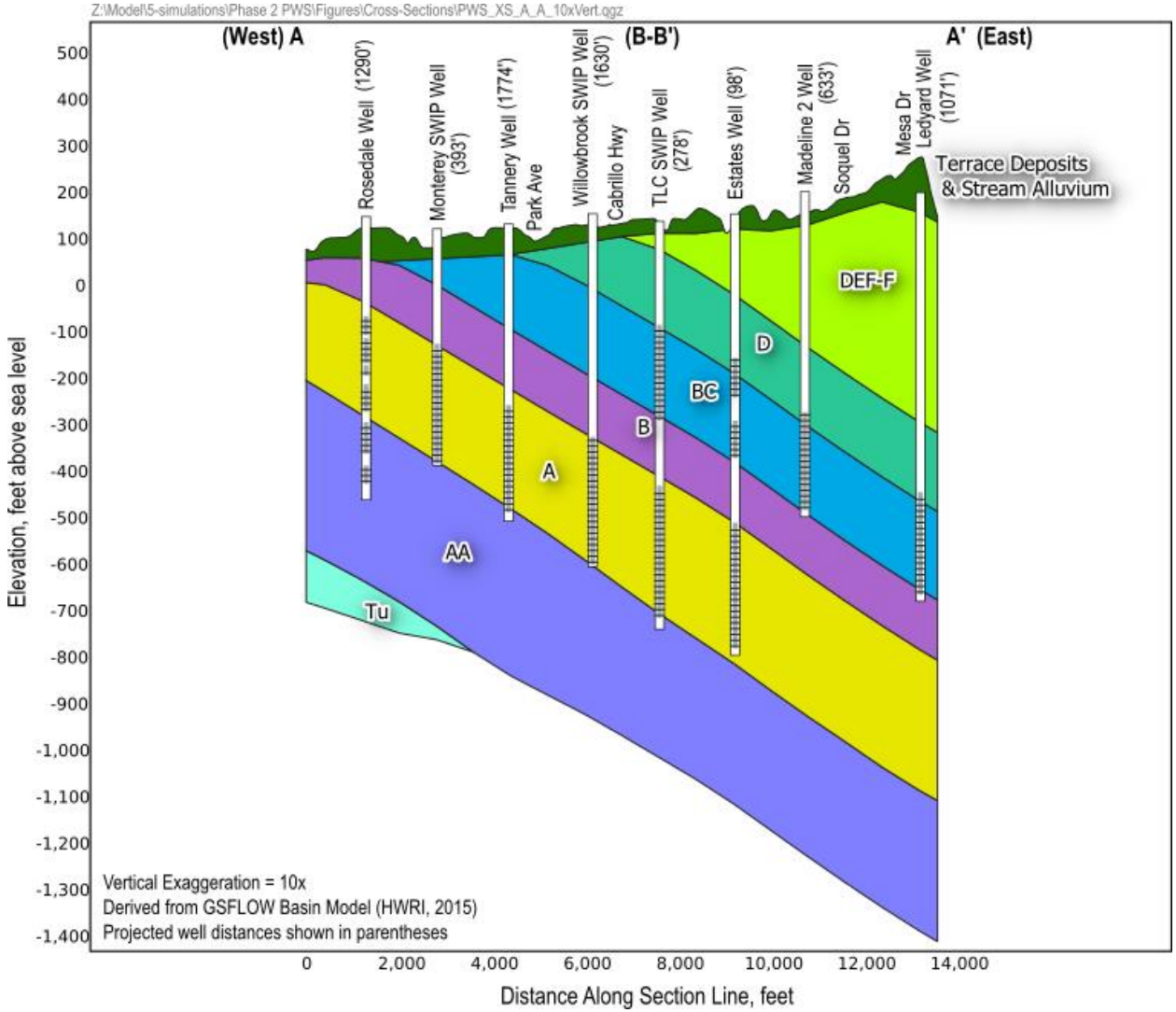

Figure 2. Cross-Section A-A' Based on Basin Model Layer Elevations

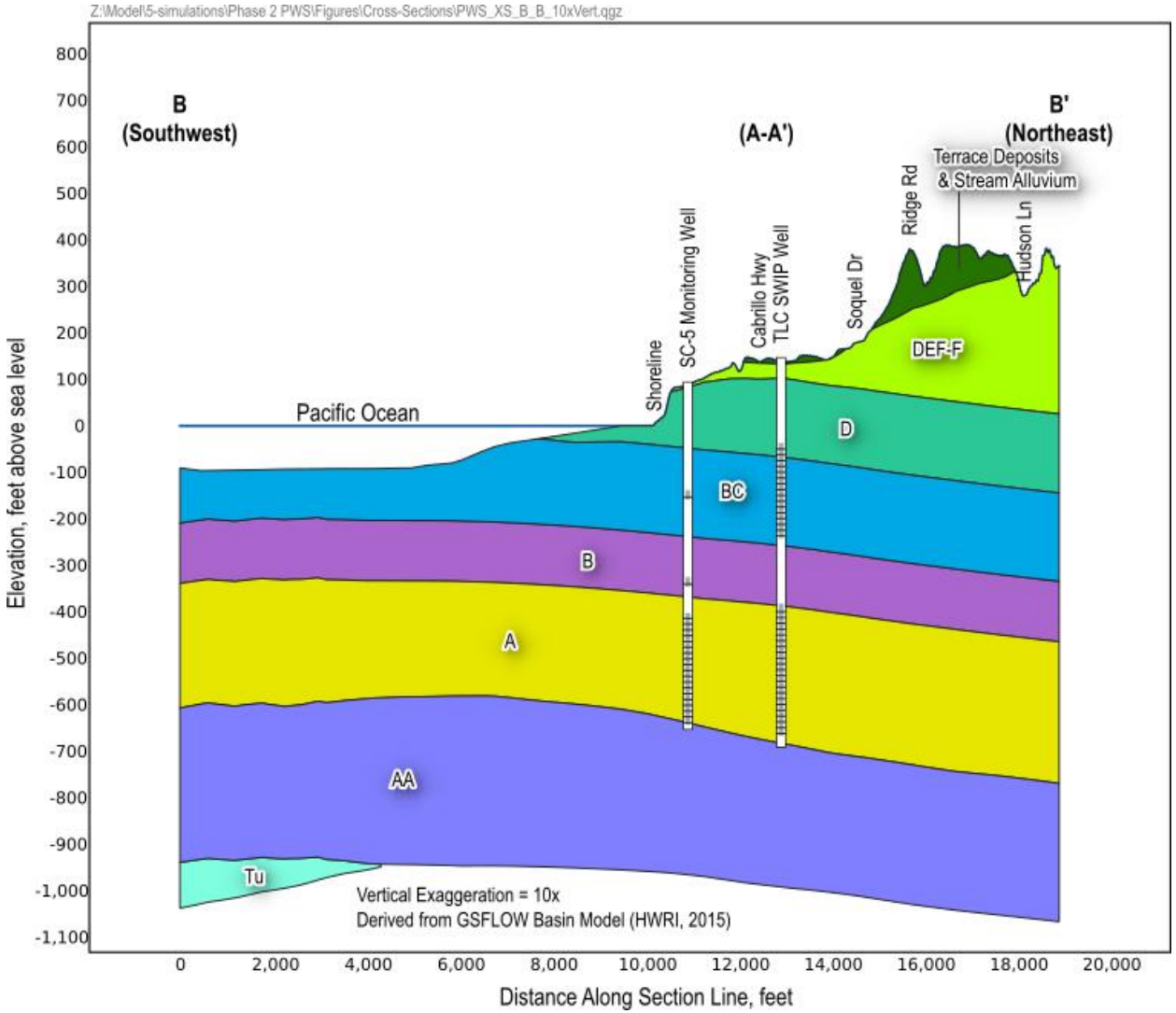

Figure 3. Cross-Section B-B' Based on Basin Model Layer Elevations

3.1.2 Flowmeter Results

Spinner flowmeter surveys conducted during pumping and recharge testing of the TLC Pilot well recorded flow contributions from Purisima BC unit (screen from 220-415 ft bgs) of only 5% to 7% of total flow respectively (Figure 4). This indicates that around 18-20 times more volume of recharged water will enter the Purisima A unit when compared to the Purisima BC unit. The Basin Model previously simulated flow contributions of between 23% to 46% from the Purisima BC unit. These new results support revising the Basin Model to more accurately represent the observed distribution of flow within the model.

The new information about distribution of recharge into the Purisima BC and A unit wells also has implications for SqCWD pumping distribution under the PWS project. The PWS project increases pumping near the SWIP wells in order to reduce pumping in other areas of the Basin where SqCWD pumps other aquifer units. While the well construction report concludes that TLC SWIP well recharge will help raise coastal groundwater levels and prevent seawater intrusion in the BC unit, the previously planned increases of pumping from the BC unit is likely not supported by the reduced amount of recharge into the BC unit. Simulation of a revised pumping distribution is included as part of this Phase 2 groundwater modeling report.

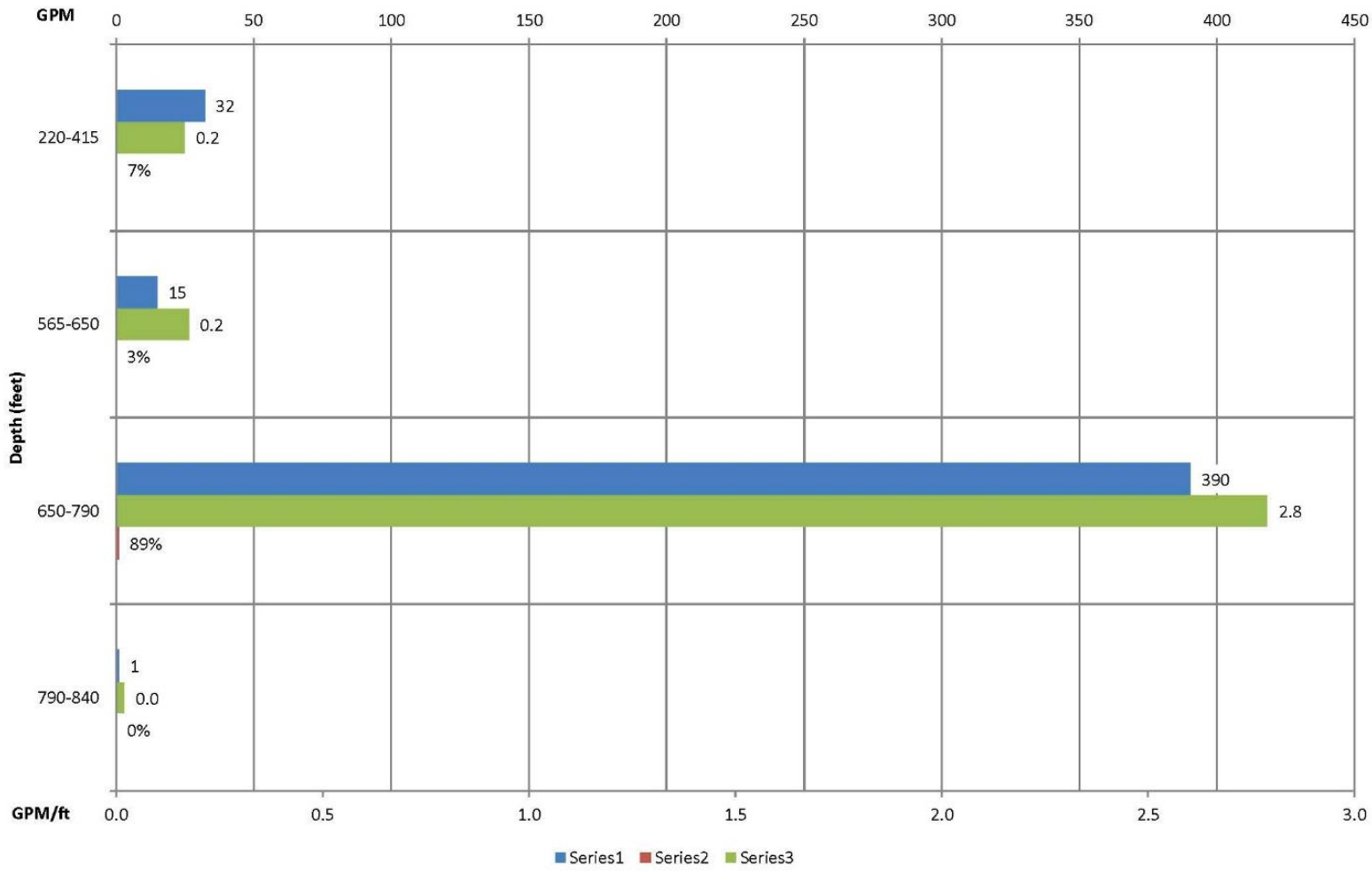

Figure 4. Spinner Flowmeter Log Results during Recharge Test of Twin Lakes Church Pilot well (adapted from B&C, 2020)

3.1.3 Aquifer Parameters Based on Constant-Rate Pumping Tests

Aquifer parameters of horizontal hydraulic conductivity (K_x), transmissivity (T), and specific storage (S_s) assigned in the Basin Model in the area of TLC well were previously derived from best available hydrogeologic knowledge and through the process of model calibration, but differ from the local aquifer properties estimated for the Purisima A unit from a recent TLC Pilot well constant-rate pumping test. Local Purisima A unit storativity and transmissivity values were estimated from analysis of head drawdown and recovery data measured during the constant-rate tests. Only values of aquifer properties estimated from well tests that incorporated data from monitoring wells representing aquifer response were used to inform the Basin Model update. These results are more representative of aquifer properties over a larger area than well tests that only use data at the pumping well. Horizontal hydraulic conductivity and specific storage were then calculated from these estimates using the local aquifer thickness. The updated model values and values previously used in model simulations for the Purisima A unit are summarized in Table 1. The TLC Pilot well testing indicates that horizontal hydraulic conductivities for the Purisima A unit are 3 times the value used in calibration simulations for the GSP. Values for specific storage in the Purisima A unit estimated from the constant-rate tests incorporating monitoring well data are larger than values used in model simulations for the GSP. Transmissivities in Table 1 are based on the modeled 275 feet aquifer thickness of the Basin Model grid cell where the TLC Pilot well is located as opposed to the aquifer thickness encountered at the well location.

Based on flow distribution results showing a high proportion of flow from the Purisima A unit, the analyses to estimate aquifer parameter values in the well construction report assumed all flow was from the Purisima A unit. The well construction report did not estimate aquifer parameter values for the Purisima BC unit so horizontal hydraulic conductivity for the BC unit is estimated based on the flow distribution shown in flowmeter results. The lower conductivity of the Purisima BC unit is supported by lithologic observations and geophysical testing from the TLC Pilot well. Much of the BC unit on the lithologic log of this well is described as clayey sand or silty sand, while the A unit has thicker intervals of sand or sandstone without the qualifiers indicating more fine-grained sediments.

Table 1. Aquifer Parameters at TLC in Purisima A and BC Units

	USED IN CALIBRATED MODEL SIMULATIONS FOR GSP		BASED ON TLC PILOT WELL TESTS	
AQUIFER PROPERTY	**PURISIMA A**	**PURISIMA BC**	**PURISIMA A**	**PURISIMA BC**
Horizontal Hydraulic Conductivity (ft/day)	3.0	3.9	10.6-11.7	0.75
Transmissivity (ft^2/day)	825	750	2,924 – 3,273	Not estimated
Specific Storage (ft/ft)	1.52×10^{-7}	1.01×10^{-6}	1.6×10^{-6} – 3.9×10^{-6}	Not estimated

3.2 Modeling Flow Distribution

The flowmeter survey during both pumping and recharge test in the TLC Pilot well showed that over 95% of the flow occurred in the Purisima A unit, with 5% in the Purisima BC unit (B&C, 2020). This means that recharged water preferentially enters the Purisima A unit at a 19:1 ratio relative to the Purisima BC unit. In light of this new information, efforts are undertaken to better simulate this within the model. As the distribution of recharge volume between aquifers is dependent primarily on differences in transmissivity between the two aquifer units, these values can be adjusted in order to correct flow distribution within the model. Results of these runs are then used to reevaluate model results in light of the effect of PWS SWIP recharge on groundwater elevations and groundwater budget components. The relationships between parameters used to modify flow distribution are summarized in Equation 1. The ratio of transmissivity ($K * b$) and therefore flow distribution between layers is dictated primarily by conductivity, therefore conductivity is revised to represent accurate flow distribution.

$$(K_A * Screen_A)/(K_{BC} * Screen_{BC}) = 19 \quad (1)$$

The constructed screen interval lengths within each of the Purisima A and BC units are known and the Purisima A unit hydraulic conductivity (K_A) of approximately 10 feet per day was estimated from a constant rate pumping test. Therefore, Purisima BC unit hydraulic conductivity (K_{BC}) is revised in the model to approximately 0.75 feet per day in order to simulate the observed flow distribution between the two aquifer units. This estimate is approximately one fifth the value used in calibration simulations for the GSP.

The K_x and S_s values for the A and BC units and S_s values for the BC unit used in the Basin Model in the vicinity of the TLC well were updated by assigning updated values to the calibration pilot points in the vicinity of TLC. The resulting K_x and S_s values in the model grid cell representing the TLC well are summarized in Table 2. Maps of updated K_x values are shown on Figure 5 and Figure 6 for each layer and updated S_s values are displayed on Figure 7 and Figure 8.

Table 2. Updated Aquifer Parameters at TLC Grid Cell used in Phase 2 Model Simulations

	Used in Phase 2 Model Simulations	
AQUIFER PROPERTY	**PURISIMA A**	**PURISIMA BC**
Horizontal Hydraulic Conductivity, K_x (ft/day)	10.36	0.68
Transmissivity, T (ft^2/day)	2,839	173.93
Specific Storage, S_s (ft/ft)	1.0×10^{-6}	

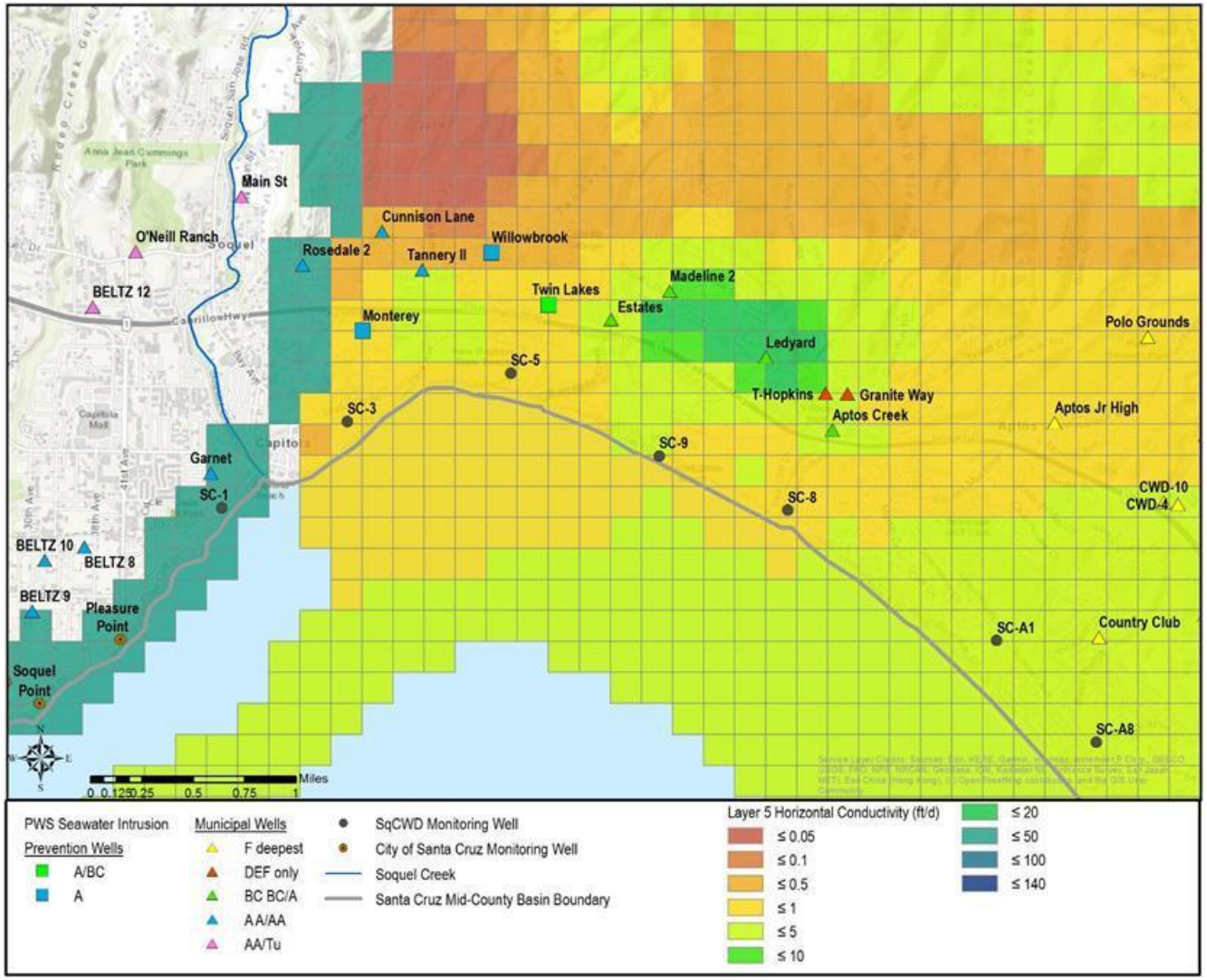

Figure 5. Updated K_x in Purisima BC unit (model layer 5)

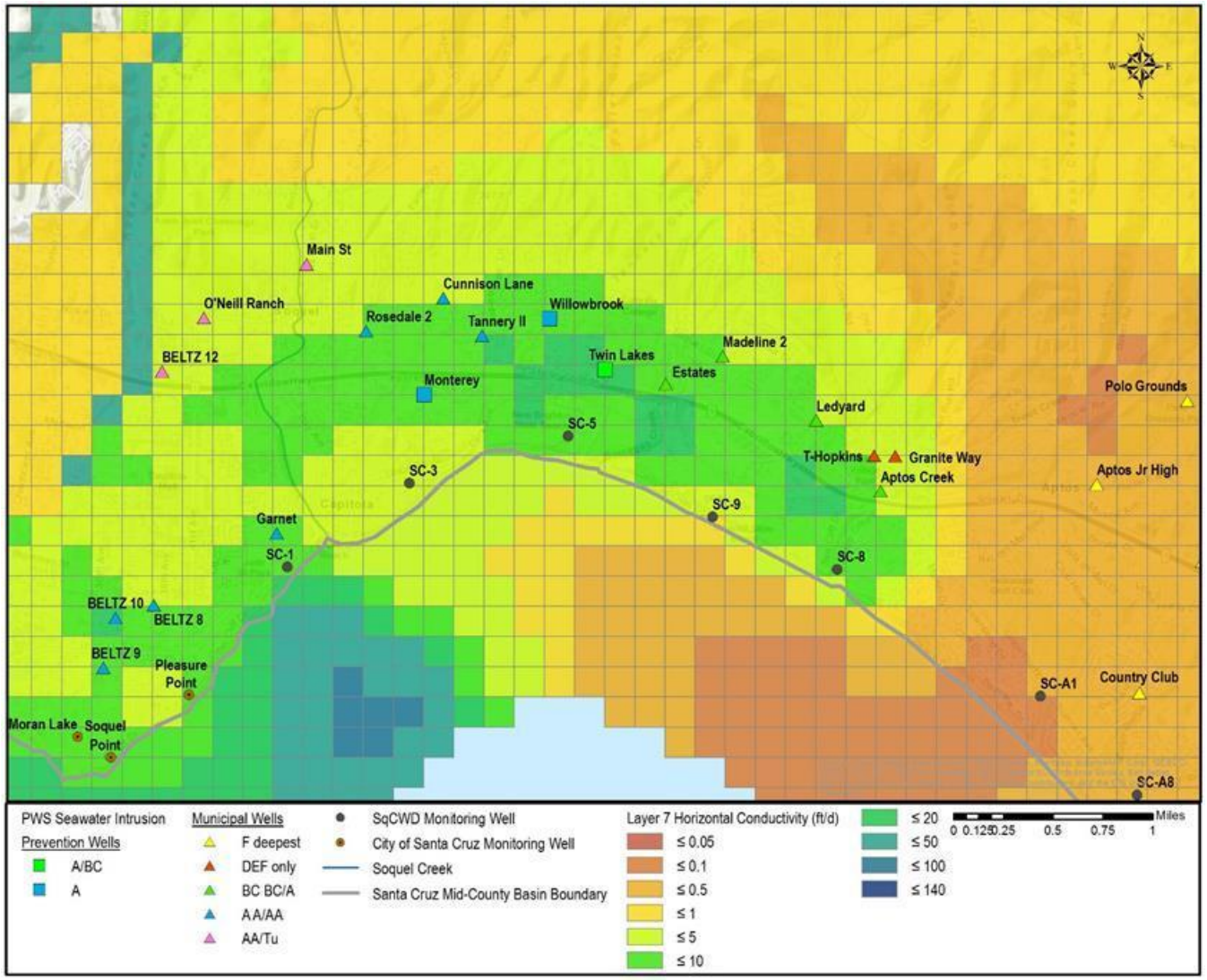

Figure 6. Updated Kx in Purisima A Unit (model layer 7)

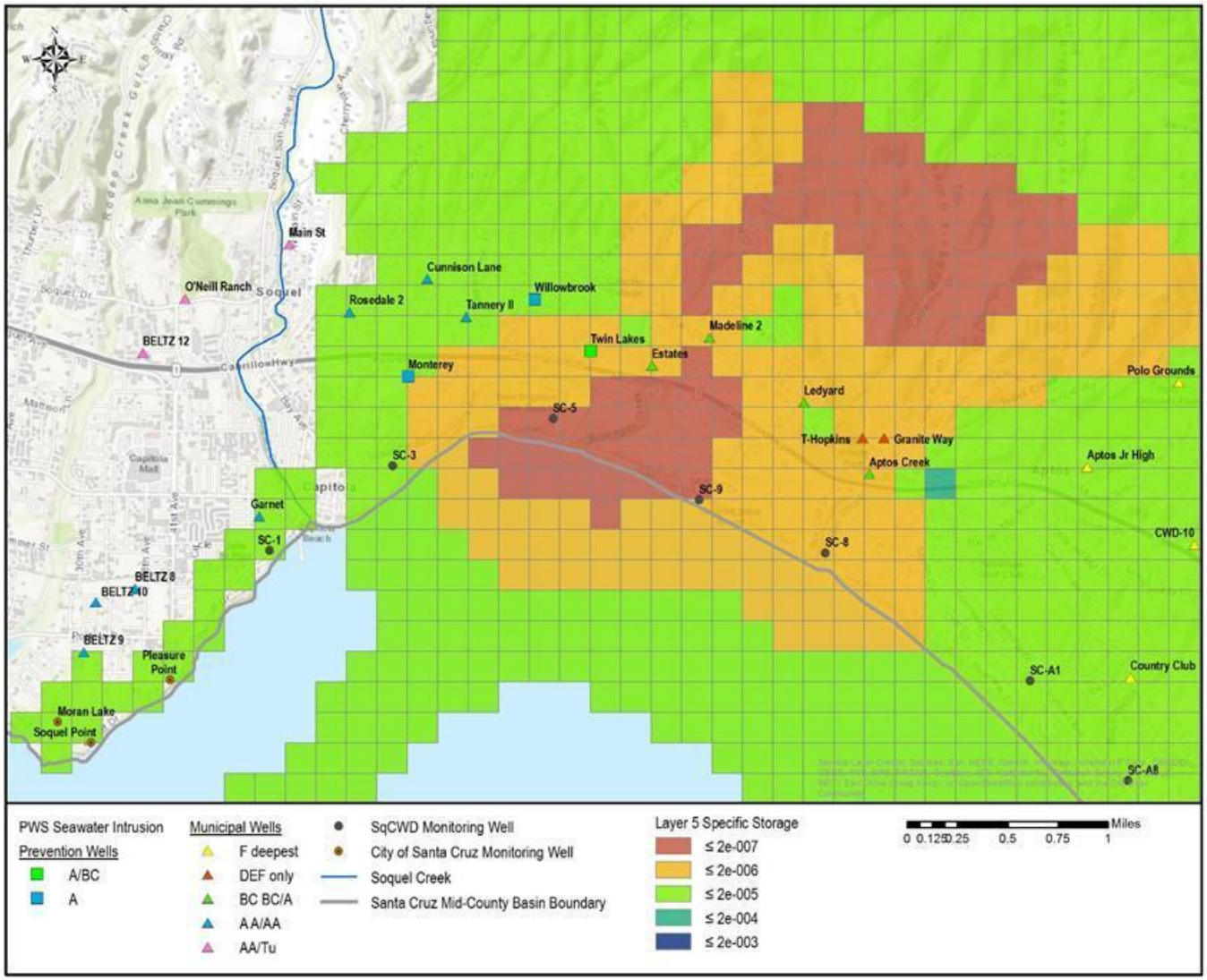

Figure 7. Updated S_s (dimensionless) in Purisima BC unit (model layer 5)

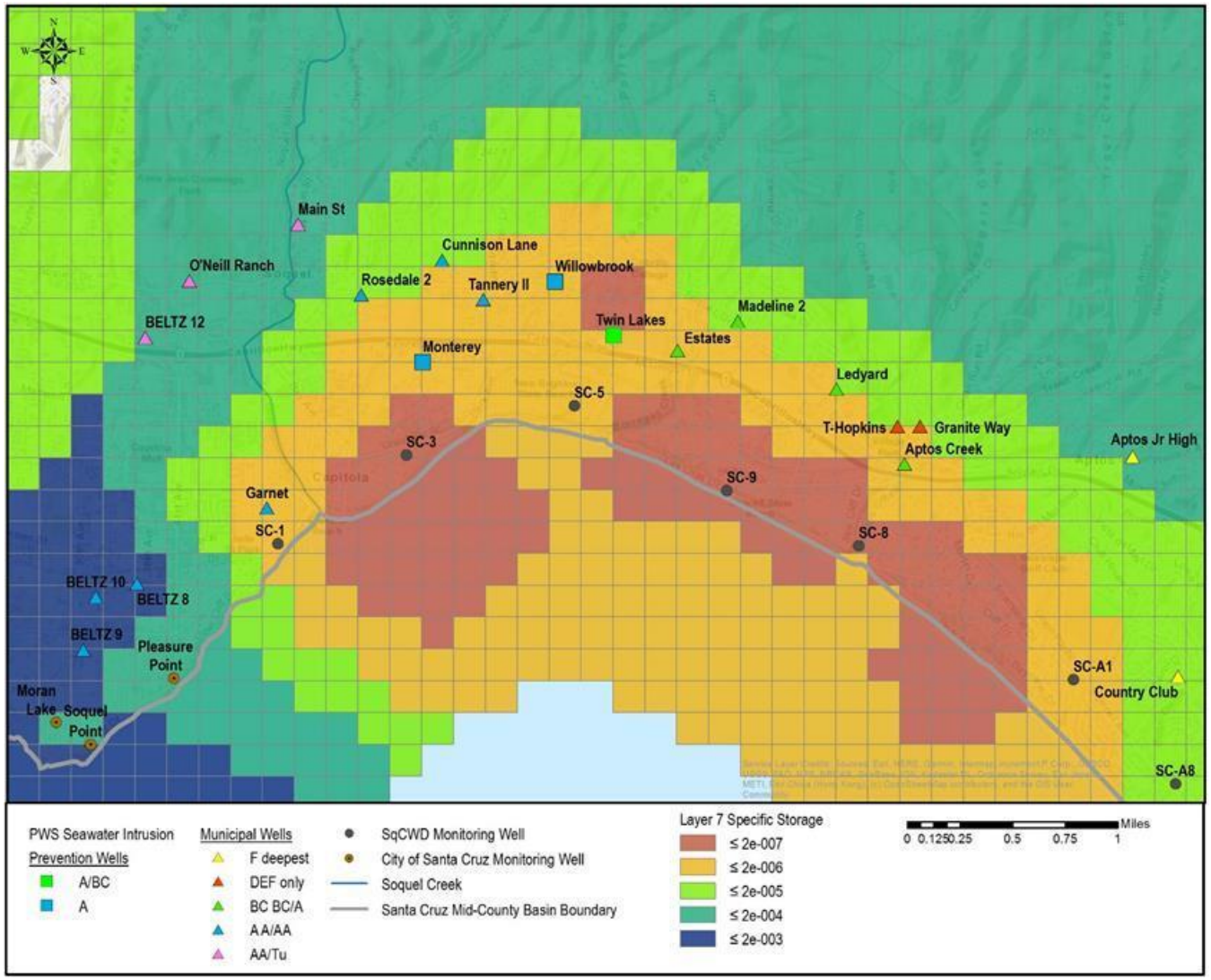

Figure 8. Updated S_s (dimensionless) in Purisima A unit (model layer 7)

3.3 Updated Model Calibration Results

3.3.1 Groundwater Hydrographs

Groundwater hydrographs displaying observed historical water levels (blue dots), water levels simulated by the previously calibrated model (green line) and water levels simulated by the Phase 2 updated model (dashed line) for selected monitoring wells are presented in Figure 9 through Figure 14. Overall, the simulated water levels for the Phase 2 updated model are in most wells identical to groundwater elevations seen in the previous calibration model runs used for the GSP, though some wells show slight differences.

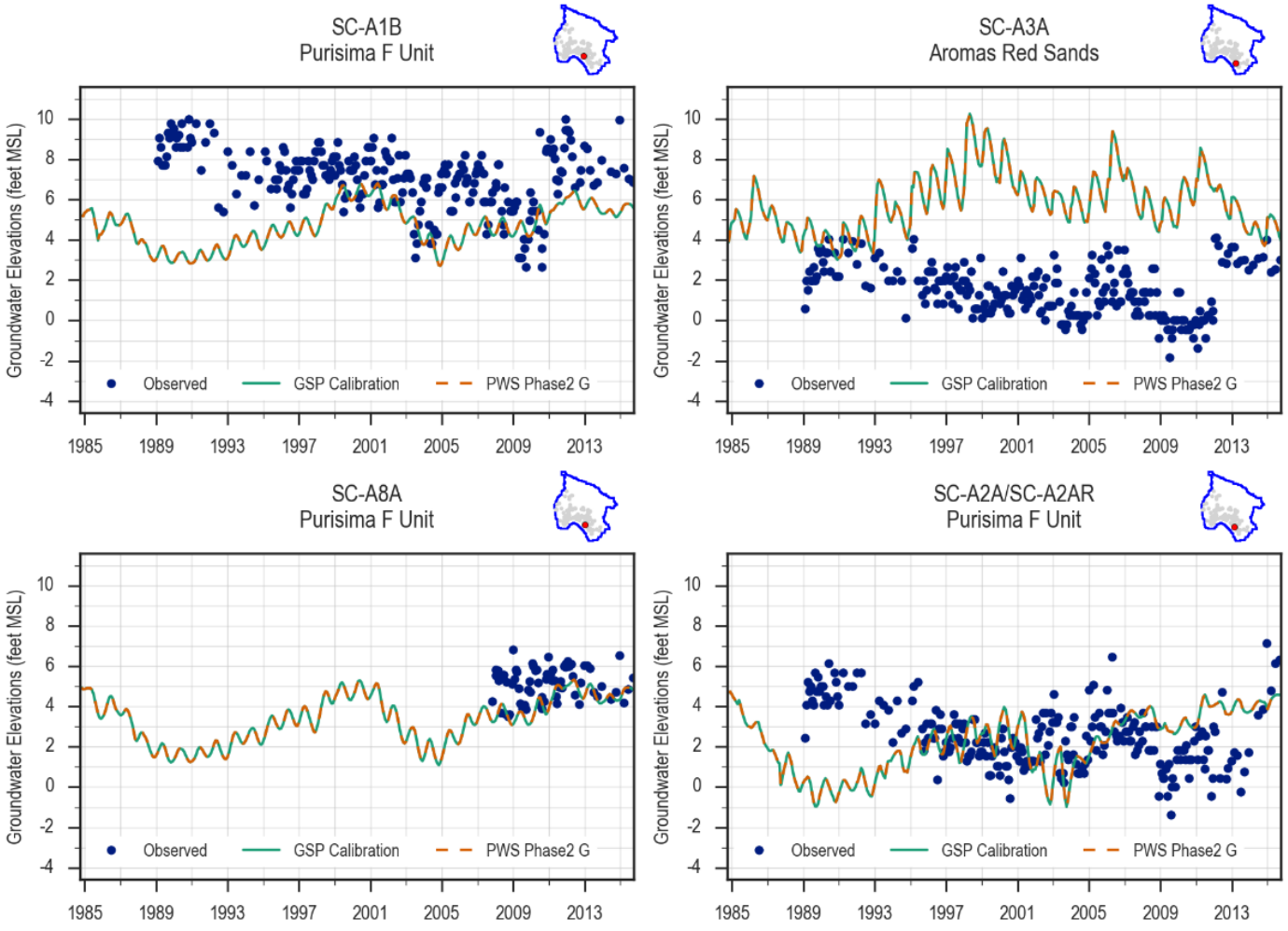

Figure 9. Calibration Hydrographs at Coastal Monitoring Wells in Aromas and Purisima F Units

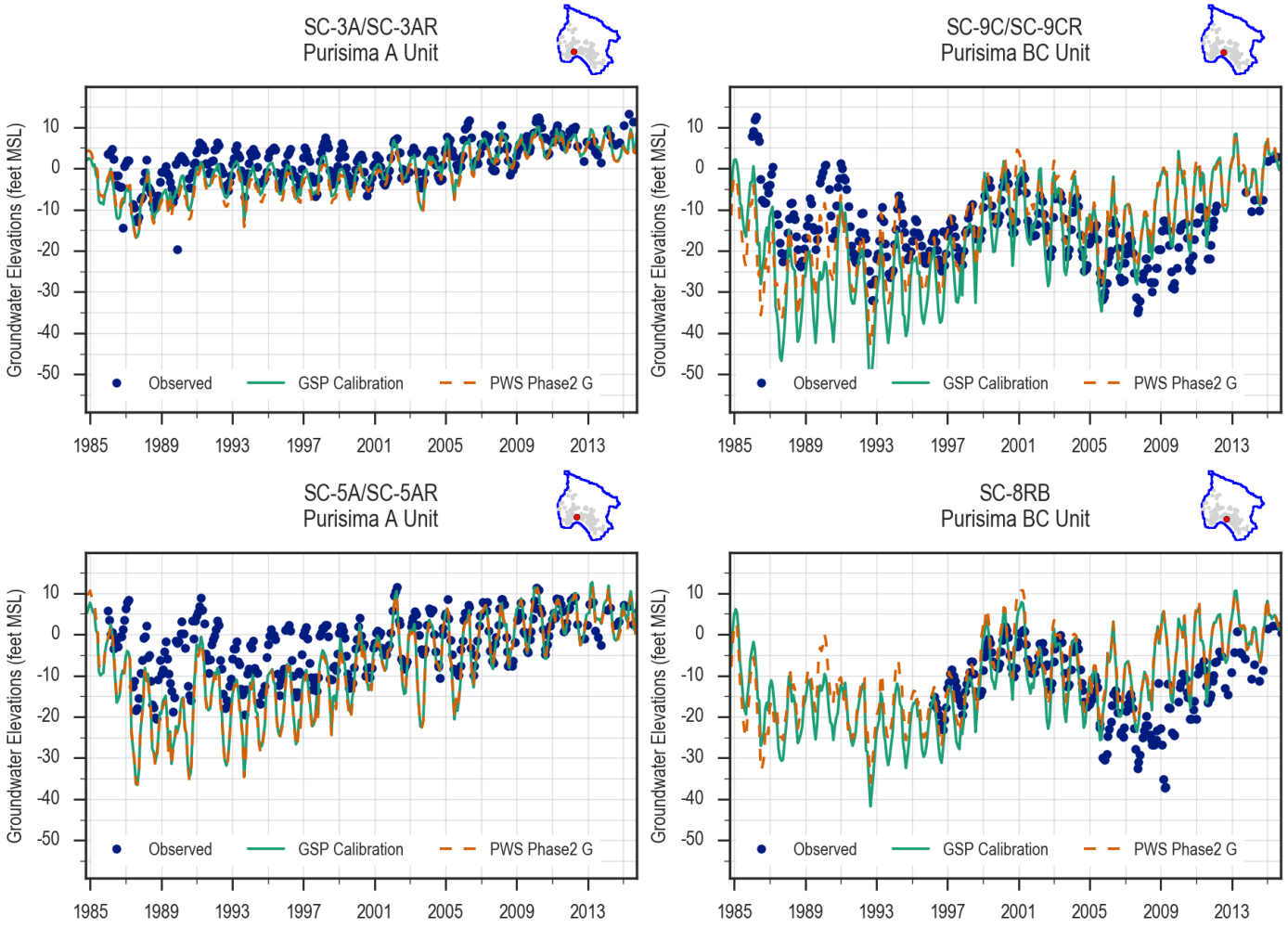

Figure 10. Calibration Hydrographs at Coastal Monitoring Wells in Purisima BC and A Units

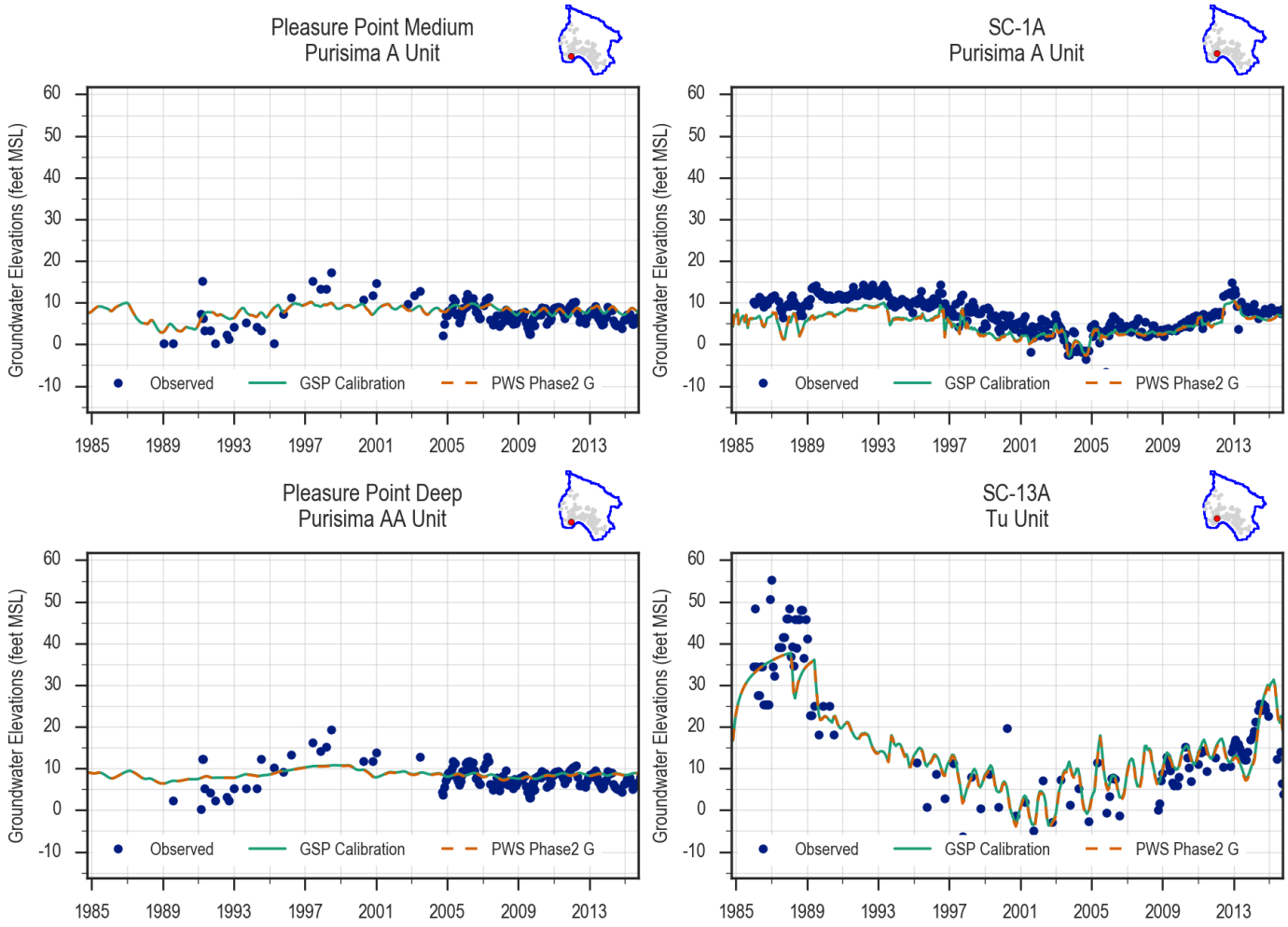

Figure 11. Calibration Hydrographs at Coastal Monitoring Wells in Purisima A and AA Units and Tu Unit

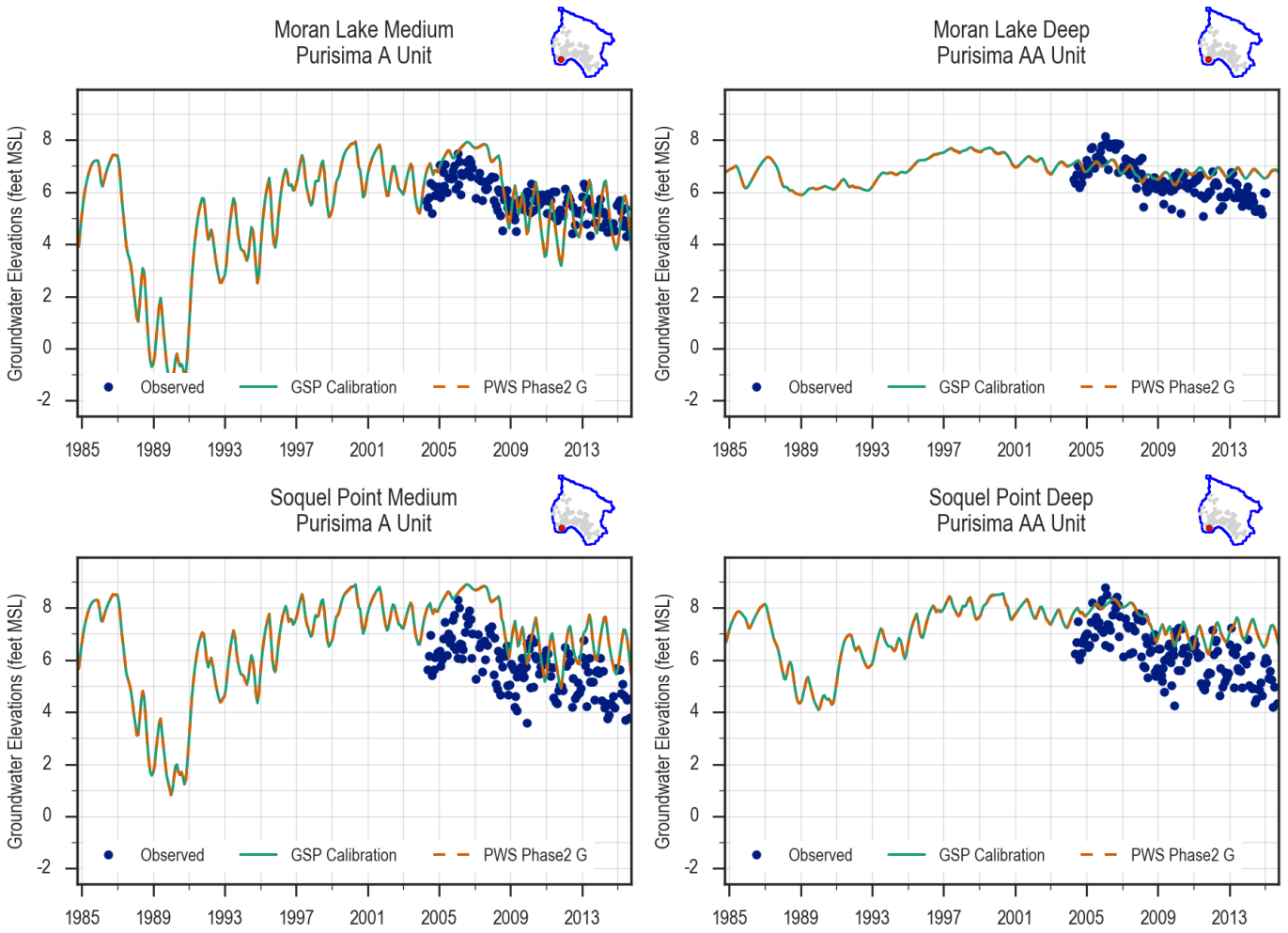

Figure 12. Calibration Hydrographs at Coastal Monitoring Wells in Purisima A and AA Units

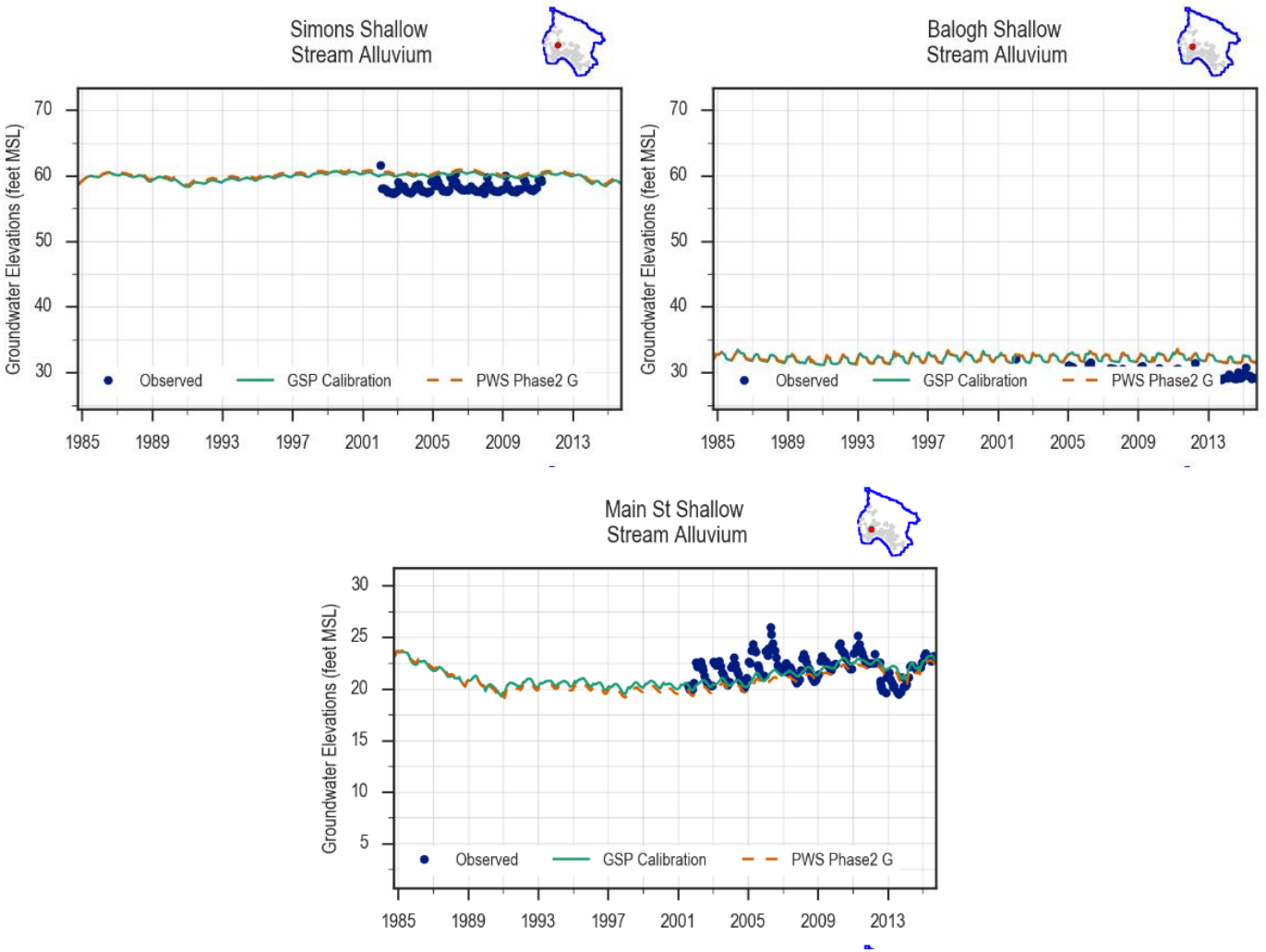

Figure 13. PWS Phase 2 Calibration Groundwater Hydrographs, Stream Alluvium

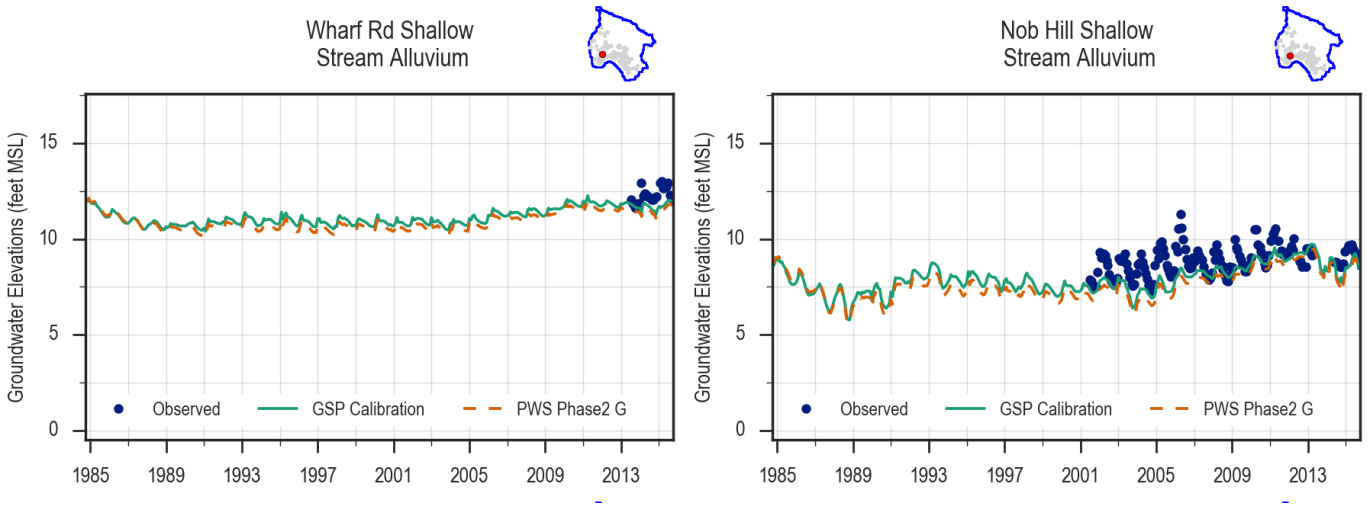

Figure 14. PWS Phase 2 Calibration Groundwater Hydrographs, Stream Alluvium

4 SIMULATION OF PURE WATER SOQUEL FLOW REDISTRIBUTION

4.1 Flow Distributions at Recharge and Production Wells

Predictive simulations of the PWS SWIP project run using the Climate Catalog and the described Phase 2 updated aquifer properties result in flow distributions of 93% to the Purisima A unit and 7% to the Purisima BC unit for the TLC Pilot well, consistent with the flow distribution observed during flowmeter surveys during recharge testing of the TLC Pilot well. Simulated flow distribution is summarized for the SWIP wells and other nearby production wells in Table 3 below. For production wells, which can be screened across multiple aquifers, the flow percentages do not total to 100% if some portion of flow is coming from aquifer units other than the Purisima A and BC units. Flow distribution at pumping wells varies slightly over the simulation period because of changes in well pumping rates over the simulated period.

Table 3. Modeled Flow Distribution in TLC and Nearby Wells

	WELL NAME	PERCENTAGE OF FLOW TO/FROM PURISIMA A (LAYER 7)	PERCENTAGE OF FLOW TO/FROM PURISIMA BC (LAYER 5)
SWIP Wells	TLC	93%	7%
	Willowbrook	100%	0%
	Monterey	100%	0%
Production Wells	Estates	94% - 100%	0% - 6%
	Rosedale	73% - 75%	0%
	Tannery 2	93% - 97%	0%
	Madeline	0%	100%

The Willowbrook SWIP well is assumed to only be screened in the Purisima A unit. This change from previous assumptions to be screened across both A and BC units is made for the following reasons:

- The testing at the TLC SWIP well showed that flow in the BC unit is small compared to the A unit and it would likely be a smaller proportion at Willowbrook as the BC unit thins to the west.
- Most BC unit pumping and the BC unit coastal monitoring wells with seawater intrusion sustainable management criteria are to the east of the TLC SWIP well. The Willowbrook SWIP well is to the west of TLC SWIP well and therefore would be unlikely to add much benefit for preventing seawater intrusion in the BC unit.
- Screening only the A unit will simplify design, construction, testing, and monitoring.

4.2 Pumping Redistribution

PWS recharge is planned into the Basin's Purisima A and BC units, but the PWS project also supports in-lieu recharge in aquifer units and areas where water is not directly recharged. In-lieu recharge is facilitated by increasing SqCWD pumping in areas where PWS recharge takes place, which allows for reductions of SqCWD pumping from the Tu aquifer unit in the western portion of the Basin and from the Purisima F unit and Aromas Red Sands in the eastern portion of the Basin[3]. Prior to testing of the TLC Pilot well, SqCWD pumping redistributions evaluated for the Pure Water Soquel EIR and GSP included increased pumping in both the Purisima A and BC units (M&A, 2019b). Figure 15 (as planned as a project in the GSP) and Figure 16 (as implemented in Phase 2) show map schematics of the change in strategy for the areas of recharge (recharge, down arrows), increased pumping (plus signs), and decreased pumping (minus signs). Based on results of testing the TLC Pilot well, less recharge into the BC unit is expected and while this lower recharge can help prevent seawater intrusion in the BC unit, it is unlikely to support increasing pumping from the BC unit. Therefore, the pumping redistribution simulated for PWS Phase 2 modeling (Table 4) does not include increased pumping in SqCWD wells screened in the Purisima BC unit but not the Purisima A unit. These wells are the Ledyard and Madeline pumping wells screened only in the BC unit, as well as the Aptos Creek well screened in the BC and DEF units. At these wells, the Phase 2 pumping distribution assumes the same pumping as the baseline simulation of conditions without the PWS project. Therefore, zero pumping is assumed at the Aptos Creek well in contrast to the distribution evaluated for the GSP which included reinitiating pumping at the well. Pumping increases are still included at the Estates well because the well is screened in both the Purisima A and BC units.

The updated pumping redistribution includes additional pumping in the Purisima A unit which should be supported by more overall recharge into the A unit. The redistribution also includes a smaller reduction in pumping in the Purisima F unit and Aromas Red Sands, which was shown to be sustainable based on a sustainable yield evaluation for the GSP (M&A, 2019b).

Table 4 also shows that pumping distributions change after Water Year 2025. Water Year 2026 is when the Cunnison Lane well is planned to come online. With Cunnison Lane well online, pumping is reduced at existing wells, including the Tannery II and Estates wells closest to the SWIP wells. The pumping distribution is also different in critically dry years as Garnet well pumping is reduced compared to non-critically dry years because the City of Santa Cruz is expected to increase pumping near the Garnet well during critically dry years. Table 4 shows the average change from baseline and GSP project pumping distributions over the Water Years 2026-2069.

[3] *The Aromas Red Sands overlies the Purisima Formation but only occurs in the eastern portion of the Basin.*

The GSP also includes an estimate of Basin sustainable yield. Modeling for the GSP shows the PWS project results in groundwater elevations rising higher than minimum thresholds and meeting measurable objectives. As sustainability is defined as avoiding undesirable results by meeting minimum thresholds, the sustainable yield is greater than the net pumping achieved by PWS and other projects in the GSP. The GSP's approach for estimating sustainable yield is to use the configuration of the projects but increase net pumping while still meeting minimum thresholds.

The GSP's estimate for sustainable yield provides an estimate of the operational range for the pumping and recharge distribution. Therefore, Table 4 compares the pumping and recharge distribution simulated for PWS Phase 2 simulations with the distribution that achieves sustainability for the GSP. For example, the GSP indicates that recharge at the SWIP wells could be 50 acre-feet less than simulated for PWS with accompanying changes to the pumping distribution. However, sustainable yield has not been evaluated with the Phase 2 groundwater model.

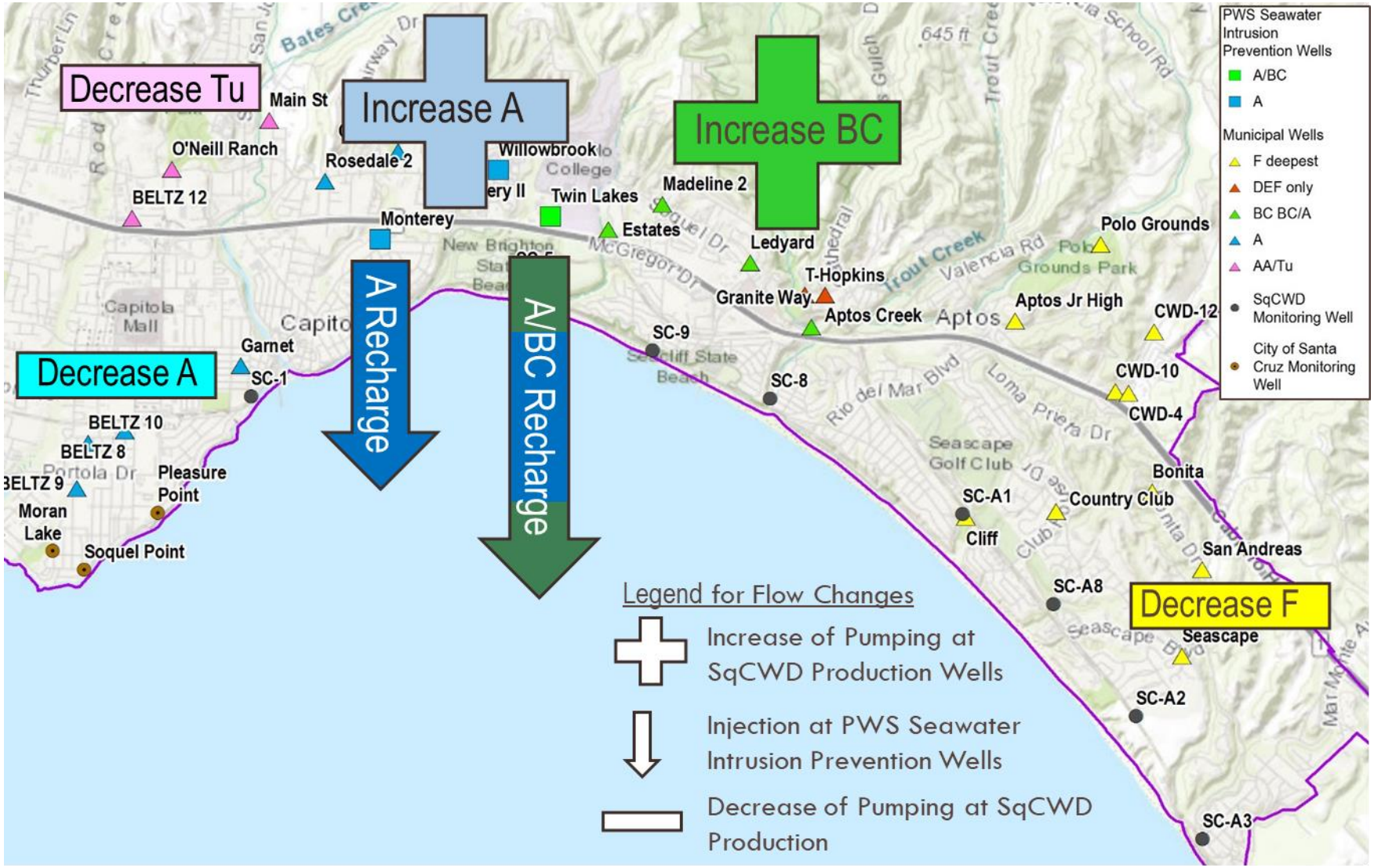

Figure 15. Schematic GSP Pumping and Recharge Redistribution

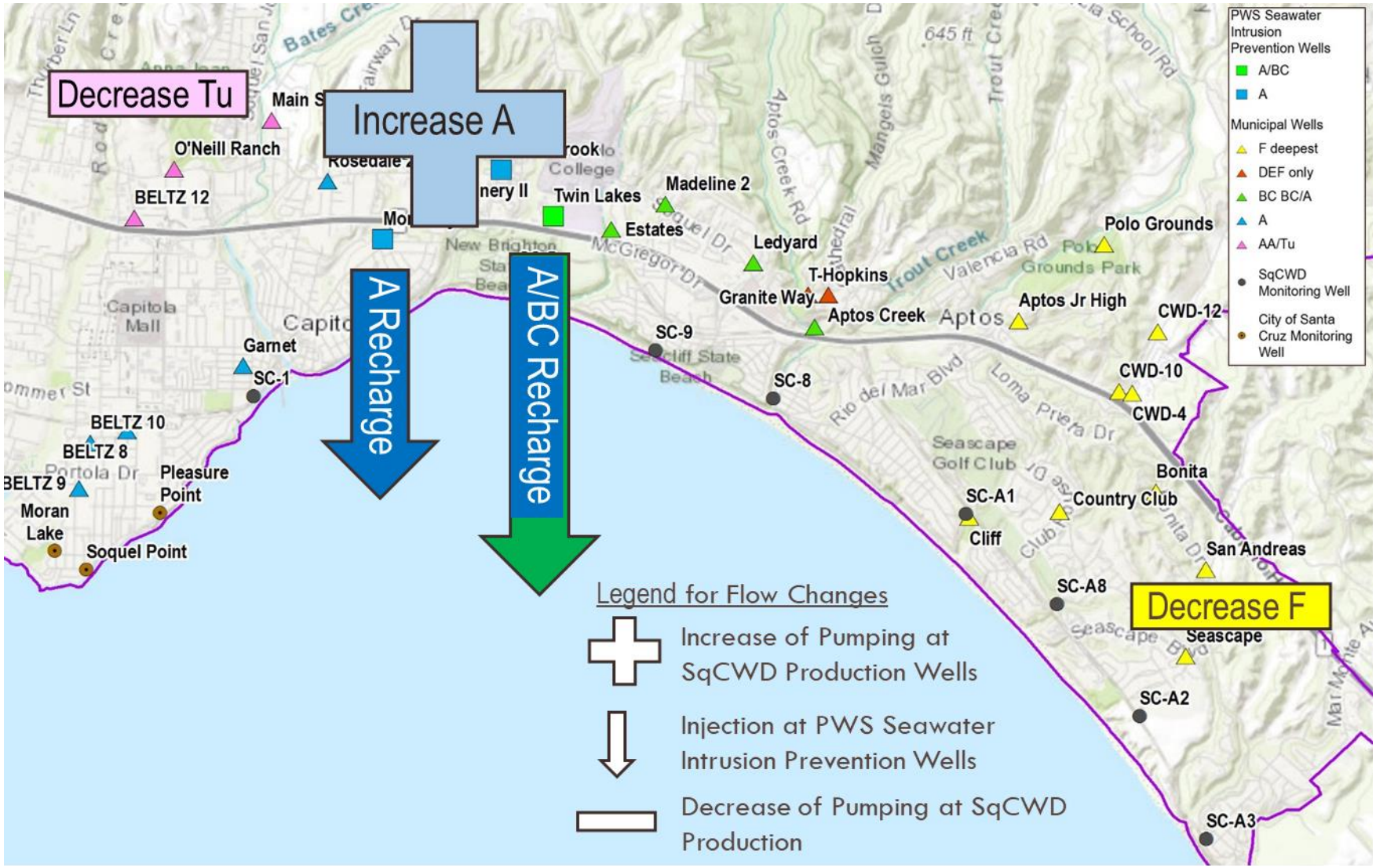

Figure 16. Schematic PWS Phase 2 Pumping and Recharge Redistribution

Table 4. PWS Phase 2 Pumping and Recharge Redistribution by Well

Well	Aquifer	Non-Critically Dry[1]	Non-Critically Dry[1]	Critically Dry[1]	Average Change From Baseline without PWS Project (M&A, 2019)	Average Change From GSP Redistribution (M&A, 2019)	Average Change From GSP Sustainable Yield (M&A, 2019)
		Acre-feet per year					
		2023-2025	2026-2069				
O'Neill Ranch Well	Purisima AA/Tu	264	190	195	-38	9	-38
Main St Well	Purisima AA/Tu	348	348	352	-180	0	0
Rosedale 2 Well	Purisima A/AA	544	544	553	0	0	0
Garnet Well	Purisima A	320	278	139	0	49	0
Monterey SWIP	Purisima A	-500	-500	-500	-500	0	-50
Cunnison Lane	Purisima A	0	439	437	209	40	13
Tannery Well II	Purisima A	689	580	577	369	9	17
Willowbrook SWIP	Purisima A	-233	-233	-233	-233	0	0
TLC SWIP	Purisima BC/A	-742	-742	-742	-742	0	0
Estates Well	Purisima BC/A	466	404	403	88	2	6
Madeline 2 Well	Purisima BC	98	98	98	0	-24	-24
Ledyard Well	Purisima BC	108	108	108	0	-12	-12
Aptos Creek Well	Purisima DEF/BC	0	0	0	0	-105	-102
T-Hopkins Well	Purisima DEF	156	137	137	0	0	0
Granite Way	Purisima DEF	145	135	135	0	0	0
Polo Grounds Well	Purisima F	100	100	100	0	0	0
Aptos Jr High Well	Purisima F	250	250	250	0	0	0
Country Club Well	Aromas / Purisima F	70	70	70	0	0	70
Bonita Well	Aromas / Purisima F	137	86	144	-173	18	22
San Andreas Well	Aromas / Purisima F	159	85	148	-275	18	-136
Seascape Well	Aromas / Purisima F	46	46	46	0	0	0

[1] Negative flow values for SWIP wells are recharge flows.

4.3 Expected Benefits from Pure Water Soquel

Expected seawater intrusion benefits of projects including the PWS project are evaluated in the GSP based on simulated groundwater elevations at the GSP's representative monitoring points

with groundwater elevation proxies for sustainable management criteria to protect the Basin from seawater intrusion[4]. The groundwater elevation proxies include minimum thresholds below which there are undesirable results due to the level of risk of eventual seawater intrusion. The GSP requires that there are no undesirable results by 2040 which can be achieved for the seawater intrusion indicator by raising groundwater levels to minimum thresholds at all coastal representative monitoring points. The sustainable management criteria also include measurable objectives, which reduce seawater intrusion risk further and provide operational flexibility. It is the goal of the PWS project to achieve measurable objectives within the SqCWD service area if possible, but sustainability will be achieved if only minimum thresholds are met.

The GSP defines the groundwater elevation proxies based on 5-year averages so running 5-year averages are calculated from the model's monthly output for comparison with minimum thresholds and measurable objectives. To avoid undesirable results, the running 5-year average must achieve the groundwater elevation proxy for the minimum threshold at all the representative monitoring points by 2040 and be maintained above the minimum threshold thereafter. The goal of the PWS project is to achieve measurable objectives to provide operational flexibility, but 5-year averages of groundwater elevations below measurable objectives are not considered undesirable results if they are above minimum thresholds.

The simulation of the PWS project with the Phase 2 redistribution under projected future climate conditions using the Basin Model demonstrates expected Basin sustainability benefits. The Basin Model shows that the PWS project raises running 5-year average groundwater levels at coastal monitoring wells (Figure 17) throughout SqCWD's service area to reduce the risk of further seawater intrusion. Figure 18 through Figure 22 show running 5-year averages of simulated groundwater levels at representative monitoring points for seawater intrusion in the SqCWD's service area without the project (yellow line labeled Baseline), with the project using pumping distribution evaluated for the GSP (green line labeled GSP) and the revised pumping distribution (blue dashed line labeled Phase 2). The simulated groundwater levels are compared to groundwater elevation proxies for minimum thresholds (black dots) and measurable objectives (black dashes) adjusted for sea level rise.[5]

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[4] *As indicated in the SGMA Regulations Section §354.36(b) "groundwater elevations may be used as a proxy for monitoring other sustainability indicators." The Basin Groundwater Sustainability Plan uses groundwater elevation proxies for seawater intrusion in addition to monitoring chloride concentrations. The groundwater elevation proxies are based on cross-sectional SEAWAT models of density-dependent flow and transport to estimate heads at coastal monitoring wells needed to prevent seawater intrusion into productive aquifer units. Using Monte Carlo uncertainty analysis based on uncertainty of aquifer characteristics, a range of protective groundwater levels were developed for each coastal monitoring well cluster (HydroMetrics LLC, 2009). The minimum threshold at a coastal monitoring well is the groundwater elevation that represents at least 70% of cross-sectional model simulations being protective, while the measurable objective at the well is the groundwater elevation that represents greater than 99% of cross-sectional model simulations being protective.*

[5] *From the GSP: "The model incorporates projected sea level rise in the offshore boundary condition for simulations of future conditions. The boundary condition head for sea level is increased over time to 2.3 feet in 2070 over current sea level rise based*

Without the project (yellow line labeled Baseline), undesirable results for seawater intrusion are projected to occur in the Purisima A (Figure 18 and Figure 19), Purisima BC (Figure 20), Purisima F (Figure 21) and Tu aquifer units (Figure 22). Running 5-year average simulated groundwater levels are projected to be below the minimum threshold at representative monitoring points in these aquifer units pumped by SqCWD.

In the Purisima A aquifer unit (Figure 18 and Figure 19) where most PWS recharge occurs, groundwater levels (blue dashes labeled Phase 2) are projected to rise to or above measurable objectives even as pumping is increased from these aquifer units greater than increases assumed for the GSP (green line labeled GSP).

In the Purisima BC aquifer unit where some PWS recharge occurs, groundwater levels are projected to rise above measurable objectives at SC-9C (blue dashes labeled Phase 2 on Figure 20) showing how PWS prevents seawater intrusion in the BC unit. However, increasing pumping in the BC unit as assumed for the GSP (green line labeled GSP) is not supported by the lower amount of recharge into the BC unit observed during testing of the TLC Pilot well. At SC-8RB, groundwater levels are projected to rise substantially compared to the baseline and GSP pumping distribution for the PWS project that increases pumping in the BC unit but the groundwater levels do not rise to the minimum threshold. However, the groundwater elevation proxy for the seawater intrusion sustainable management criteria at SC-8RB was included in the GSP based on potential plans to pump the Aptos Creek well screened partially in the BC unit. Since the updated pumping distribution does not add pumping at this well, meeting minimum thresholds at this well should no longer be necessary to prevent significant and unreasonable conditions for seawater intrusion. It is not expected that non-municipal pumping would occur from the BC unit underlying the similarly productive DEF unit in the area of SC-8RB.

Figure 20 also shows hydrographs for SC-5C in the BC unit and SC-9A in the A unit, but groundwater elevation proxies for seawater intrusion sustainable management criteria are not set for those wells as sustainable management criteria for seawater intrusion are generally just set for the deepest unit where nearby production occurs.

Figure 21shows how pumping reduction from the Purisima AA and Tu units under PWS (blue dashes) also is projected to raise groundwater levels above minimum thresholds to prevent undesirable results for seawater intrusion consistent with the evaluation for the GSP (green line).

on state of California projections for Monterey representing 5% probability under a High Emissions scenario (California Natural Resources Agency, 2018). Since the datum in the model is set at current sea level, simulated future groundwater levels were compared to the groundwater level proxies plus the total sea level rise of 2.3 feet. This allows evaluation of whether projects and management actions will raise and maintain groundwater elevations to meet groundwater level proxies relative to projections of higher sea levels."

In the Purisima F and Aromas Red Sands aquifer units where pumping is reduced under PWS, groundwater levels (blue dashes labeled Phase 2) are projected to rise above or near measurable objectives by 2040 and to be maintained above minimum thresholds thereafter so that undesirable results for seawater intrusion do not occur (Figure 22) even with increased pumping from these units compared to the distribution evaluated for the GSP (green line labeled GSP).

SWIP well hydrographs on Figure 23 show that simulated well water levels in the SWIP wells are not projected to rise to ground surface. This indicates that planned recharge quantities are within the capacities of the wells. In simulations for the GSP, recharge at the Willowbrook SWIP well was decreased to 233 acre-feet per year based on simulated well water levels rising to ground surface. With the Phase 2 revisions to the Basin Model that increase Purisima A unit conductivities, an increase of recharge at the Willowbrook SWIP well to 248 acre-feet per year likely can be supported based on Figure 23. This would facilitate total PWS project recharge of 1,500 acre-feet per year instead of the 1,475 acre-feet per year simulated with the Basin Model.

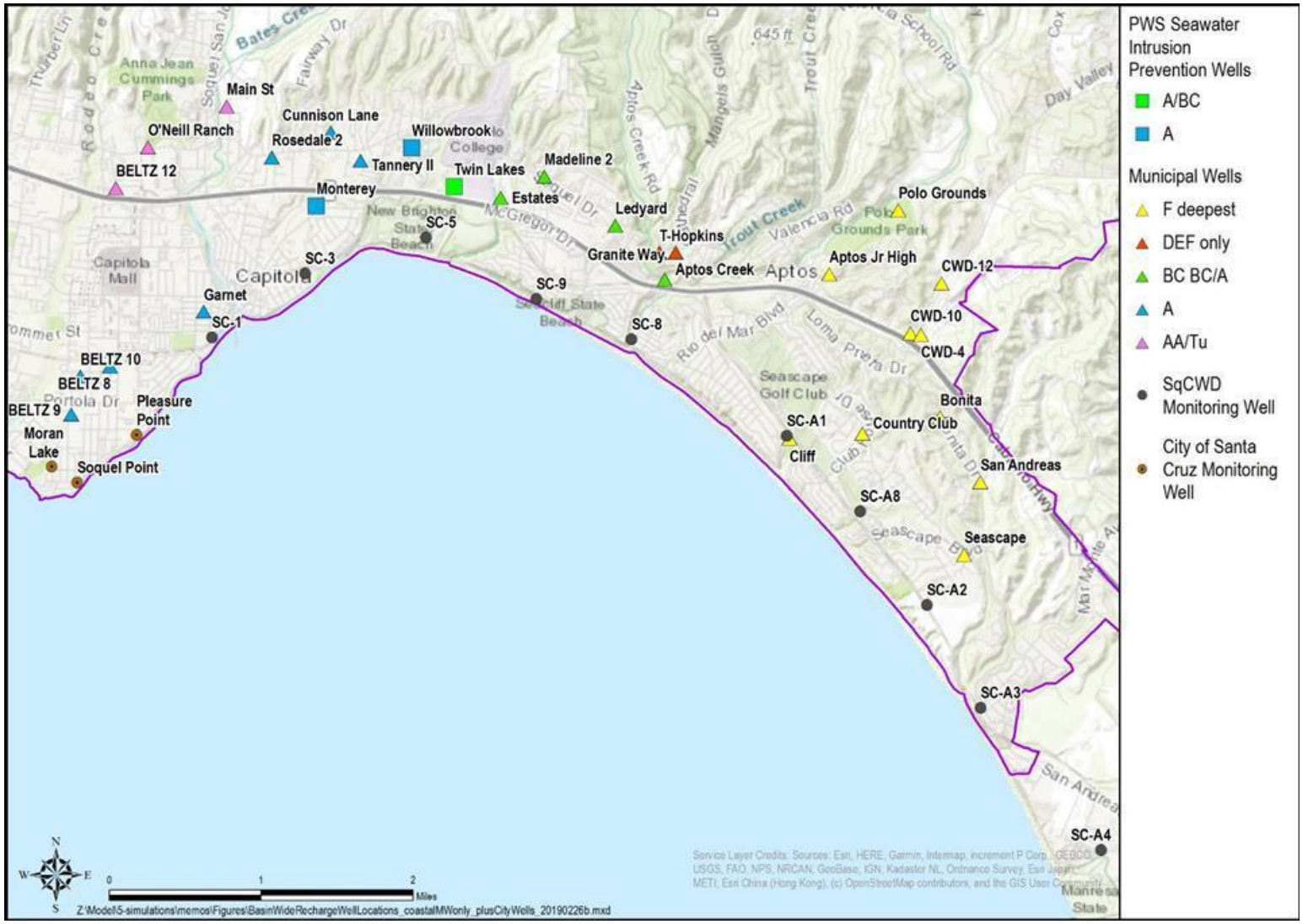

Figure 17. SqCWD and City of Santa Cruz Coastal Monitoring Wells Used as Representative Monitoring Points for Seawater Intrusion

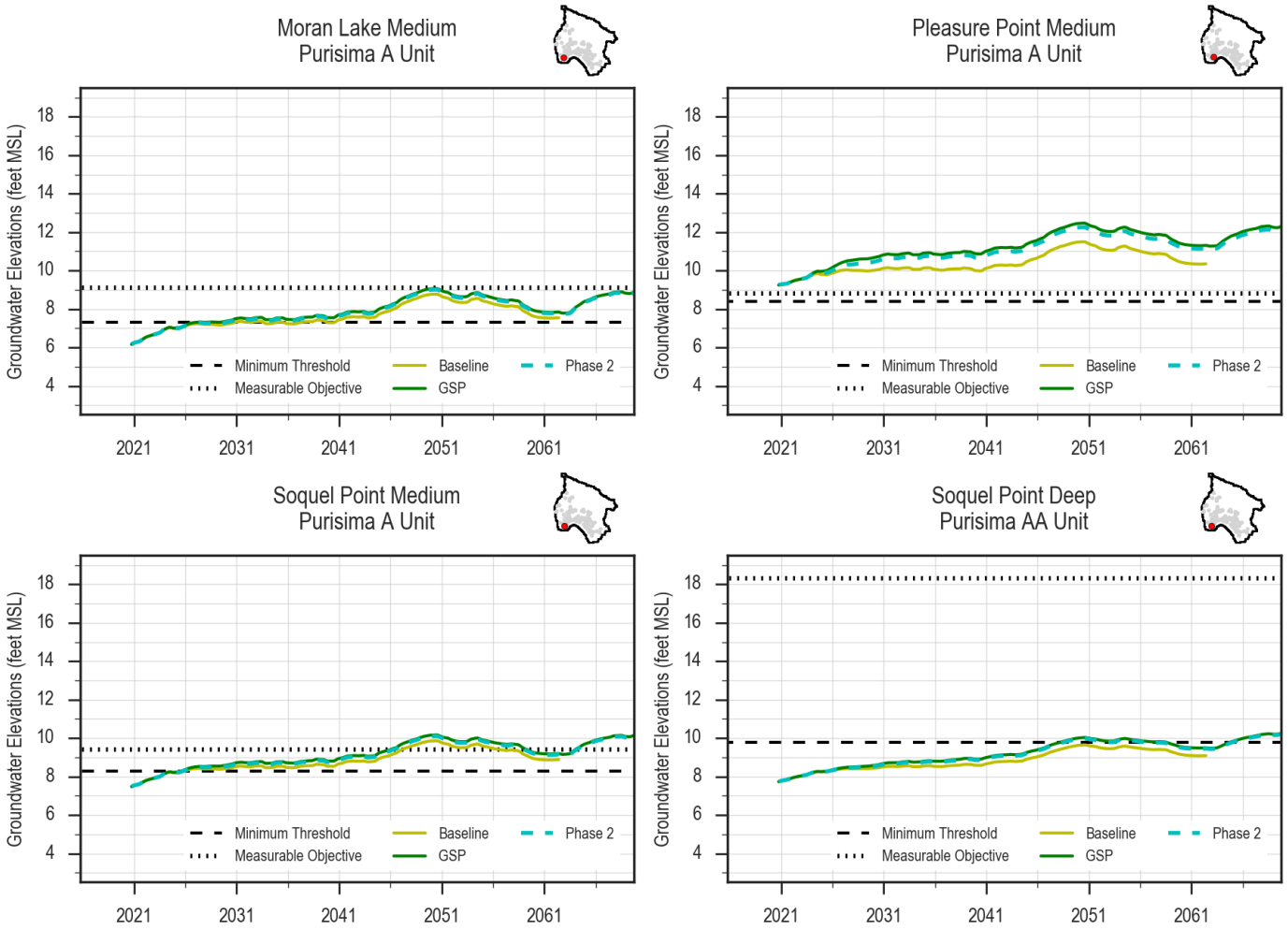

Figure 18. Groundwater Hydrographs at City of Santa Cruz Coastal Monitoring Wells Screened in Purisima A and AA

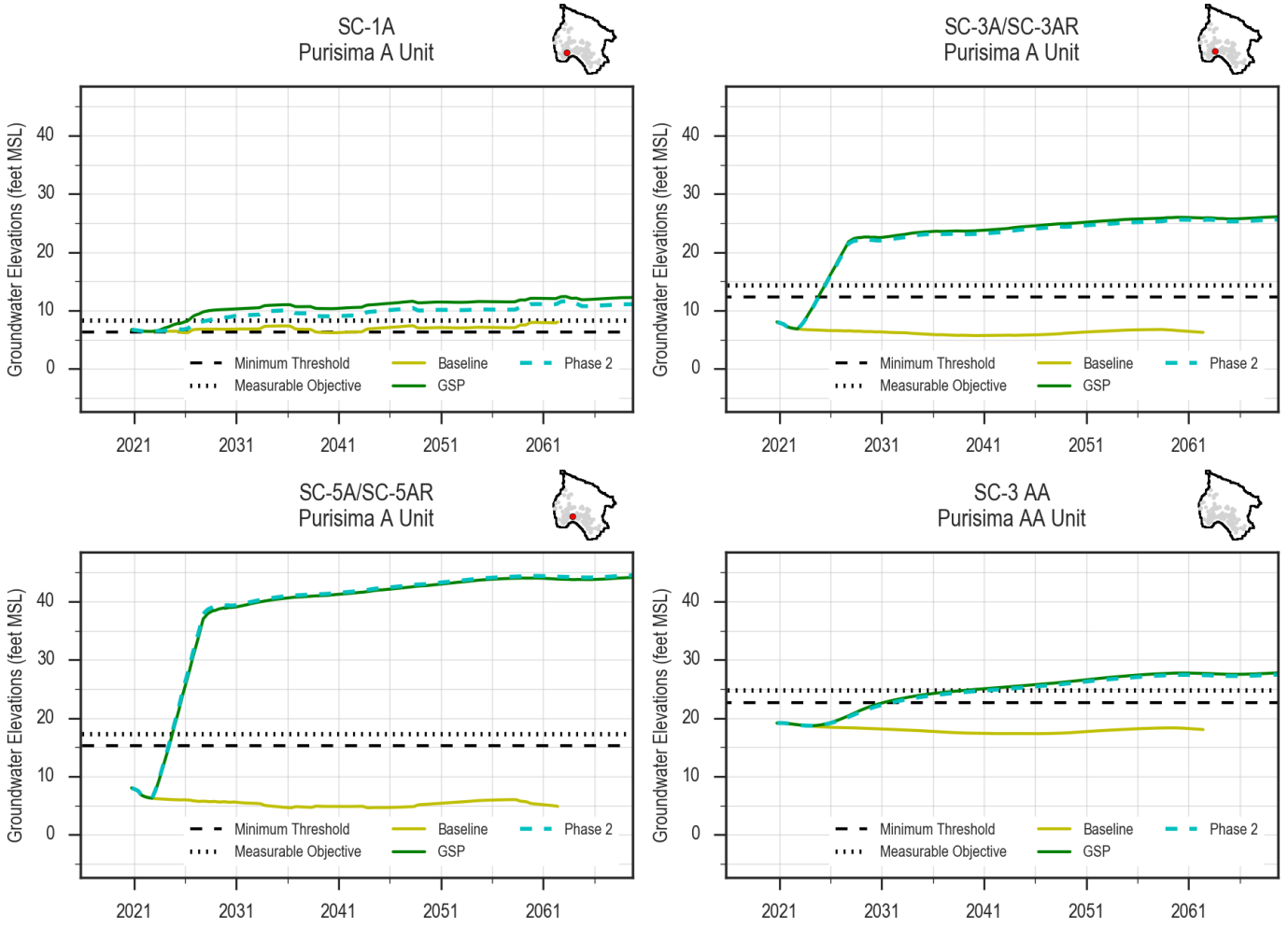

Figure 19. Groundwater Hydrographs at Soquel Creek Water Distict Coastal Monitoring Wells Screened in Purisima A and AA units

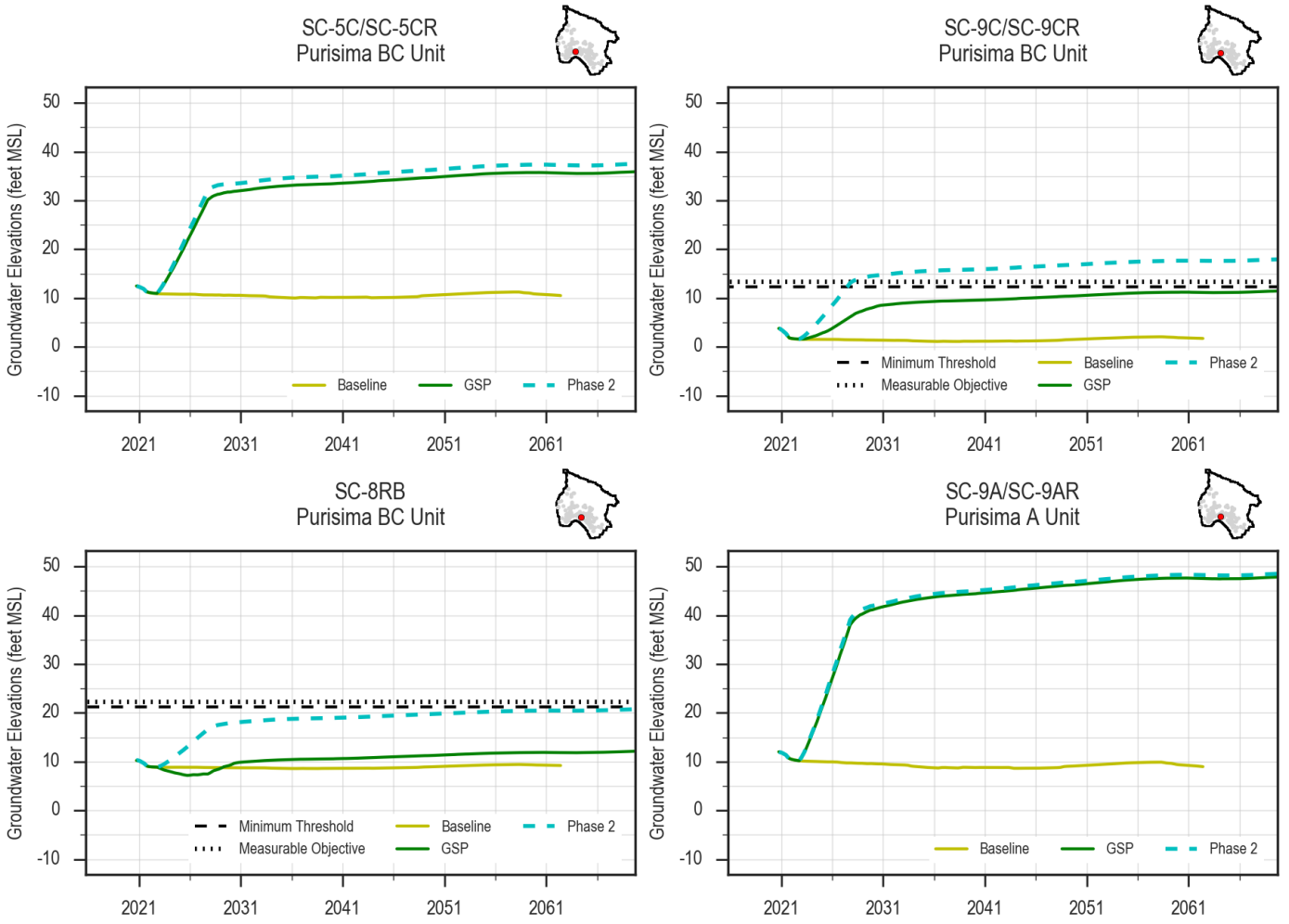

Figure 20. Groundwater Hydrographs at Soquel Creek Water District Coastal Monitoring Wells Screened in Purisima BC and A units

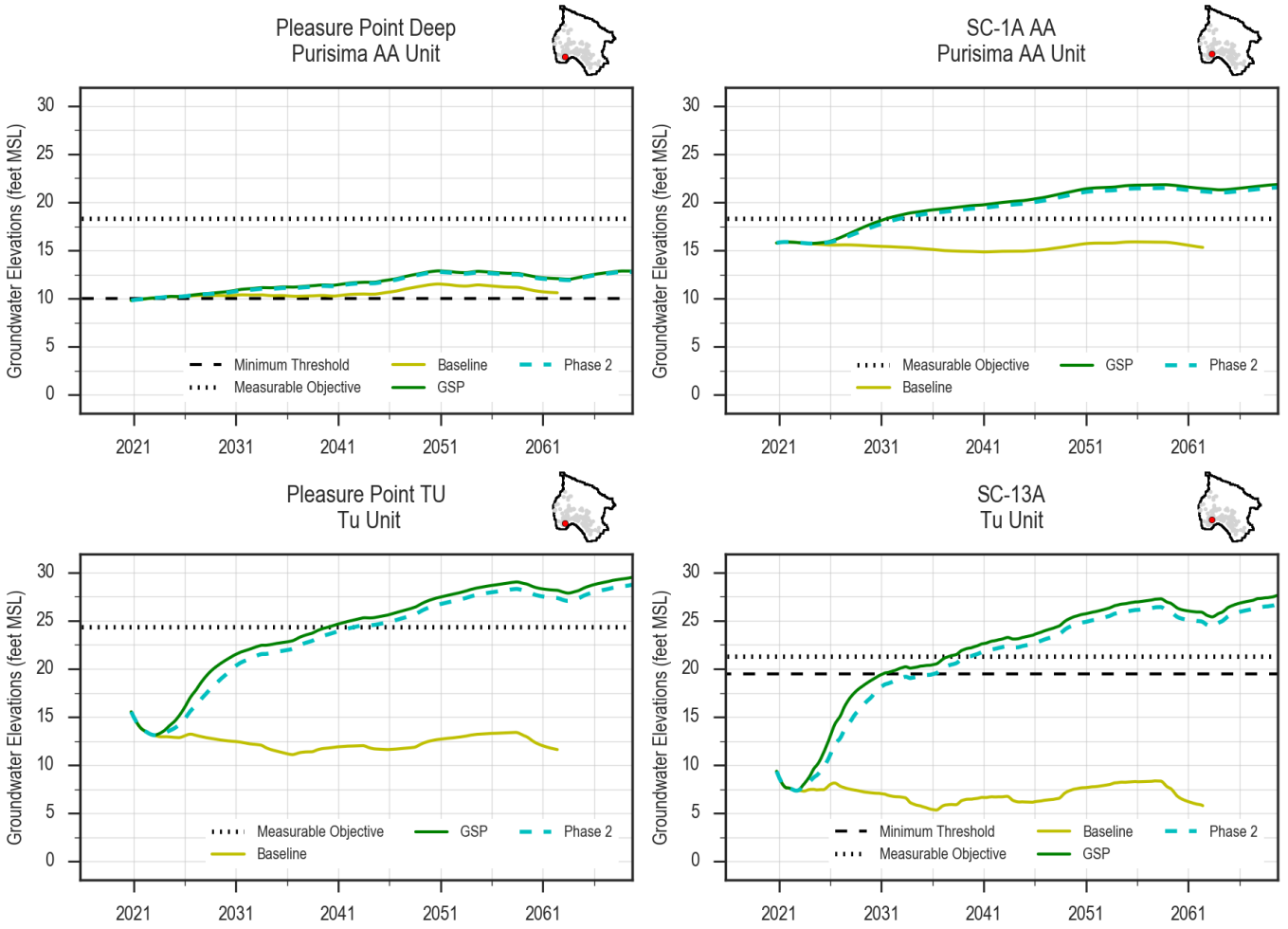

Figure 21. Groundwater Hydrographs for Purisima AA unit and the Tu unit at Coastal Monitoring Well Locations

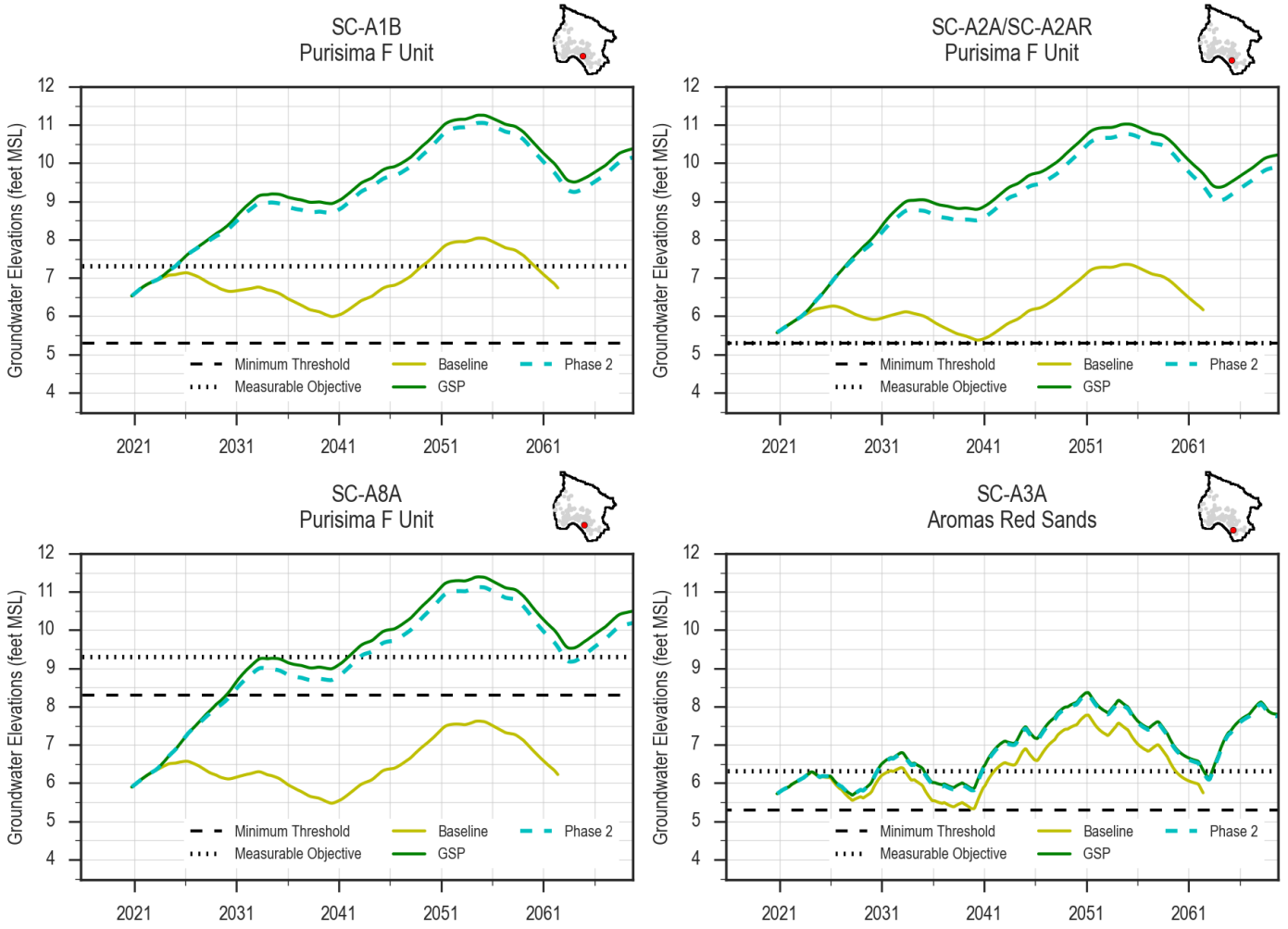

Figure 22. Groundwater Hydrographs at Soquel Creek Water District Monitoring Wells Screened in Purisima F unit and Aromas Red Sands

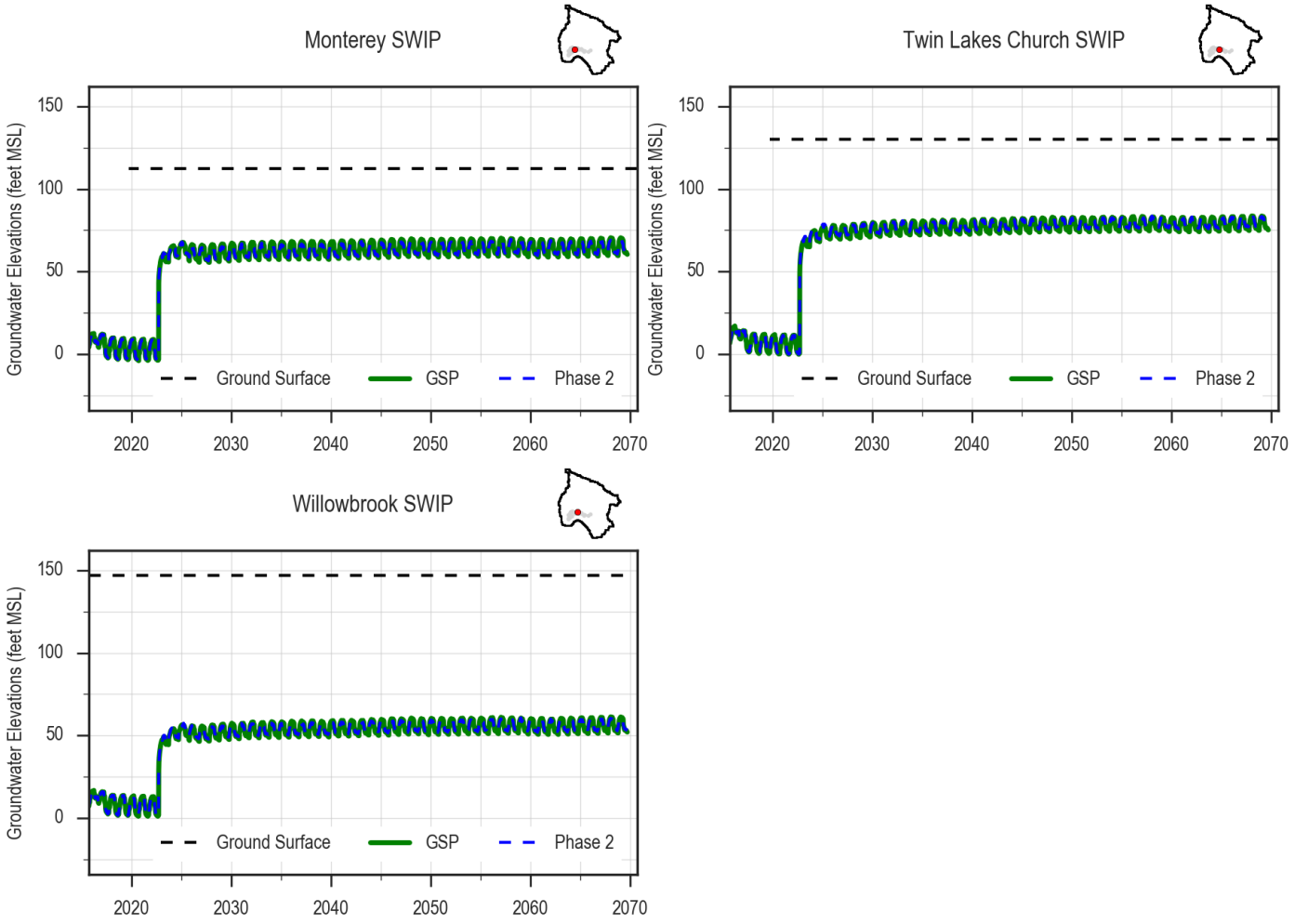

Figure 23. Hydrographs at SWIP Wells

4.4 Groundwater Elevation Contours in Baseline and PWS Scenarios

Simulated groundwater elevations in the Purisima A and BC units are presented for the baseline and PWS simulations below. Results are presented on September 30th of 2025 and 2047, dates which reflect 3 years and 25 years of ongoing recharge respectively. In addition to recharge, the pumping redistribution changes between 2025 and 2047, as summarized in Table 4. These changes include pumping at the Cunnison Lane well and decreases in pumping at the Garnet, Tannery II, and Estates wells. Table 4 also displays pumping redistribution from baseline for both time periods.

For both the Purisima BC and Purisima A units, baseline groundwater elevations in 2025 reflect conditions conducive to seawater intrusion. In the Purisima BC unit, elevations are below sea level in a large area along the coast within drawdown cones from the Estates, Madeline 2, and Ledyard wells (Figure 24). Elevations are more than 10 feet below minimum thresholds (MT) at the SC-9C and SC-8B coastal monitoring wells. In the Purisima A unit, the baseline scenario predicts elevations below sea level along the coast within drawdown cone from the Rosedale and Tannery II wells. Drawdown from the Garnet and Estates wells also contribute to groundwater elevations being approximately 5-15 feet below MT at the SC-3A and SC-5A coastal monitoring wells, and just above MT at the SC-1A coastal monitoring well (Figure 25). Elevations in 2047 are largely similar for both units (Figure 26 and Figure 27), though adding Purisima A unit pumping at the Cunnison Lane well widens and reduces the depth of the depression in this area.

PWS simulated groundwater elevations in 2025 are significantly higher than the baseline scenario in both the Purisima BC and Purisima A units. In the Purisima BC unit, elevations are uniformly above sea level across the area of interest. While only 5% of recharge at the TLC well enters the Purisima BC unit, this recharge translates to an increase of 10-30 feet in elevation across the area of interest even with increased pumping at the Estates well from baseline as part of the pumping redistribution. Groundwater elevations are above MT at the SC-9C coastal monitoring well, and roughly 4 feet below MT at the SC-8B coastal monitoring well (Figure 28) though the MT for SC-8B was established to protect production at the Aptos Creek well, which is no longer assumed. PWS benefits are similarly present in the Purisima A unit, raising groundwater elevations by around 15-45 feet in the area of interest even with increased pumping from baseline in the A unit as part of the pumping redistribution. Elevations are more than 10 feet and 20 feet above MT at the SC-3A and SC-5A coastal monitoring wells respectively. Elevations are about 2 feet above MT at the SC-1A coastal monitoring well. Even with a small depression from pumping at Garnet, elevations are uniformly above sea level along the coast (Figure 29).

Between 2025 and 2047, recharge and pumping redistribution continue to raise simulated groundwater elevations in the Purisima A and Purisima BC units. In the Purisima BC unit,

elevations are raised by roughly an additional 5 feet in the area between SC-8B and SC-5A, a product of recharge at TLC even with increases in pumping from baseline at the Estates well. Groundwater elevations are about 5 feet above MT at the SC-9A coastal monitoring well, and just meet MT at the SC-8B coastal monitoring well (Figure 30). In the Purisima A unit, elevations are similarly raised an additional 5-10 feet across much of the area of interest: specifically, near the TLC and Estates wells, in the eastern areas near SC-19, and near the Garnet well. Elevations near the Rosedale and Cunnison Lane wells are slightly lower than in 2025, a result of pumping at the Cunnison Lane well. Elevations are above MT by around 10-15 feet and 20-25 feet at the SC-3A and SC-5A coastal monitoring wells respectively, and roughly 6 feet above MT at the SC-1 coastal monitoring well. By 2047, groundwater elevations are uniformly above sea level across the area of interest, including the depression at Garnet (Figure 31).

For reference, Figure 32 and Figure 33 show groundwater elevation contour maps from the Santa Cruz Mid-County Basin GSP (2019) based on observations in Fall 2016 for Purisima BC Unit and Purisima A Unit respectively. Compared to conditions in 2016, baseline simulations show decline in groundwater elevations in these aquifer units by 2025 (Figure 24 and Figure 25) with projected increases of pumping to meet demand that bounces back from historically low demand that occurred during the drought conditions through 2016. Project simulations (Figure 28 through Figure 31) show higher groundwater levels compared to conditions in 2016 with the largest increases in the Purisima A unit.

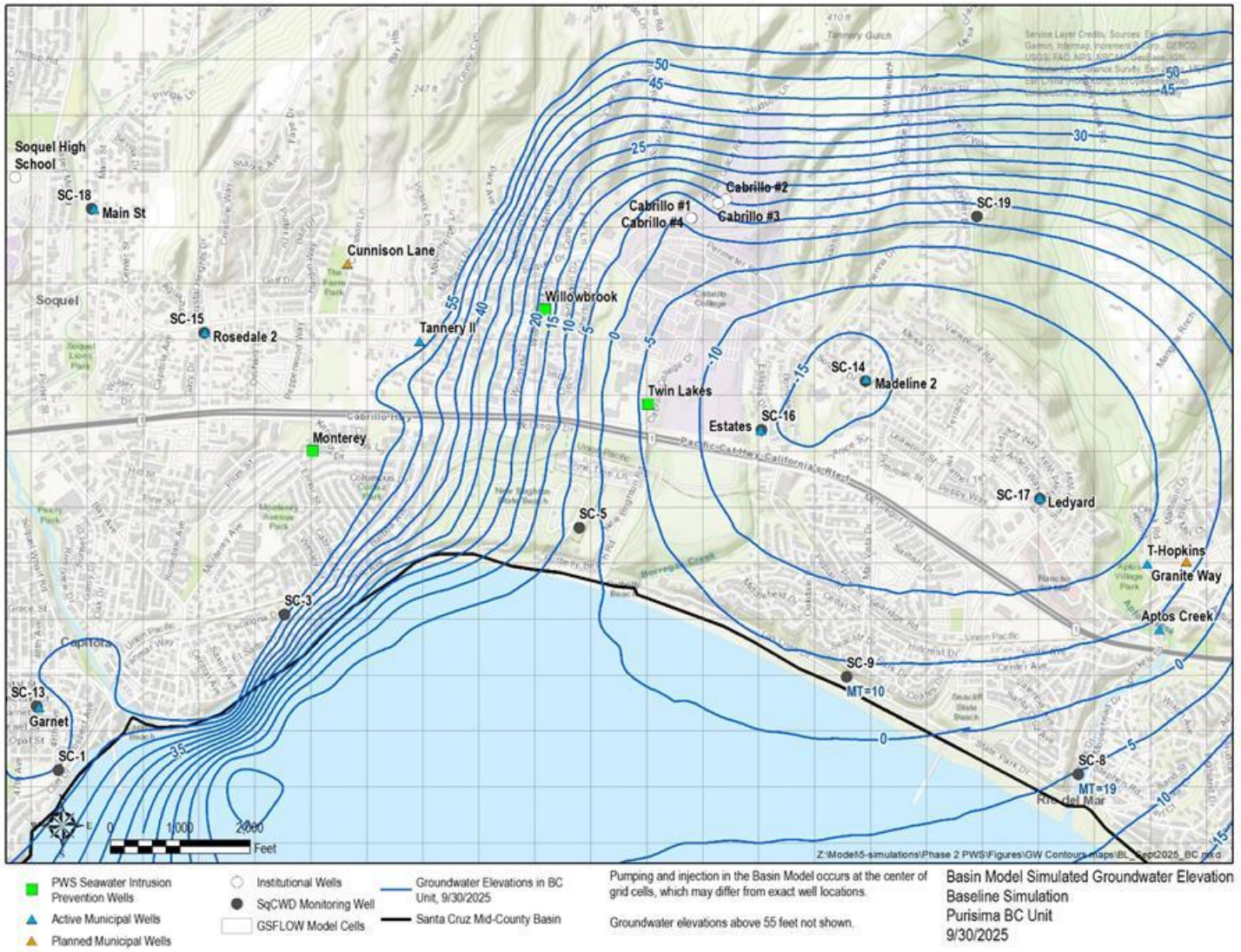

Figure 24. Simulated Baseline Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2025

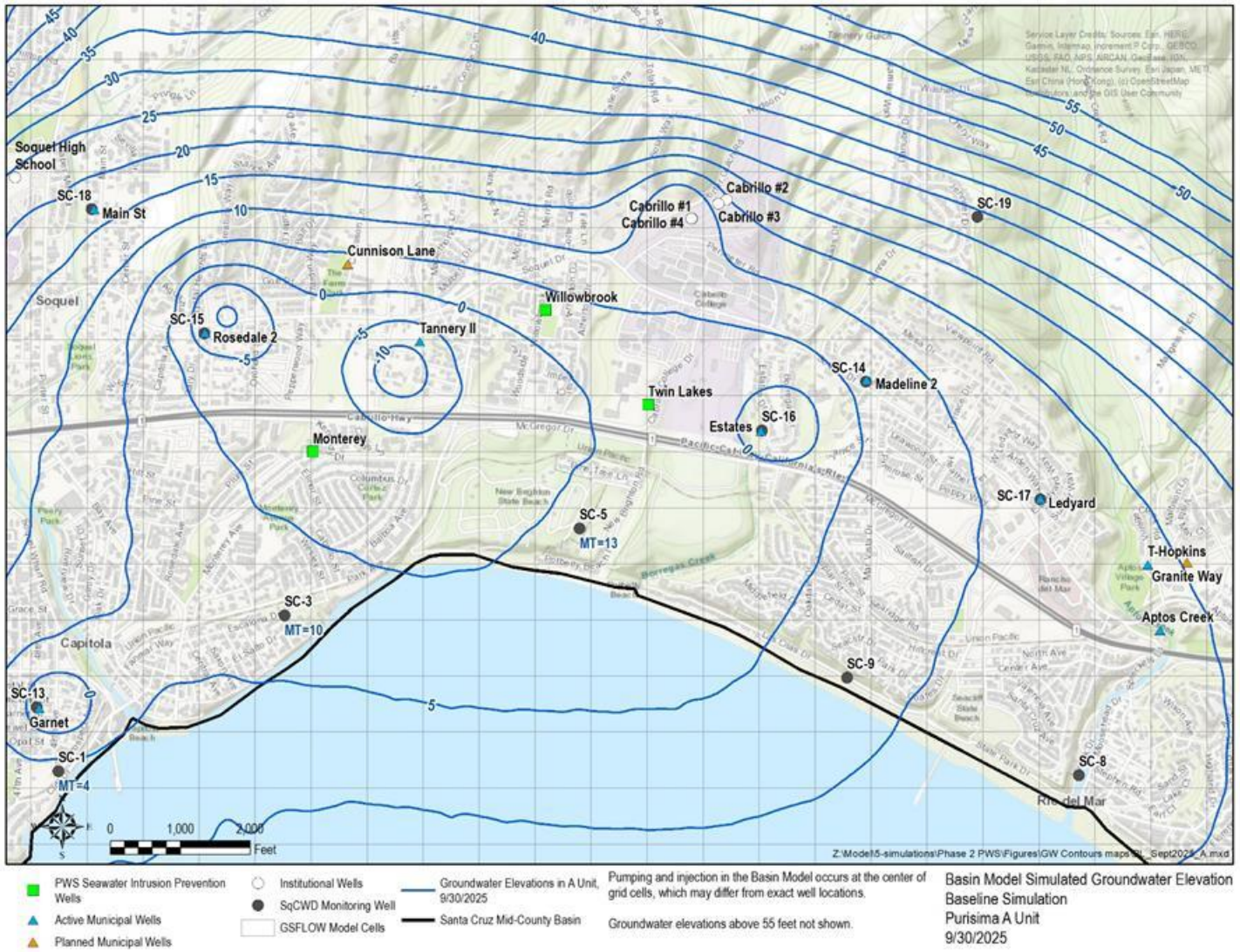

Figure 25. Simulated Baseline Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2025

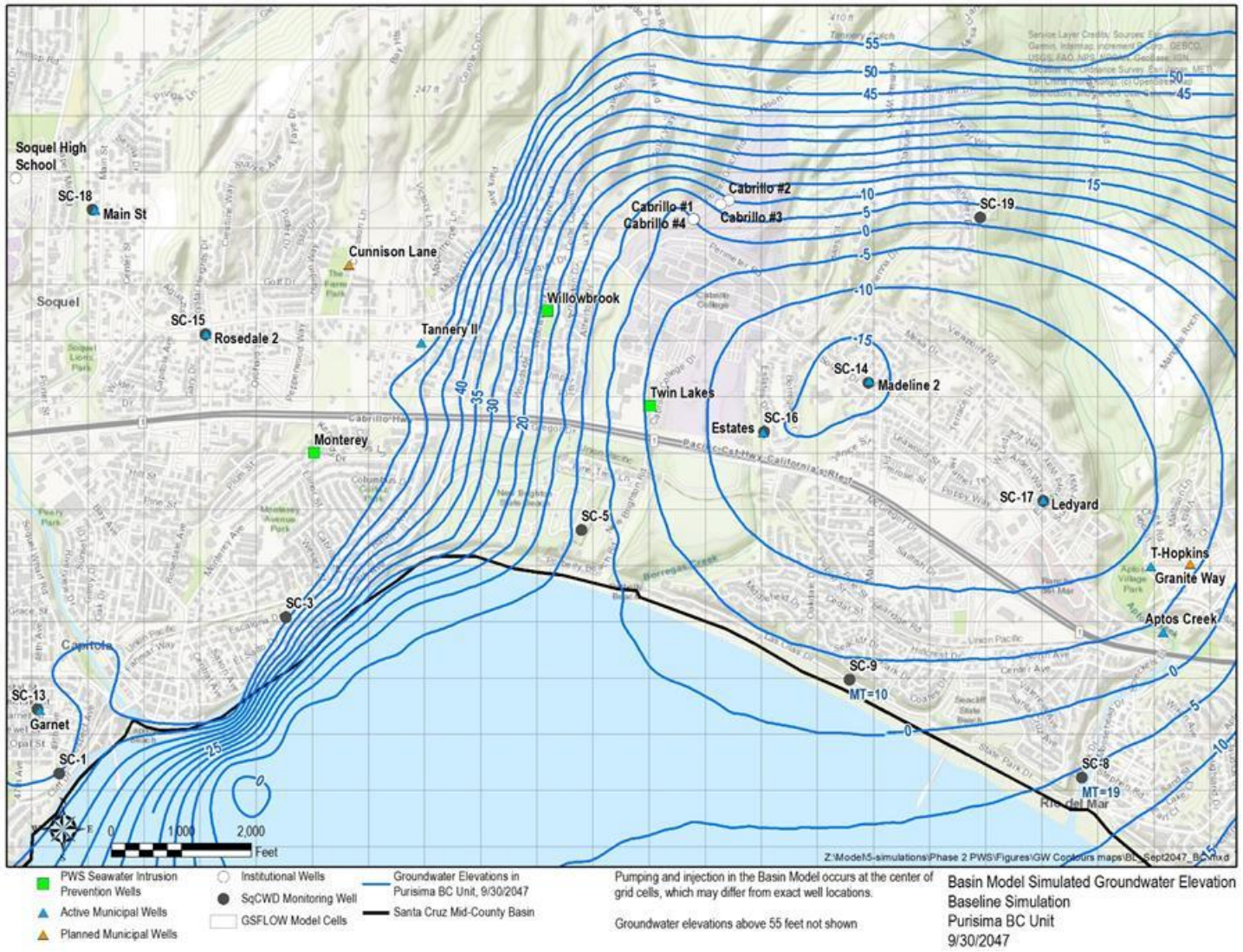

Figure 26.Simulated Baseline Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2047

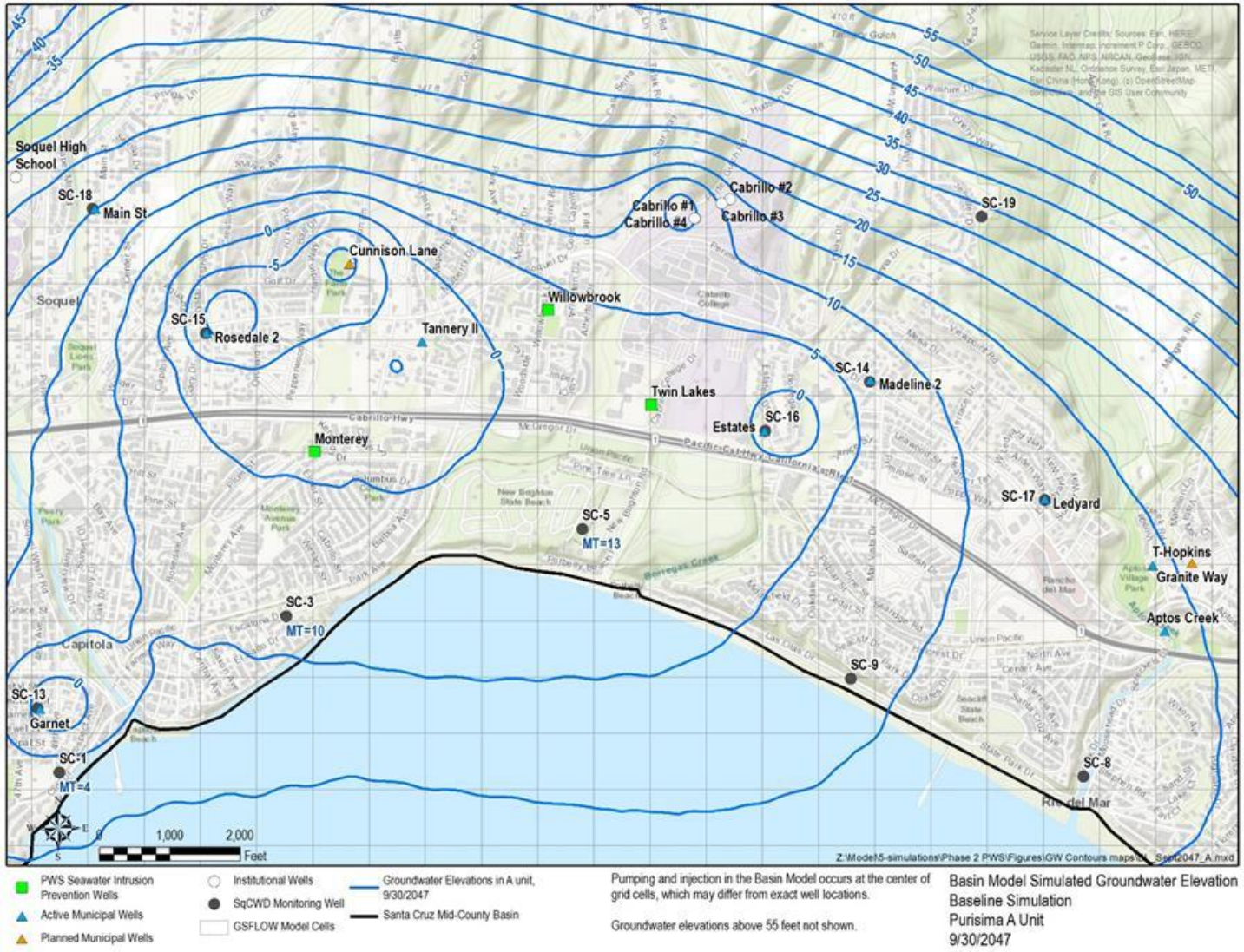

Figure 27. Simulated Baseline Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2047

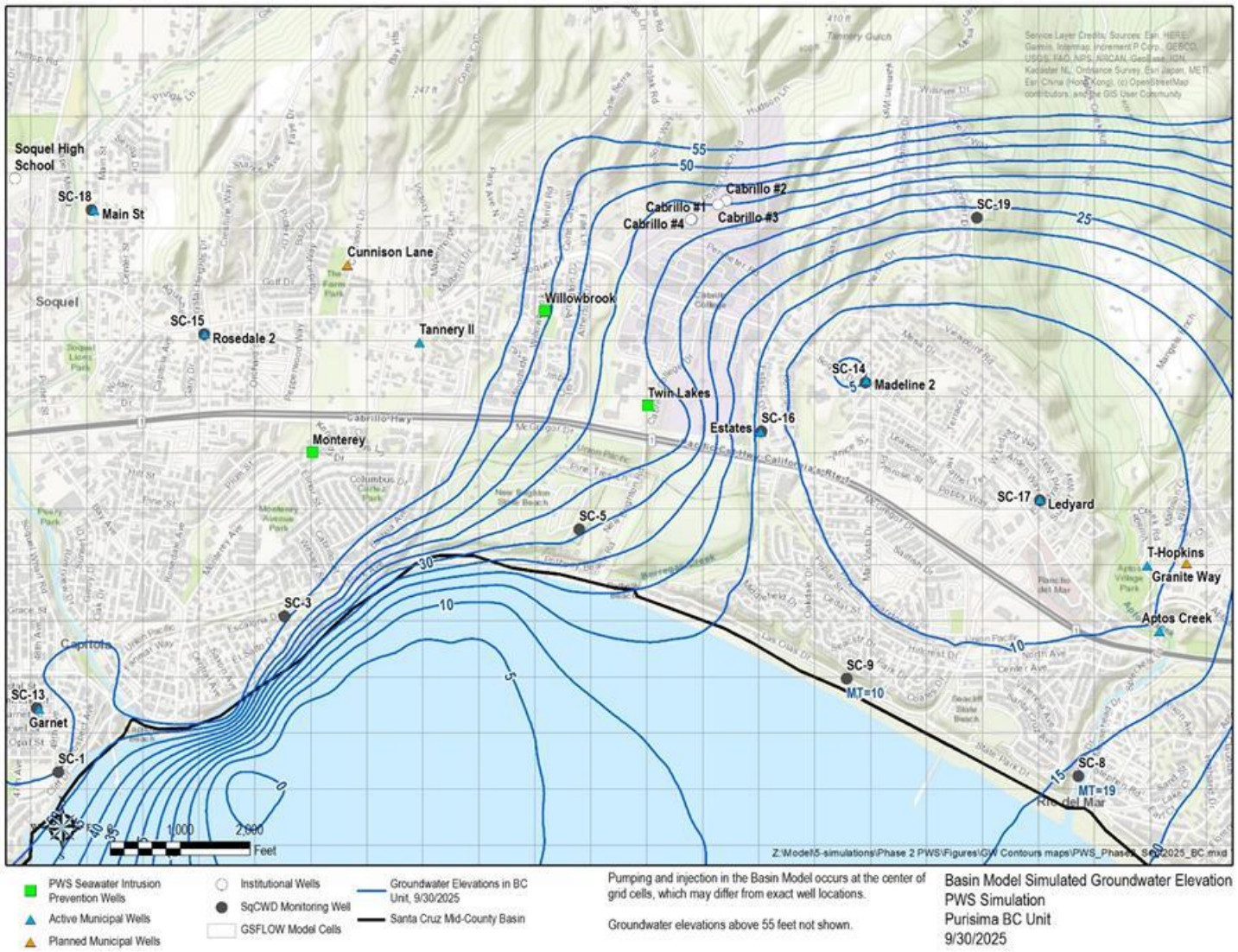

Figure 28. Simulated PWS Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2025

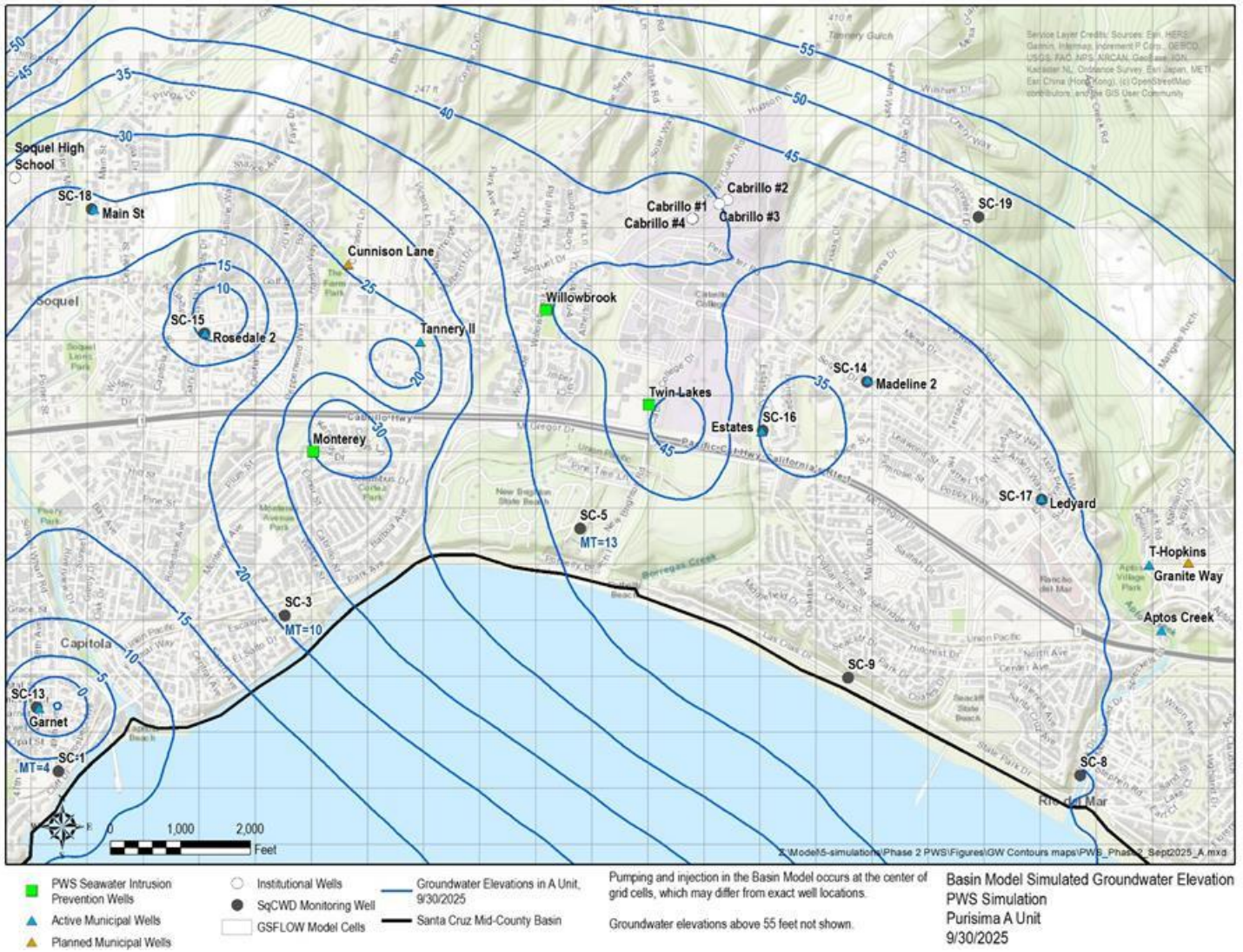

Figure 29. Simulated PWS Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2025

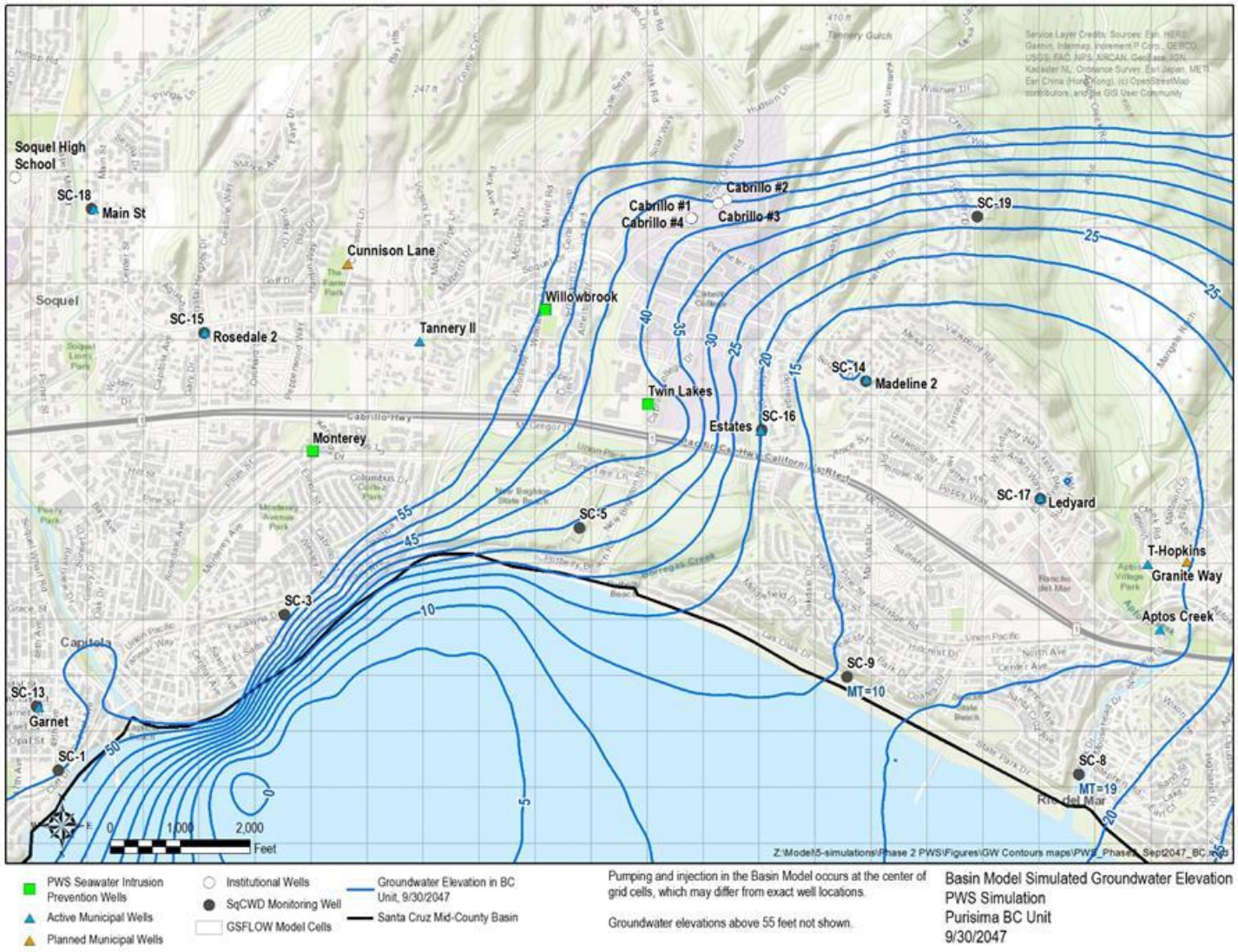

Figure 30. Simulated PWS Groundwater Elevations (feet msl) in Purisima BC Unit, 9/30/2047

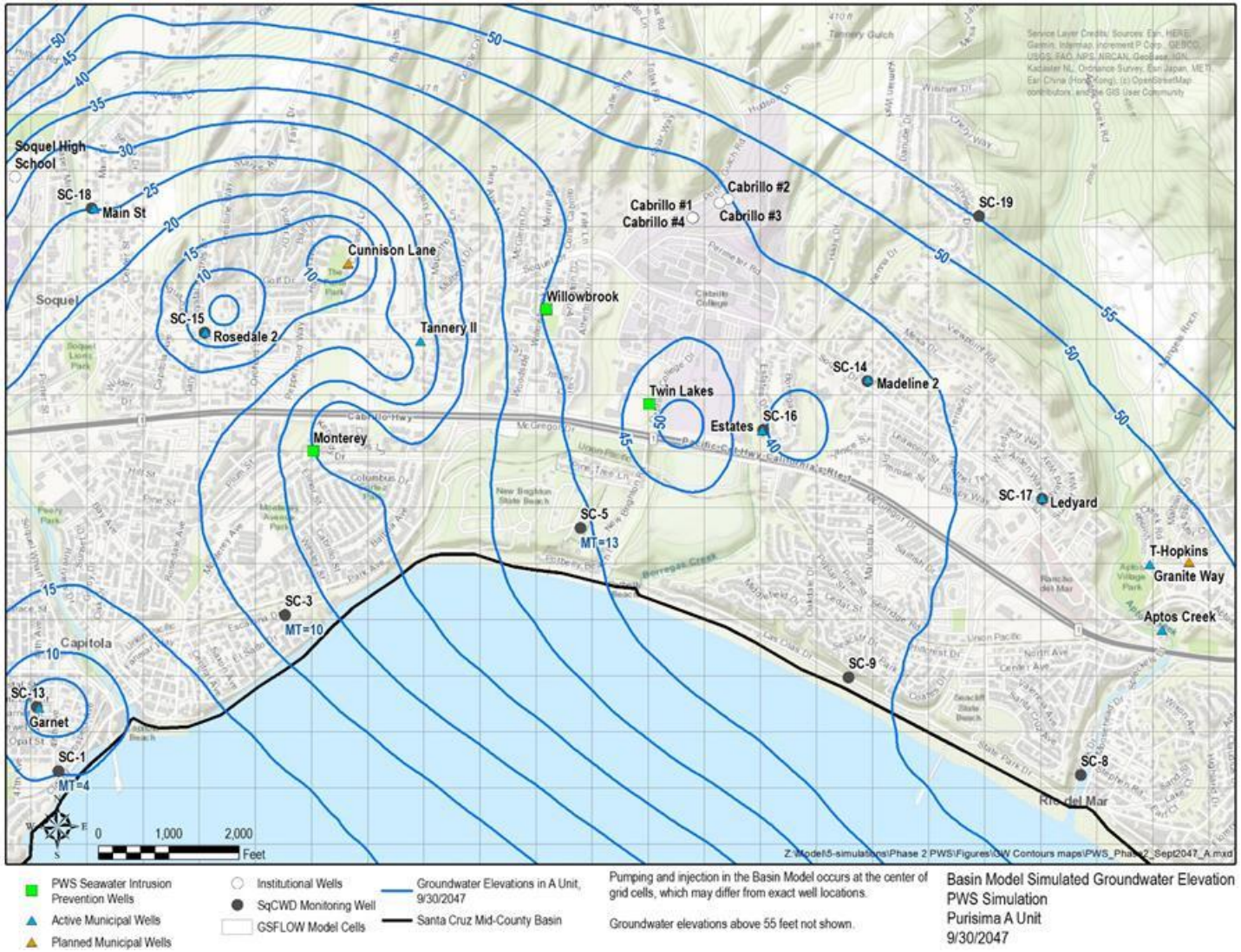

Figure 31. Simulated PWS Groundwater Elevations (feet msl) in Purisima A Unit, 9/30/2047

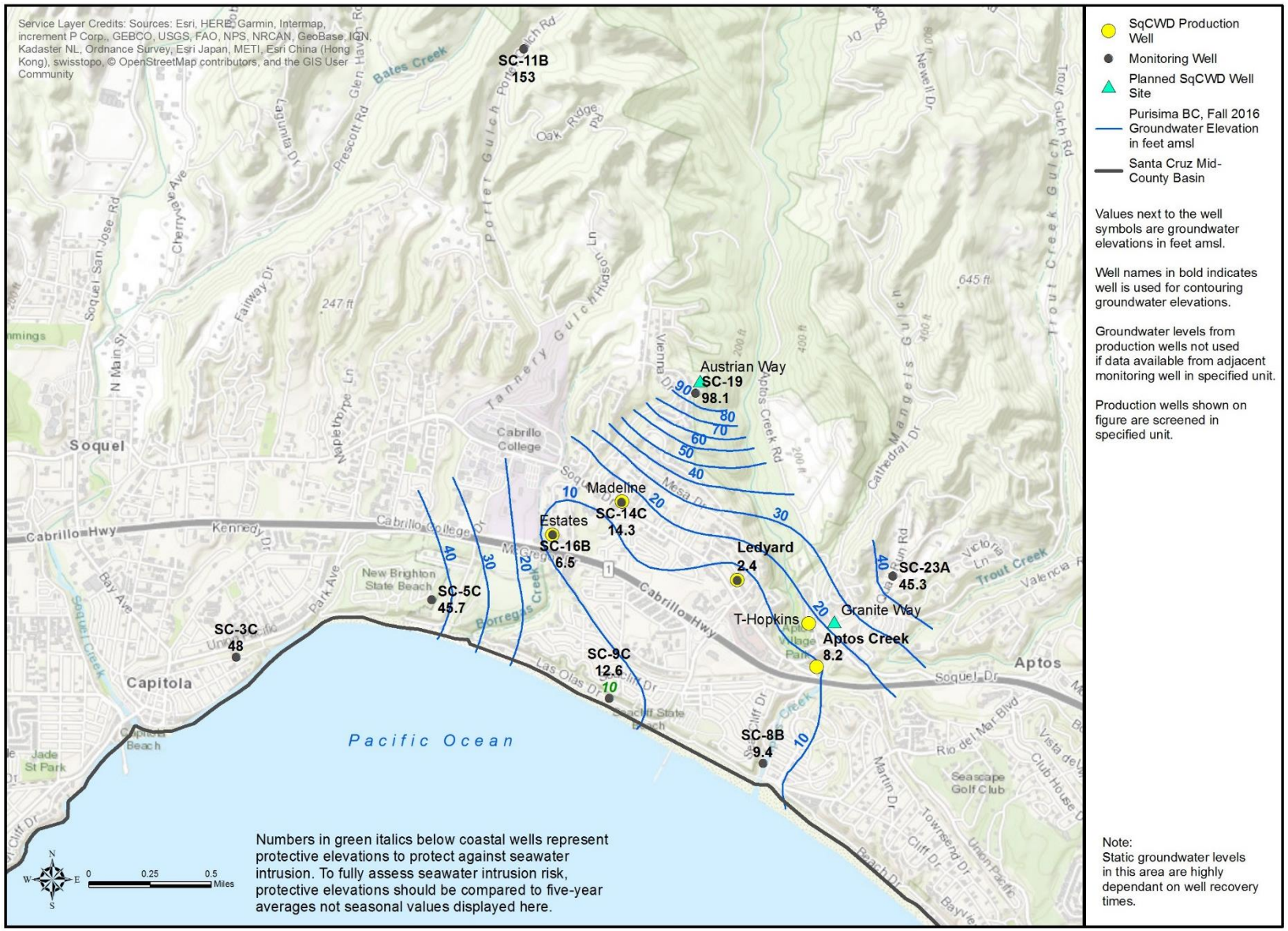

Figure 32. Observed Groundwater Elevations (feet msl) in Purisima BC-Unit, Fall 2016 (Reproduced from Santa Cruz Mid-County Basin GSP)

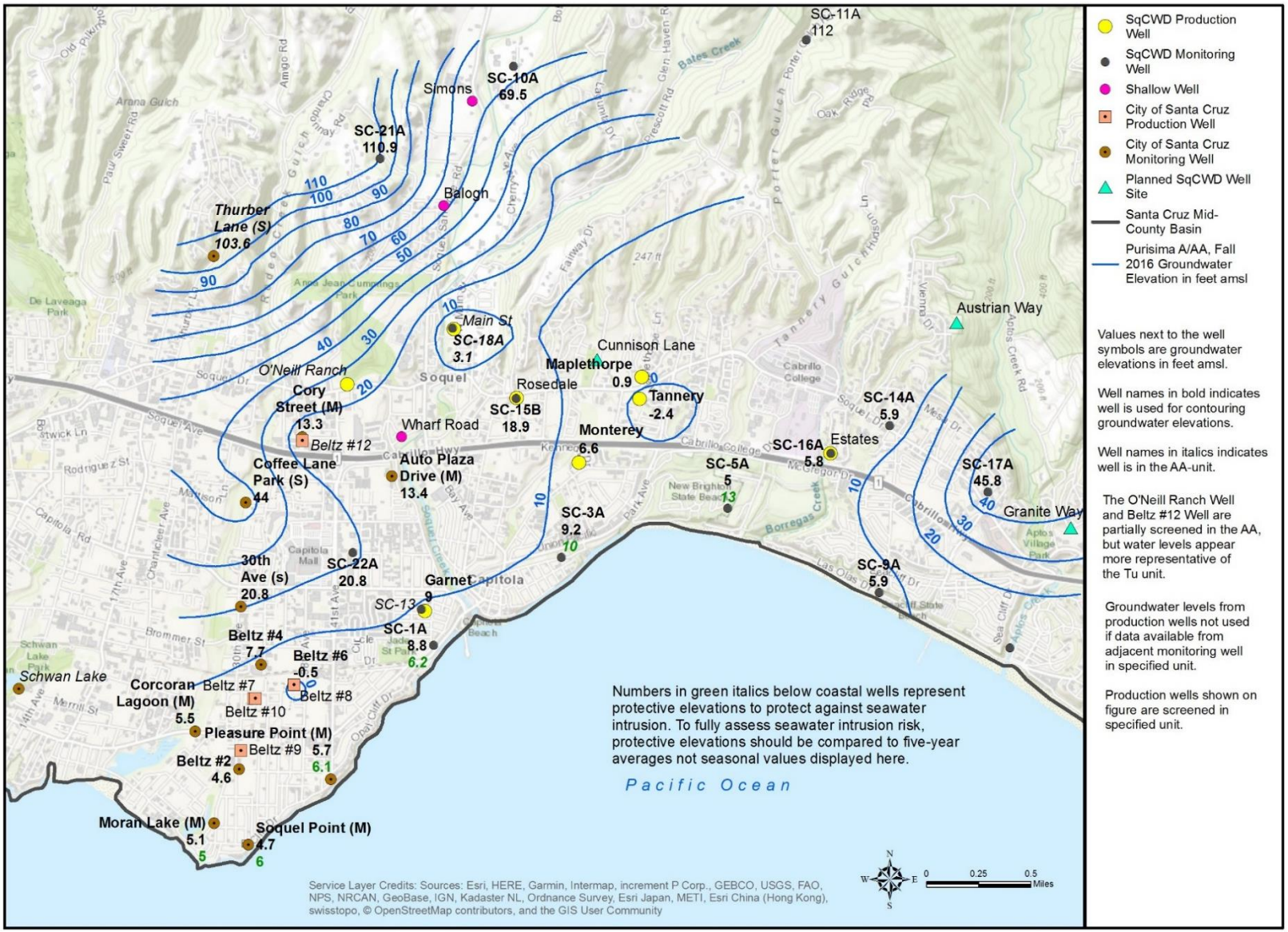

Figure 33. Observed Groundwater Elevations (feet msl) in Purisima A and AA Units, Fall 2016 (Reproduced from Santa Cruz Mid-County Basin GSP)

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5 LONG-TERM FATE OF RECHARGED PURIFIED WATER

USGS MODPATH particle tracking is based on results of the simulation of the PWS project with updated pumping distribution using the Basin Model to assess the spatial extent of recharged water. The primary purpose of the MODPATH particle tracking is to estimate the long-term fate of recharged purified water. The long-term fate of recharged purified water is evaluated based on where recharged purified water travels to in the Basin including which wells eventually extract purified water. These updated results are planned for incorporation into a revision of the project anti-degradation study (B&C, 2018). MODPATH particle tracking is not used to estimate retention times of recharged purified water for travel from the SWIP wells to production wells for the Title 22 engineering report. The 800x800 foot grid cell size of the Basin Model is not used for these estimates because the Basin Model does not represent exact well locations within the grid and does not represent gradients near the SWIP wells and production wells accurately. The clearest example of the issue with the grid resolution is if a SWIP well and a production well are in adjacent cells. The wells could be up to 2,263 feet apart if in cells diagonally adjacent, but particles released from one SWIP well cell would reach the production well cell immediately due to the shared cell side. In addition, the gradient driving particle travel time would represent average gradient over the area and not represent the gradients being steeper closer to each of the wells.

However, particle velocities based on the MODPATH results are provided for comparison with the results of the refined particle tracking that is used to estimate travel times for the Title 22 engineering report (Section 6).

5.1 MODPATH Setup for Particle Tracking based on GSFLOW Model

Long-term spatial extent of recharged water in Purisima A and BC units are based on particle locations at the end of Water Year 2047. 2047 represents the extent of 25 years of recharged water and encompasses the updated long-term pumping distributions assumed for PWS including Cunnison pumping that comes online in Water Year 2026.

Also evaluated are particle locations at the end of Water Year 2025 for comparison with refined particle tracking to estimate travel times. At the end of Water Year 2025, recharge has been ongoing for 3 years, providing a visualization of short-term travel times estimated by MODPATH on the 800x800 foot grid of three years or less. This short-term period is before SqCWD plans to bring the Cunnison production well online, which will change the pumping distribution. Addition of the Cunnison production well reduces pumping at the Tannery II and Estates wells, the SqCWD production wells nearest to the SWIP wells, and therefore reduces gradients to the nearest SqCWD production wells.

MODPATH is set up so that particles are released from the Basin Model cells with simulated TLC, Willowbrook, and Monterey SWIP recharge wells during every simulated month when SWIP wells are in operation. The number of particles released from each well is proportional to the recharge flow rate, so that the number of particles approximately equates to the amount of recharged mass. For example, doubling the flow rate at a constant concentration effectively doubles the amount of mass being recharged to the aquifers, therefore twice the number of particles are released if the flow rate is doubled.

The starting points for the particles are evenly distributed in both the horizontal and vertical directions along the sides of each of the 800x800 foot Basin Model cells with the three SWIP wells. It is not possible in MODPATH to start particles in the cell interior, such as at actual well locations. The amount of flow and corresponding number of particles released by well is summarized in Table 5 below.

Table 5. Recharge Recharged Volumes and Particle Distribution Assumed for PWS Phase 2 Modeling

WELL SCREENING	RECHARGED VOLUME (AF/YR)	NUMBER OF PARTICLES RELEASED MONTHLY
Willowbrook (A)	233	164
TLC (A)	690	484
TLC (BC)	52	37
Monterey (A)	500	350
Total	1,475	1,035

Effective porosities used for the MODPATH particle tracking are 9% for the Purisima BC unit and 13% for the Purisima A unit based on adding an estimated specific retention of 5% to specific yield values in the Basin Model (HWRI, 2019a). Porosities exceed specific yield by specific retention (Robson, 1993) and a relatively low specific retention was used for the semi-consolidated Purisima Formation. The effective porosities used are also in the range of porosities presented for the Purisima Formation (8%-15%) in the primary basis for the hydrogeological conceptual model for the GSP (Johnson et al., 2004).

5.2 Results for Long-Term Fate of Recharged Water

Figure 34 and Figure 35 show the spatial extent of 25 years of recharged purified water based on MODPATH particle locations at the end of Water Year 2047 for the Purisima BC and A units, respectively. The 25-year time span encompasses the long-term pumping distributions assumed for the PWS scenario that includes Cunnison well pumping coming online in Water Year 2026.

The dots show the final locations of particles released from the model cells with SWIP recharge wells.

The spatial extent of recharged purified water even over the long-term period of 25 years, is much smaller than the area where recharge by the PWS project increases groundwater elevations. For example, recharge at the SWIP wells increase groundwater levels at SC-3A in the Purisima A unit (Figure 19) and SC-9C in the Purisima BC unit (Figure 20) very soon after recharge commences in simulated Water Year 2023, but recharged purified water does not reach these locations within 25 years.

MODPATH assumes that once a particle reaches a model cell simulating a well with high enough extraction to create a "strong sink", the particle is removed from the system by the well. Extraction flow rate for a strong sink is high relative to total flow through the aquifer at that cell. Municipal wells in the Purisima A unit are simulated as strong sinks. Therefore, the particles are removed at the cell boundary at municipal wells, and Figure 35 show no particles within the cells where particles are removed in the A unit.

There are a couple of model cells where wells add water to aquifer units, but at rates low enough that particles can pass through the model cells. This occurs at the Estates well in the BC unit where higher recharge in the A unit at Twin Lakes Church SWIP well results in flow from the A unit to the BC unit at the Estates well. This flow does not change the overall west to east gradient simulated by the Basin Model (Figure 30) and particles pass through this model cell in the BC unit (Figure 34). The particles passing through the Willowbrook model cell in the A unit (Figure 35Figure 35) indicate that particles released on the eastern edge of the cell move to the west due to the overall east to west gradient simulated at the 800x800 grid resolution (Figure 31).

As shown on Figure 35, some particles pass through cells where private domestic wells are located because the wells are considered "weak sinks" by MODPATH. Extraction flow rate for a weak sink is low relative to total flow through the aquifer at that cell so weak sink pumping is not strong enough to capture particles in MODPATH. As MODPATH does not show capture of particles at these wells, MODPATH does not reflect the reality that the wells will extract purified water as it travels to the well. Figure 35 does show particles traveling to private domestic well locations so those wells are expected to extract purified water. Therefore, the amount of purified water captured by private domestic wells are estimated outside of MODPATH as described below.

5.2.1 Estimates of Purified Water Contribution to Wells and Aquifer

Estimates of the amount of recharged purified water extracted from wells versus remaining in Basin aquifers are primarily based on the number of particles simulated by MODPATH as extracted at municipal wells and remaining in the model over the 25-year period. As described,

treatment of private domestic wells as “weak sinks” requires estimating the amount of purified water extracted by the private domestic wells separately from MODPATH.

The estimate of the amount of purified water captured by private domestic wells is based on the assumption that once purified water reaches the private domestic well, all water extracted from the well is purified water. This first requires assessing which private domestic wells are expected to extract purified water at all. Figure 34 shows private domestic well locations known to be screened in the Purisima BC unit and shows no purified water traveling to these locations in the BC unit. Figure 35 shows private domestic well locations assumed to be screened in Purisima A unit. The only non-municipal well locations where purified water travels are the locations near the Monterey SWIP well. As will be later described in Section 6.3, estimated retention time of purified water between Monterey SWIP well and the nearest private domestic well is approximately 33 months. Assuming that all of private extraction near the Monterey SWIP well after 33 months is purified water, 89% of the non-municipal extraction over the 25-year period is purified water. The estimated total non-municipal extraction simulated by the Basin Model near the Monterey SWIP well over the 25-year period is approximately 125 acre-feet. Therefore, the amount of purified water estimated to be extracted by non-municipal wells near the Monterey SWIP well and overall is approximately 110 acre-feet or 0.3% of the total amount of purified water recharge. This extraction of purified water by private wells would reduce extraction of purified water by municipal production wells Tannery II, Rosedale, and Cunison slightly from estimates based on particle capture in MODPATH.

Based on the MODPATH results and the above estimate for domestic private wells near the Monterey SWIP well, approximately 37% of recharged purified water is captured by SqCWD production wells and 0.3% of recharged purified water is captured by private domestic wells. The remaining approximately 63% remains in the aquifer system after 25 years of simulated recharge operations.

shows the estimated total amount of recharged purified water from the PWS project extracted by each well and the fraction of the total water pumped by each well consisting of recharged water captured by SqCWD production wells and non-municipal wells simulated in the Basin Model through the end of Water Year 2047. Note that the percentages of pumped purified water in the middle column are shown as a fraction of total pumping at each individual well, rather than as total pumped purified water across all wells, and so do not add up 100% along all rows. The last column totals up to the 37% of all recharged water that is captured at wells.

Table 6. Estimated Total Amount of Purified Water Captured at Wells through end of Water Year 2047

SUPPLY WELL	TOTAL PUMPED AT WELL THROUGH END OF WY 2047 (AF)	PERCENT PURIFIED WATER OF TOTAL WATER PUMPED AT WELL	PERCENT OF ALL RECHARGED PURIFIED WATER CAPTURED AT WELL
Tannery	14,700	41%	16%
Estates	10,300	40%	11%
Rosedale	13,600	19%	7%
Cunnison Lane	9,600	10%	3%
Madeline	3,000	1%	0.1%
Private Wells around Monterey SWIP Well (APN 3719112)	125	89%	0.3%

shows the fate of recharged purified water by aquifer unit. For water recharged into the Purisima A unit, 44.7% of the recharged water is captured by wells after 25 years of recharge. Almost none of the smaller amount of water recharged into the Purisima BC unit is captured by wells during the same period. Recharged water remains in the same aquifer unit that they are recharged indicating flow is two-dimensional for the spatial extent of the recharged purified water simulation. This is consistent with the three-dimensional Basin Model flow output showing that 99.9% of total particle velocity throughout the area of influence of the project is parallel to the modeled aquifer layering and that flow gradients orthogonal to the layering are negligible.

Table 7. Fate of Purified Water at End of Water Year 2047 by Aquifer Unit

AQUIFER WHERE PARTICLES RELEASED	PERCENT PURIFIED WATER REMAINING IN A UNIT	PERCENT PURIFIED WATER REMAINING IN BC UNIT	PERCENT PURIFIED WATER CAPTURED BY WELLS
A	59%	0%	37%
BC	0%	4%	0.1%

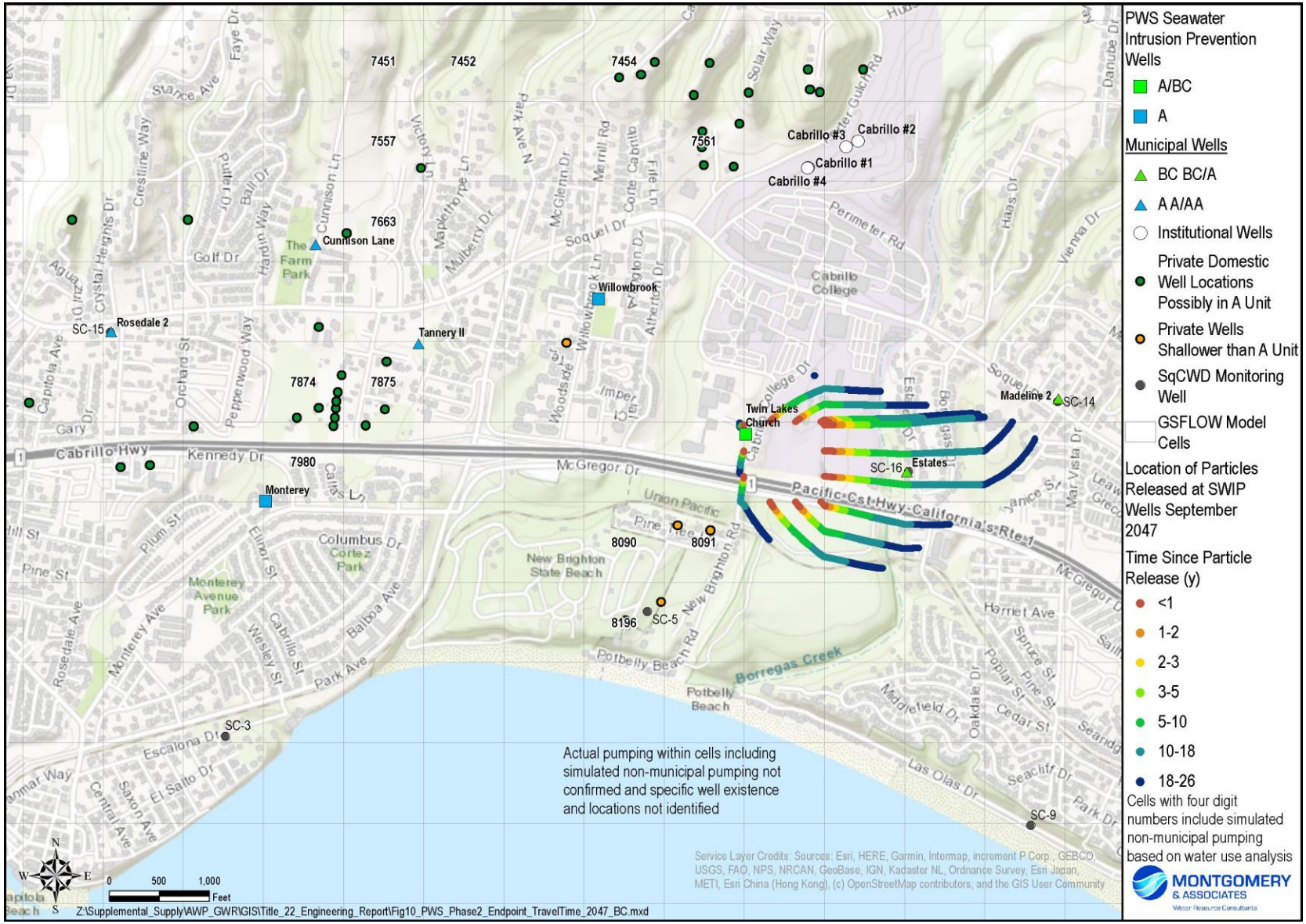

Figure 34. MODPATH Particle Tracking in Purisima BC Unit, End of Water Year 2047

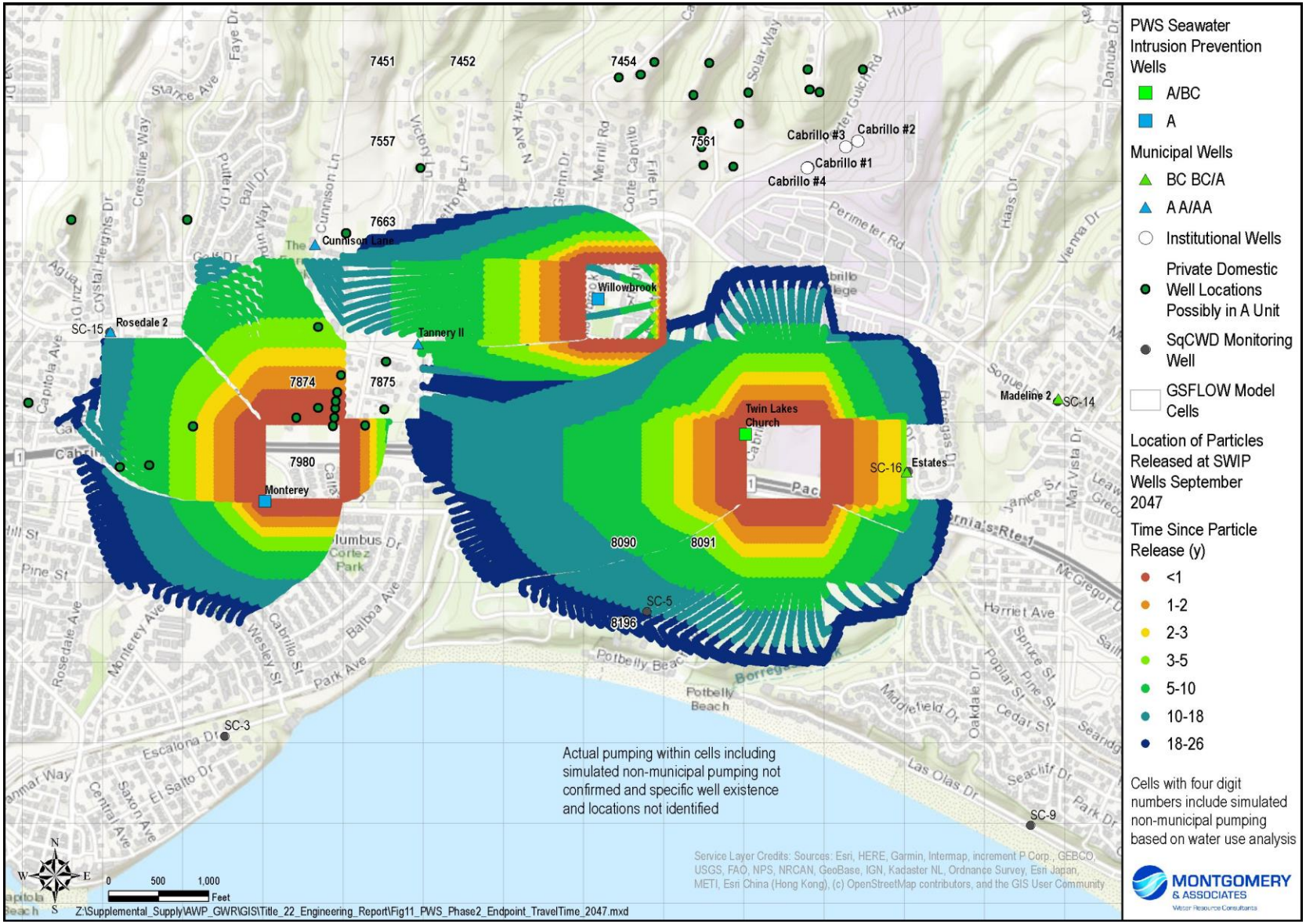

Figure 35. MODPATH Particle Tracking in Purisima A Unit, End of Water Year 2047

5.3 Particle Velocities for MODPATH Results

The colors on Figure 34 and Figure 35 represent times from 0-25 years since the particles are released along the edges of the 800x800 foot Basin Model grid cells. They do not represent the actual travel times from the SWIP wells since wells in the Basin Model are represented as being at the grid cell centers and particles are released at cell edges, with neither wells nor particle release points at the actual well locations. Therefore, actual distances between recharge and production wells are not represented in the Basin Model. In order to compare with the refined particle tracking analysis, in which particles are released at the actual well locations and which more accurately simulates near-well gradients, the average travel velocities of the MODPATH particles are calculated.

For comparison with refined particle tracking used to estimate travel times between recharge and production wells, average velocities are calculated based on MODPATH results for purified water recharged between Water Year 2023-2025 when gradients are expected to be greater as the Cunnison Lane well is not projected to come online until Water 2026. Figure 36 and Figure 37 show the spatial extent of recharged purified water at the end of Water Year 2025 with color representing times up to 3 years since the particles are released from the edges of the 800x800 foot Basin Model cells.

Figure 36 and Figure 37 show the limitations of using MODPATH results based on the Basin Model with 800x800 foot grid cells. The Monterey SWIP well is in the same Basin Model grid cell 7980 with simulated non-municipal pumping, such that MODPATH cannot calculate travel times between the Monterey SWIP wells and any non-municipal wells in the cell. The Basin Model grid cell where the Monterey SWIP well is located is also adjacent to model cells 7874 and 7875 with simulated non-municipal pumping and the Tannery II SqCWD production well. Since particles are released and captured at cell edges, rather than at cell centers, they enter the adjacent cells with pumping immediately. This occurs despite the Monterey SWIP well and the Tannery II well actually being located on opposite corners of their respective grid cells. Similarly, the grid with Twin Lakes Church SWIP well is adjacent to the cell 8091 with simulated non-municipal pumping. As the adjacent cells, even the one with municipal pumping at Tannery II, appear to be weak sinks after three years of recharge, particles have not been captured at the end of 2025. There is a model cell between the cells of Twin Lakes Church SWIP well and the SqCWD Estates production well, but MODPATH is not able to simulate travel from the northwest corner of the cell where Twin Lakes Church SWIP well is across its model cell to the east towards the Estates well. This underscores the need for the refined particle tracking simulation.

Table 8 shows the average velocities in the MODPATH simulation of particles captured at production wells for both the Water Year 2023-2025 and Water Year 2023-2047 periods,

respectively. SqCWD's planned Cunnison Lane well is projected to come online after Water Year 2025 which distributes SqCWD pumping over an additional well and reduces gradients. Therefore, velocities in the earlier period before Cunnison Lane comes online are faster than the later period after Cunnison Lane comes online. This supports the rationale for the selection of the WY 2025 time period for use in the refined particle tracking simulation.

Table 8. Average Particle Velocities by Capture Point, for End of Water Years 2025 and 2047

Aquifer	Capture Point	WY 2023-2025 Average Particle Velocity (ft/d)	WY 2023-2047 Average Particle Velocity (ft/d)
Purisima A	Tannery	0.79	0.6
	Estates	0.77	0.66
	Rosedale	-	0.49
	Cunnison	-	0.49
Purisima BC	Madeline	-	0.22

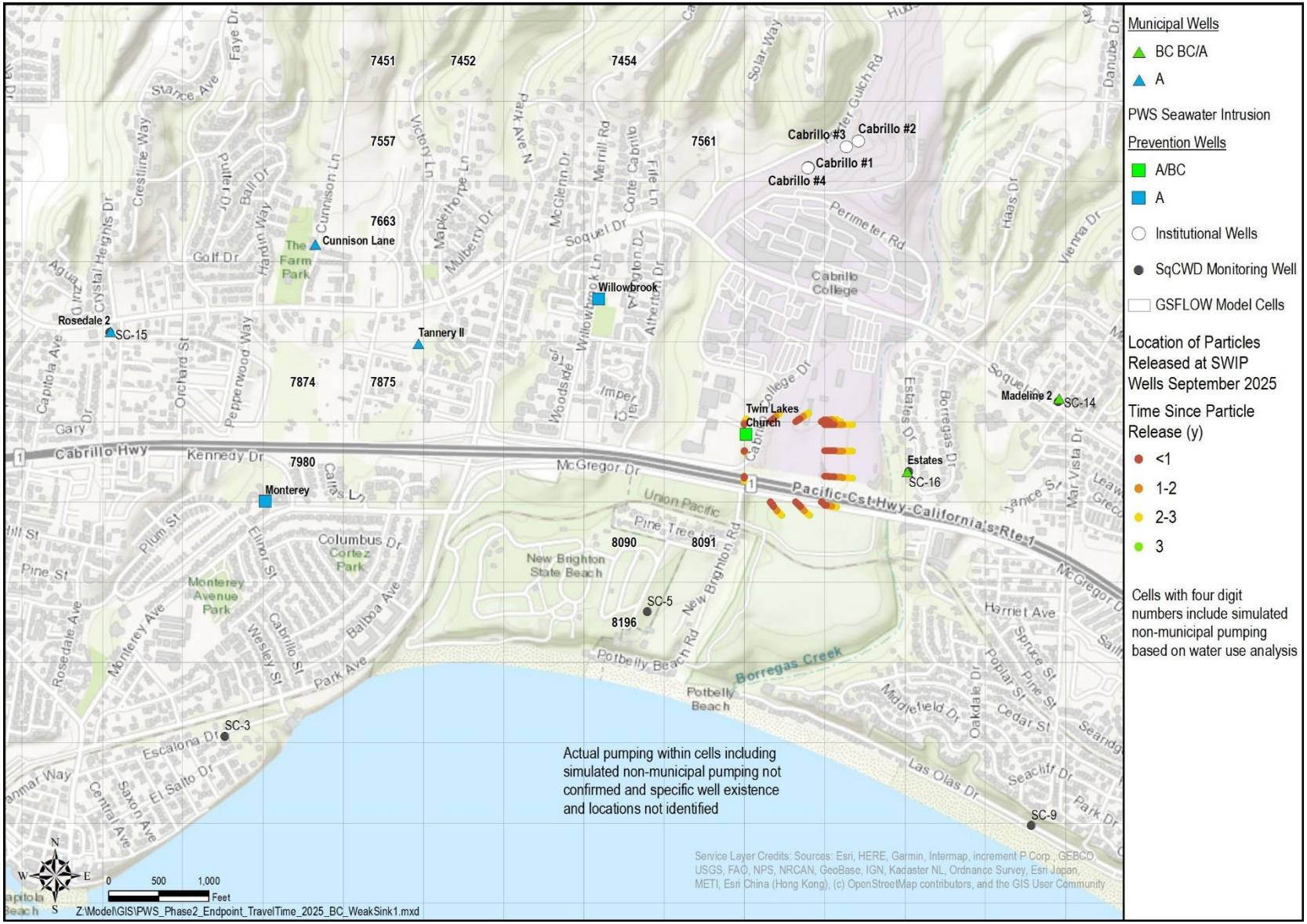

Figure 36. MODPATH Particle Tracking in Purisima BC Unit, End of Water Year 2025

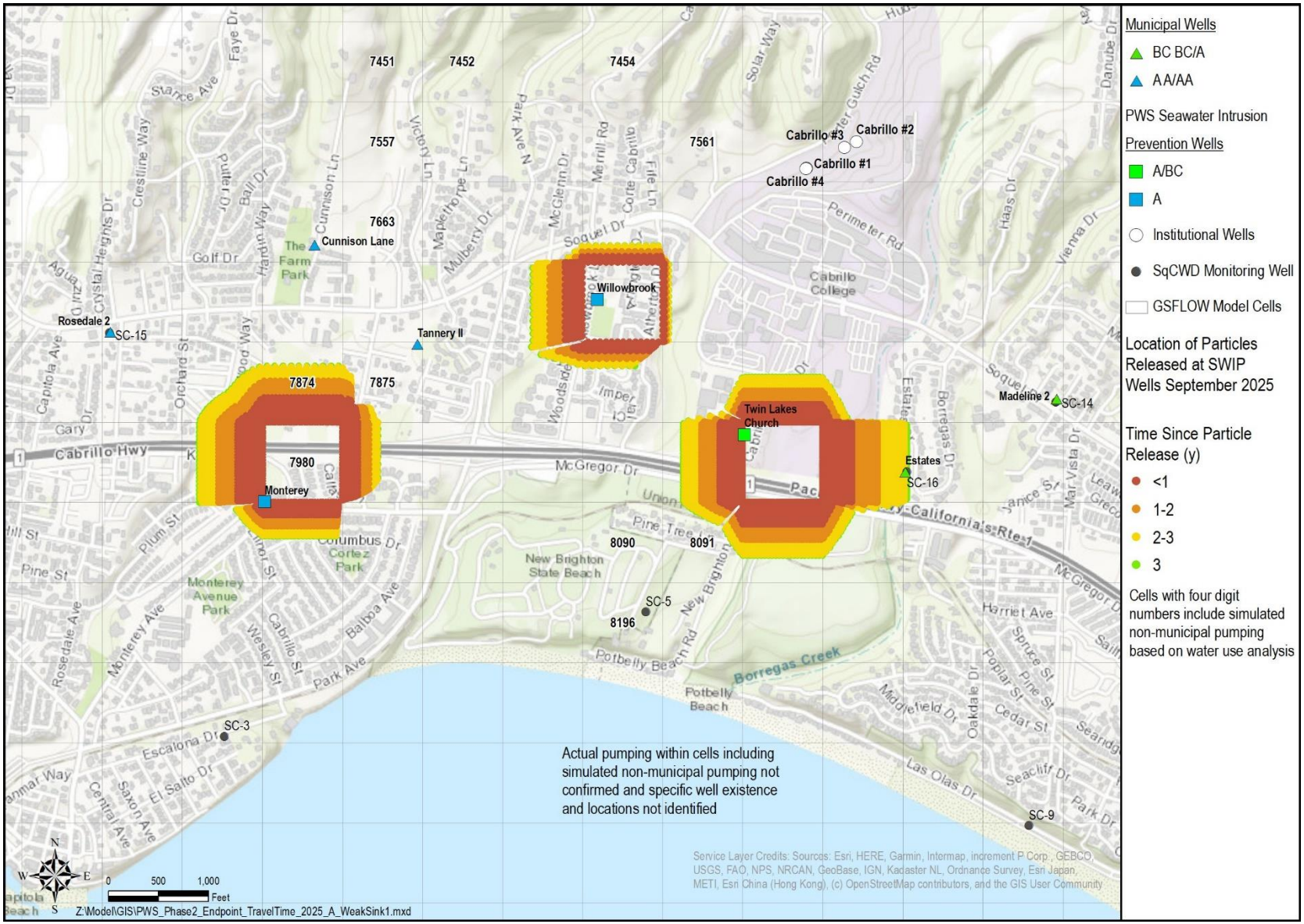

Figure 37. MODPATH Particle Tracking in Purisima A Unit, End of Water Year 2025

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6 RETENTION TIME ESTIMATES

Modeled retention time estimates are necessary for the purpose of siting SWIP wells during project planning to meet California regulations for Groundwater Replenishment with Recycled Water (GRR) until a tracer study is performed. The regulations provide different levels of credit for calculating virus log reductions and response times in Tables 60320.10 and 60320.124 as replicated in Table 9. Modeled retention time is the modeled travel time between recharge at a SWIP well and a production well. The credits are then multiplied by modeled retention time to calculate retention times for permitting purposes. The discussion below refers to travel times as time since recharge in the aquifer for water that has not reached a production well.

Table 9. Comparison of Retention Time Estimate Method and Corresponding Credits

METHOD USED TO ESTIMATE THE RETENTION TIME	VIRUS LOG REDUCTION AND RESPONSE TIME CREDIT PER MONTH
Numerical modeling consisting of calibrated finite element or finite difference models using validated and verified computer codes used for simulating groundwater flow.	0.50 month
Analytical modeling using existing academically-accepted equations such as Darcy's Law to estimate groundwater flow conditions based on simplifying aquifer assumptions.	0.25 month

As described above, the Basin Model is a calibrated numerical finite difference model using USGS GSFLOW code but does not have a grid discretization that will accurately represent travel times between wells, particularly on the shorter times scales required for permitting. Additionally, the coarse model grid cannot accurately reflect the steeper hydraulic gradients that would occur at sub-grid scales around recharge and pumping wells, which may have a large effect on short term travel times. Furthermore, the representation of the positions of the recharge and pumping wells within the Basin Model is limited to the wells being located at the center of the existing grid cells, which may be some distance away from the actual well locations. In the case of the Monterey and Tannery II wells and the TLC and Estates wells, for example, the separation distance between the actual positions of the wells is almost double the separation distance between the simulated positions at the center of the grid cells (Figure 37). Finally, the particles in the Basin Model particle tracking are released and captured at the edges of the grid cells containing the wells, rather than at their actual locations, which can result in either over- or under-estimation of the travel distance between the wells. These issues support the application of a refined particle tracking simulation approach to represent the inter-well retention times more precisely.

Refinement of the Basin Model grid itself is not a simple or straightforward process because the Basin model using GSFLOW requires setup of the integrated PRMS watershed component

model on the same grid and resolution as used for the MODFLOW groundwater model. Therefore, a refined particle tracking simulation is constructed based on the calibration of the Basin Model and simulates flows that are consistent with regional flow simulated by the Basin Model while more accurately representing well locations and near-well gradients as described in detail below. The 0.5 virus log reduction and response time credit per month that applies for the Basin Model should apply to retention times estimated by the refined particle tracking simulation. To provide additional support for this credit, a comparison of travel times estimated by the refined particle tracking simulation are compared to travel times based on MODPATH results for the Basin Model (Section 6.4) and an analytical equation that represents what would appropriately be assigned 0.25 virus log reduction and response time credit per month.

6.1 Modeling Refined Flow Fields for Particle Tracking

In order to address the technical challenges of using the relatively large 800x800 foot grid cell size of the Basin Model for estimating retention times, a methodology for modeling refined flow fields for particle tracking is developed and applied. This methodology incorporates the calibrated Basin Model results with an analytic element method (AEM) model that can represent local effects from Pure Water Soquel SWIP wells. A brief introduction to the AEM method is presented below, followed by description of the methodology and analysis results for estimating retention times.

The Analytic Element Method (AEM) is a numerical groundwater modeling approach, which like the finite-difference method (FDM) or finite element method (FEM), can be used to simulate relatively complex groundwater flow problems through the solution of the governing groundwater flow equations (Strack & Haitjema, 1981a,b; Strack, 1989; Haitjema, 1995). An analytic element is a mathematical function that is associated with a specific hydrologic feature to be modeled and which by itself is an exact solution to the governing groundwater water flow equation. Therefore, analytic elements are used to represent every hydrologic feature and stress in the model. Examples of analytic elements include pumping and wells, recharge areas, regional flow gradients, aquifer property heterogeneities, and flow barriers, etc.

To solve relatively complex groundwater flow problems, the AEM method mathematically combines the effects of multiple analytic elements using the principle of linear superposition. Based on this principle, the AEM method develops a system of simultaneous equations that is solved using standard numerical solvers. The solved system of equations results in calculations of groundwater head and discharge throughout the model domain. This is an advantage over the finite-difference and finite element method because the AEM method does not require discretizing the model domain into finite sized grid nodes or elements where model input and output are constrained to pre-determined and limited locations. For most flow problems, the AEM solution is exact at all locations and is mass conservative in contrast to finite-difference or

finite-element models where the accuracy of the solution may depend on the grid size. Anderson *et al.* (2015) describes AEM models as well suited for complex 2-dimensional flow problems. More information on AEM is provided in Appendix A. Conceptually, the approach developed for the refined flow field modeling uses the principle of linear superposition of solutions to the groundwater flow equations to combine regional predicted hydraulic heads from the GSFLOW Basin Model with local scale (near-field) hydraulic heads around the SWIP wells and selected pumping wells simulated by an AEM model . The hydraulic head results from the Basin Model are interpolated from the original 800x800 foot grid cells onto a finer numerical grid of 50x50 foot cells and combined with the AEM model results for the hydraulic heads associated with the modeled mounding and depression around the recharge and extraction wells and which have been evaluated on the same refined grid. The AEM model has the advantage that wells (represented by analytic elements) can be located at their actual real-world coordinates instead of at the centers of the coarser Basin Model grid cells.

The combined solution provides improved approximation of the near-field steeper hydraulic gradients around active recharge and pumping wells, consistency with the GSFLOW Basin Model results at the regional model grid scale, and provides a refined head grid suitable for two-dimensional particle tracking at a finer grid scale. A complete description of the refined particle tracking methodology and simulations is provided in Appendix A of this report, while a summary of the approach is provided below.

The following simplifying assumptions are made for the AEM modeling of the drawdown/mounding produced by each recharge and pumping well:

1. Flow can be approximated as being at steady-state during the period of interest (e.g. the hydraulic head field and pumping and recharge rate at each well are constant). For the purposes of particle tracking, the travel distance based on the average groundwater velocity is a valid approximation.

2. Flow is assumed to be two-dimensional, an assumption which is generally consistent with the Basin Model construction for the PWS project area where the aquifers of interest are modeled as individual layers separated by aquitards (HWRI, 2015), and the three-dimensional Basin Model MODPATH results show recharged water remains within the recharged aquifer unit;

3. The spatial variation (heterogeneity) in the aquifer transmissivity (the product of horizontal hydraulic conductivity and aquifer thickness), which can vary spatially between each 800x800 foot grid cell in the Basin Model, can be approximated by grouping grid cells of similar transmissivity value ranges into simplified polygonal zones. This is appropriate for the purposes of calculating the steady-state drawdown and draw-

up from the recharge and extraction wells because the hydraulic head field varies much more smoothly than the heterogeneous distribution of transmissivities.

The simulated recharge and municipal pumping rate schedules and simulated water level hydrographs from the Basin Model were reviewed and evaluated to identify a simulated water year near the beginning of the project during which gradients between SWIP wells and nearby pumping wells would be greatest and during which a steady-state approximation based on annual averages could be reasonably approximated for the purposes of flow modeling and particle tracking. It was determined that Water Year 2025 best fit these criteria. This water year is during a period when recharge rates and pumping rates at the municipal wells are highest and after those rates have been implemented for two years. This also corresponds to the period before the planned Cunnison Lane municipal well comes online. Gradients between SWIP wells and the nearest municipal wells are greatest during this period. Annually averaged recharge rates for each SWIP well and annually averaged extraction rates for each municipal pumping well in the PWS area from the Basin Model were calculated and used as inputs for the AEM Model. The percentage of total flow from/to each well distributed to each of the target aquifer units (Purisima BC and Purisima A) used are also consistent with the Basin Model simulations.

The hydraulic transmissivities in the Basin Model are not uniform spatially, and can vary by as much as an order of magnitude even within the local region of interest for this analysis, as shown for the BC unit in Figure 38 and for the A unit in Figure 39. This spatial variation (heterogeneity) in the aquifer transmissivity in the Basin Model was approximated in the AEM Model by grouping grid cells of similar ranges of transmissivity value into simplified polygonal transmissivity zones for the Purisima BC and A aquifer units. These averaged aquifer properties for each zone in both the BC and A units are shown in Table 10. This approach to representing the spatial heterogeneity of the transmissivity field through zones of spatially averaged properties is appropriate for the purposes of calculating the steady-state drawdown and draw-up from the recharge and extraction wells because the hydraulic head field varies much more smoothly than the heterogeneous distribution of transmissivities. For the actual particle tracking analysis, the full grid of actual aquifer hydraulic conductivity and aquifer thicknesses values from the Basin Model are used.

Table 10. Average Aquifer Properties Assigned to Each AEM Model Tranmissivity Zone for Each Aquifer Unit

	BC UNIT AQUIFER (LAYER 5)			A UNIT AQUIFER (LAYER 7)		
TRANSMISSIVITY ZONE	**AVERAGE[1] HORIZONTAL HYDRAULIC CONDUCTIVITY (FT/DAY)**	**AVERAGE[2] LAYER THICKNESS (FEET)**	**AVERAGE[1] TRANS-MISSIVITY (FT^2/DAY)**	**AVERAGE[1] HORIZONTAL HYDRAULIC CONDUCTIVITY (FT/DAY)**	**AVERAGE[2] LAYER THICKNESS (FEET)**	**AVERAGE[1] TRANS-MISSIVITY (FT^2/DAY)**
High Transmissivity Zone	6.7	190	1,273	11.9	271	3,221
Medium Transmissivity Zone	1.0	188	190	5.9	259	1,528
Background Transmissivity Zone	0.29	189	55	2.2	251	545

[1] Geometric mean (mean of the log_{10} transformed values) grid cells in zone

[2] Geometric mean of transmissivity of grid cells in zone divided by geometric mean of hydraulic conductivity of grid cells in zone

After calibration described in Appendix A, the AEM Model with the SWIP recharge and municipal pumping wells positioned at their real world coordinates rather than the centers of the Basin Model grid cells and to combine these AEM hydraulic heads with the regional flow field from the Basin Model simulations run with the local recharge and extraction wells turned off.

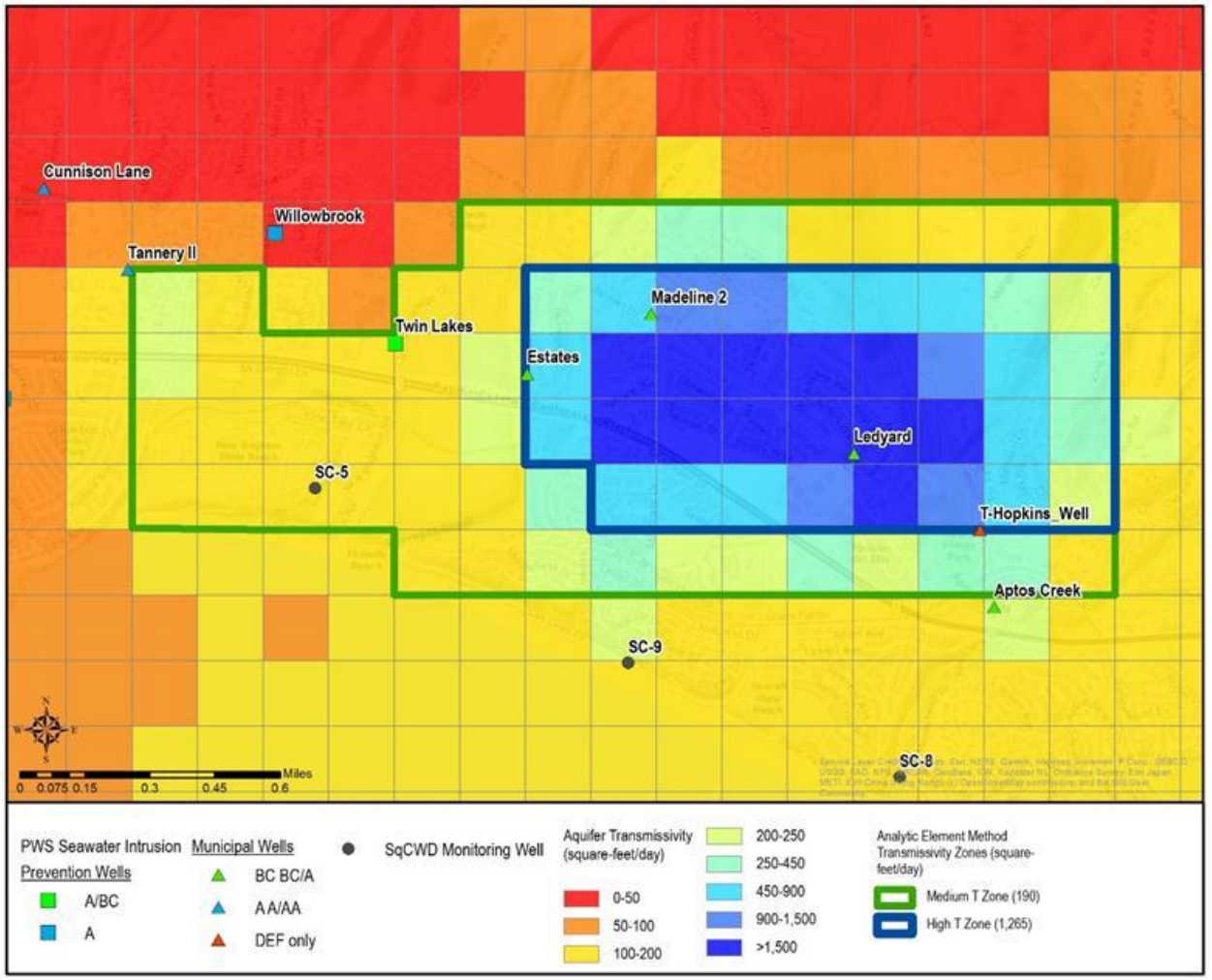

Figure 38. Basin Model Purisima BC Unit (Layer 5) Transmissivity Field and Boundaries of High- And Medium-Transmissivity Zones Defined for Use in Refined Particle Tracking

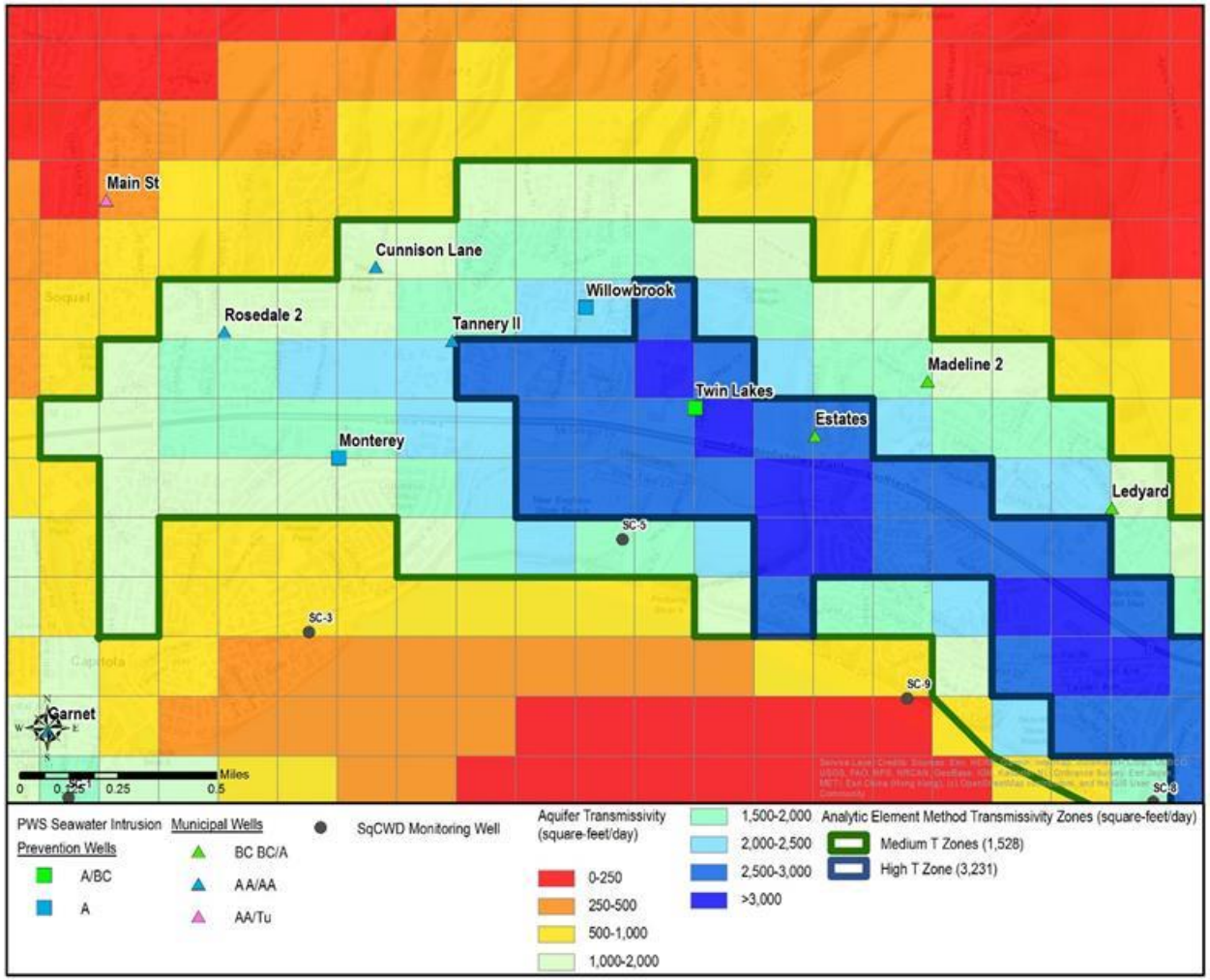

Figure 39. Basin Model Purisima A Unit (Layer 7) Transmissivity Field and Boundaries of High- and Medium-Transmissivity Zones Defined for Use in Refined Particle Tracking

6.2 Particle Tracking Analysis

Particle tracking analysis was carried out using the Groundwater Toolset in the ESRI ArcGIS Spatial Analyst Toolbox (ESRI, 2016). The Groundwater Toolset takes as inputs grids of steady state hydraulic head elevation values, effective porosities, and hydraulic conductivities. The analysis assumes two-dimensional, vertically mixed, horizontal, steady-state flow, though the hydraulic conductivity, aquifer thickness, and porosity can be spatially variable.

The effective porosity for each aquifer unit was assumed to be uniform throughout each layer, with an assigned effective porosity of 9% for the Purisima BC unit aquifer (model layer 5), and 13% for the Purisima A unit aquifer (model layer 7), consistent with the long term particle tracking conducted for the Basin Model using MODPATH. The spatially variable hydraulic conductivity and aquifer thickness grid for each aquifer unit was based on the horizontal hydraulic conductivities and model layer thicknesses from the respective model grid layers of the updated Basin Model. Basin Model hydraulic conductivities and layer thicknesses were mapped from the 800x800 foot regional model grid cells onto the 50x50 foot cell refined grid. Three hundred and sixty (360) particles where released around each of the proposed recharge wells in each aquifer unit, uniformly spread along a circle of 50-foot radius centered at the actual position of each proposed SWIP well. The released particles are tracked through the velocity field until they either enter a depression (such as the cone of depression of a pumping well), exit the grid, or the specified maximum travel time is reached, which for this analysis particles is three years.

6.3 Refined Particle Tracking Results

The 3-year particle tracks, color-coded by travel times of 0-6 months, 6-12 months, 12-18 months, 18-24 months, 24-30 months, and 30-36 months, are shown in Figure 40 and Figure 41 for the Purisima BC and A units, respectively. For both aquifers, the greatest rate of travel occurs in the first months when the particles experience the greatest hydraulic gradient closest to the SWIP wells. The particle velocities then begin to decrease logarithmically away from the SWIP recharge wells. In the A aquifer unit the particle travel distances are generally shortest around the Willowbrook SWIP well primarily due to the lower recharge rate as compared to the TLC and Monterey SWIP wells, although the fastest particles from all three wells have maximum 3-year travel distances on the order of 1,000 feet. By contrast, in the BC unit, the maximum 3-year particle travel distance is under 500 feet from the TLC SWIP well, attributable to the much lower recharge rate in the BC unit as well as the lower aquifer transmissivities.

No particles released at any of the SWIP wells in either the BC or A unit reach any municipal pumping wells within 3 years. In the BC unit, particles released at the TLC well travel only 30% of the distance to the Estates well, whereas particles released at TLC in the A unit travel 65% of

the distance to the Estates well, while particles released at the Willowbrook and Monterey SWIP wells travel on the order of only 50% the distance to the nearest municipal pumping wells.

Figure 40 shows that no particles released at the TLC SWIP well reaches any private domestic wells identified in the Monitoring Well Network Analysis (B&C, 2019) in the BC aquifer unit.

In the A aquifer unit (Figure 41) particles released from the Monterey SWIP well reach the locations of two assumed private domestic wells identified in the Monitoring Well Network Analysis (B&C, 2019) approximately 33 months into the three-year refined particle tracking period, as summarized in Table 11. The closest private domestic well to the Monterey SWIP well is screened to a depth of 360 feet and therefore extracts water from the Purisima A unit that the Monterey SWIP well would recharge.

On March 4, 2020, the District measured the depth of the private well closest to the Willowbrook SWIP well shown on Figure 40 at 130 feet below ground surface, which indicates that the well does not produce from the Purisima A unit that the Willowbrook SWIP well will recharge. Therefore, Figure 41 shows that particles released from the Willowbrook and TLC SWIP wells do not reach any identified private domestic well potentially in the Purisima A unit within 3 years.

Table 11. Travel Times in A Aquifer Unit To Assumed Locations Of Private Wells

SOURCE SWIP WELL	ASSUMED PRIVATE WELL LOCATION	DIRECTION FROM SWIP WELL	TRAVEL TIME (DAYS)	TRAVEL TIME (MONTHS)
Monterey	APN 3719112	NNE	1,009	33.2
Monterey	APN 3717109	NW	1,020	33.5

The average annual individual pumping rate for private domestic wells is estimated at 0.23 AF/yr (HWRI, 2017), which is several orders of magnitude lower than the rate in the municipal pumping wells. Therefore, the drawdown from individual private wells are not simulated in the analytic element modeling. In the Basin Model the estimated aggregate pumping of private wells within a grid cell is represented by a well centered at that grid cell. This aggregated non-municipal pumping is also incorporated in the refined particle tracking approach through the superposition of the regional Basin Model heads results, although the head gradients from this aggregated pumping are spatially averaged over the coarser Basin Model grid cell size

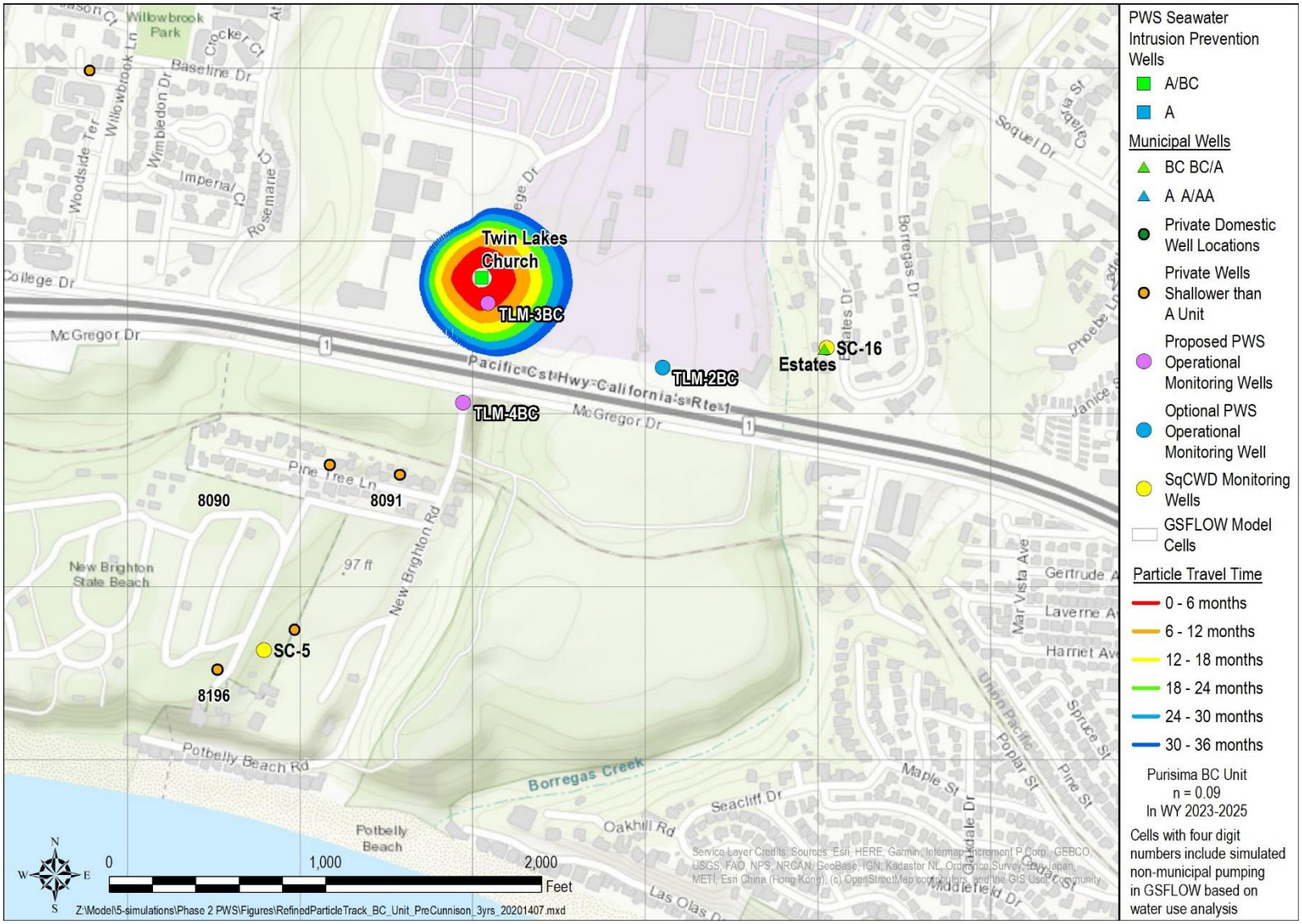

Figure 40. Refined Particle Tracking Results in Purisima BC Unit (Layer 5)

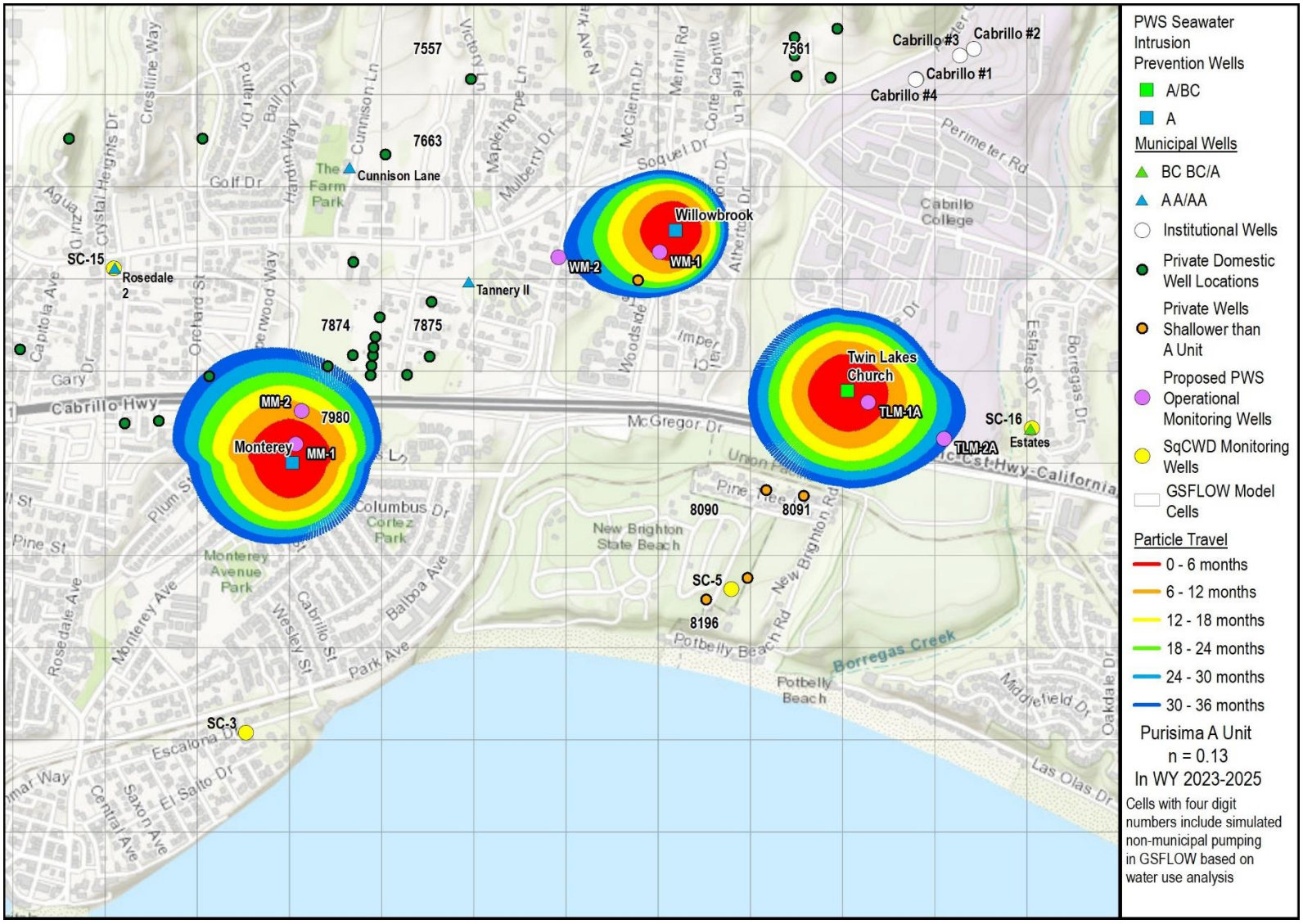

Figure 41. Refined Particle Tracking Results in Purisima A Unit (Layer 7)

6.4 Comparison of Retention Times with Other Methodologies

As described above, the refined particle tracking simulation is based on the Basin Model calibration and consistent with regional flow simulated by the Basin Model so the 0.5 credit should apply to travel times estimated by the refined particle tracking simulation. To provide additional context for this application, retention times are estimated based on MODPATH particle tracking for the Basin Model and analytical equations based on simplifying aquifer assumptions. These other methodologies are compared to refined particle tracking to demonstrate appropriateness of 0.5 credit for the refined particle tracking. Estimates using the analytical equations also are provided to demonstrate the robustness of proposed log reduction virus credits and monitoring well locations even when using a 0.25 credit.

6.4.1 Comparison with MODPATH Particle Tracking Simulation

Due to the 800x800 foot grid cell size of the Basin Model, retention times directly estimated from the MODPATH particle tracking simulation should not be used because they do not represent actual well locations. However, the average particle velocities for particles captured at model cells with production wells simulated in the Basin Model can be used to compare to methods that account for actual distances between wells. For this comparison, average particle velocities for particles captured by wells by the end of Water Year 2025 in the MODPATH simulation (Table 8) are multiplied by the actual distance between the Twin Lakes Church SWIP well and the Estates production well to calculate an equivalent retention time between the wells as shown in Table 12. The retention time estimated through the refined particle tracking analysis is also shown on Table 12 for comparison.

Table 12. Equivalent Retention Times Based on Average Particle Velocities from MODPATH and Actual Distances Between Wells vs. Refined Particle Tracking

AQUIFER	CAPTURE WELL	SWIP WELL	DISTANCE (FT)	METHOD	AVERAGE PARTICLE VELOCITY (FT/D)	EQUIVALENT RETENTION TIME (YEARS)
Purisima A	Estates	TLC	1,653	MODPATH	0.77	5.9
				REFINED PARTICLE TRACKING	0.98	4.6

Equivalent retention times based on actual distances are greater than 3 years consistent with results of the refined particle tracking simulation. The average particle velocities from MODPATH are slower than average particle velocities from the refined particle tracking

simulation because the refined particle tracking simulation simulates steeper gradients near the wells at scales less than 800 feet while MODPATH does not. The refined particle tracking simulation therefore estimates shorter retention times than relying only on the Basin Model using MODPATH would. Therefore, results from the refined particle tracking should not have a smaller credit than using only the Basin Model.

6.4.2 Comparison with Using Analytical Equations

In addition to the efforts based on the Basin Model (both MODPATH and refined particle tracking) described previously, retention times between pumping and recharge wells can also be estimated using analytical equations that are solutions of Darcy's law for simplified conditions, although this approach would qualify for only a 0.25 credit (Table 9). One such analytical solution is described by Luo & Kitanidis (2004) for the shortest travel time between a single recharge and extraction well pair operating in a uniform regional gradient. This analytical solution relies on a number of simplifying assumptions, including a homogenous aquifer of uniform conductivity and thickness between the two wells, and that both wells are pumping at equal and opposite pumping rates (i.e. $+Q_w$ and $-Q_w$). The solution assumes that only those two wells are pumping and does not account for effects of additional pumping or recharge wells that MODPATH or the refined particle tracking does.

To apply this analytical solution, we consider that flow in the proximity of the SWIP and production wells is driven almost exclusively by steep local gradients developed by recharge and extraction. Hydraulic gradients near the recharge and extraction wells are orders of magnitude larger than regional background gradients. Therefore, for the purpose of estimates with analytical equations, background regional gradients are assumed to be negligible in the time frame of interest. For permitting purposes, the analytical result for the time of first breakthrough between the two wells is adopted. Time of first breakthrough describes the minimum amount of travel time between the recharge and pumping well. Equation 2 below describes the time of first breakthrough between a pumping and recharge pair in absence of a significant regional flow field.

$$t = \frac{4\pi n b}{3} * \frac{d^2}{Q_w} \qquad (2)$$

Where: n = aquifer porosity, b = aquifer thickness, d = ½ the distance between the two wells, and Q_w is the absolute value of the pumping or recharge rate. The variable Q_w represents the equal-opposite pumping and recharge assumed by the analytical solution. Note that hydraulic conductivity is not included in the equation as it drops out in the solution derivation for the simplifying assumption of a homogeneous aquifer; this is consistent with equations presented by U.S. Environmental Protection Agency (USEPA) for travel time estimates (USEPA, 1987).

As the well pairs are not recharging and pumping at equal rates in actuality, three estimated breakthrough times are calculated using the minimum, maximum, and mean pumping rates between the SWIP recharge well and the pumping well in order to provide an upper and lower bound range over which the time of first breakthrough may occur. The analytical solution was calculated using the distance and aquifer parameters between the TLC and Estates wells in the Purisima A unit, as this area constitutes the shortest distance between a municipal pumping and recharge well in the Basin. The equal-opposite pumping rate requirement as well as the limitation to only a single active recharge-extraction well pair for these analytical estimations poses a significant limitation, further necessitating the application of refined particle tracking approach to more accurately portray pumping rates and associated head gradients.

The results from the estimates based on the analytical equation correlate well with outcomes from both the AEM method and the MODPATH particle tracking estimation. The estimates for retention times based on the analytical equation are presented in Table 13 below for the TLC and Estates well pair. The range of retention time estimates based on the analytic equation (3.6 to 5.4 years) are a bit faster than equivalent retention times based on MODPATH particle tracking (Table 12) due to the analytical equation representing the faster velocities that occur because of the steeper gradients near the wells, unlike the MODPATH simulation which cannot represent these because of the coarse grid size. The estimates based on analytical equation bracket the retention time and particle velocities estimated from the refined particle tracking simulation. However, using the analytical equation qualifies for only 0.25 virus log reduction and response time credit per month because it does not incorporate the calibrated parameter field of the Basin Model, does not represent differential rates of recharge and pumping, does not represent multiple recharge and pumping wells, and is not consistent with the regional flow of the Basin Model. The refined particle tracking simulation is consistent with the Basin Model in these aspects and therefore should qualify for 0.5 virus log reduction and response time credit per month.

Table 13. Estimates of Retention Time from TLC to Estates for Range of Qw Values using Analytical Equations

$\lvert Q_w \rvert$ (AF/YR)	TRAVEL TIME TO ESTATES (YEARS)
$Q_{ESTATES}$ = 430	5.4
Mean(Q_{TLC}, $Q_{ESTATES}$) = 560	4.4
Q_{TLC} = 690	3.6

6.4.3 Estimates with Analytical Equations for a 0.25 Credit

The analytical solution by Luo and Kitanidis (2004) can be used to estimate retention times to demonstrate the robustness of well locations for meeting GRR regulations even when using a 0.25 credit. As the analytical equation does not rely on hydraulic conductivity, the estimates apply for any range of hydraulic conductivities. The 0.25 credit provides a margin of safety for

uncertainties of parameters included in the equation and a tracer test will also be performed to demonstrate retention times.

The analytical equation is used to estimate retention times from each SWIP well to the nearest drinking water well and planned monitoring wells (Figure 40 and Figure 41) Where the nearest drinking water well is a SqCWD production well, retention time is estimated based on the average of absolute values of the recharge flow at the SWIP well and pumping flow at the SqCWD production well. As monitoring wells and private domestic wells have no or much smaller pumping than SWIP well recharge flows, pumping at these wells do not affect the gradient from the SWIP well significantly. Therefore, retention times are calculated using analytical equation (equation 3) based on the well pair being the SWIP well and the municipal production well in the same general direction as the monitoring well or private domestic well derived from Luo and Kitanidis (2004). The analytical equation calculates the retention time along the steepest gradient between the wells and will conservatively underestimate retention times to wells that are not directly between the SWIP well and the municipal production well.

$$t = \pi n b * \frac{d^2}{Q_w} * \left[\frac{2}{3} - \frac{d-R}{d} + \frac{1}{3}\frac{(d-R)^3}{d^3}\right] \quad (3)$$

Where: n = aquifer porosity, b = aquifer thickness, d = ½ the distance between the two wells, R=distance between the recharge well and the monitoring well, and Q_w is the absolute value of the pumping or recharge rate with the average between the pumping and recharge rate used.

In the cases of Pine Tree mutual company wells and the proposed monitoring wells TLM-3BC and TLM-4BC south of the Twin Lakes Church well, there is no SqCWD production well in that direction so equation 4 (USEPA, 1987) is used assuming only recharge at the SWIP well drives the gradient.

$$t = \pi n b * \frac{R^2}{Q_w} \quad (4)$$

Equation 4 is also used if using it estimates a shorter retention time than using equation 3 with the average rate recharge-municipal well pair. This occurs when municipal extraction from the aquifer unit is substantially lower than the recharge rate and retention times should therefore be driven by the full recharge rate. Both equations 3 and 4 assume that regional background flow gradients are negligible in comparison to the recharge and pumping induced gradients.

Table 14 shows the estimated retention times using the analytical equations compared to the refined particle tracking. The shortest estimated retention time between a SWIP well and a drinking water well is 25 months between Monterey and APN 371911 and given the nature of the conservative assumptions used is generally consistent with the refined particle tracking modeling results of 33 months. Applying a 0.25 credit to this estimate using the analytical equation results in a minimum retention time of 6.25 months, so a log-reduction virus credit of 6 months is supported.

The estimated retention times in Table 14 also support monitoring well locations (Figure 40 and Figure 41)for meeting GRR regulations. Table 15 shows the requirements for monitoring well locations in GRRP regulations sections 60320.224 and 60320.226 and translates the requirements to estimates of retention times based on refined particle tracking results and analytical equations. Monitoring well locations are not based on applying credits, but retention times need to confirmed by a tracer study. Table 15 lists the monitoring wells that meet each requirement.

Table 14. Estimates of Retention Times based on Analytical Equations Compared to Refined Particle Tracking

SWIP Well	Purisima Aquifer Unit(s)	Closest Municipal Well in Direction of Flow	Approx. Distance from SWIP Well (feet)	Drinking Water Well or Proposed Monitoring Well	Approximate Distance from SWIP Well (feet)	Refined Particle Tracking	Analytical Equations	
						Estimated Retention Time from SWIP Well (months, unless weeks indicated)	Estimated Retention Time from SWIP Well (months, unless weeks indicated)	Estimated Retention Time Upgradient of Nearest Drinking Water Well (months)
Monterey	A	Tannery II	2200	Tannery II	2200	>36	68	Downgradient
				APN 3719112	900	33	25	0
				APN 3717109	1050	34	31	Not upgradient
				MM-1	180	5 weeks	6 weeks	24
				MM-2	460	9	8	17
Willowbrook	A	Tannery II	1770	Tannery II	1770	>36	72	0
				WM-1	230	4	3	69
				WM-2	1040	>36	46	26
Twin Lakes Church	A	Estates	1630	Estates	1630	>36	52	0
				TLM-1A	200	9 weeks	9 weeks*	50
				TLM-2A	950	32	33	19
Twin Lakes Church	BC	Estates	1630	Estates	1630	>36	456	0
				TLM-2BC	950	>36	252*	204
Twin Lakes Church	BC	None	N/A	Pine Tree Lane Wells	1,000	>36	280	0
				TLM-3BC	160	4	7	273
				TLM-4BC	580	>36	94	186

* Based on equation 4 using recharge rate only, which results in shorter retention time than equation 3 using average of recharge and municipal pumping rates.

Table 15. Retention Time Requirements for Pure Water Soquel Monitoring Wells

GRRP Requirement	SWIP Well	Monitoring Wells Meeting Requirement	
		Refined Particle Tracking	Analytical Equations
no less than two weeks but no more than six months of travel time from the GRRP, AND at least 30 days upgradient of the nearest drinking water well.	Monterey	MM-1	MM-1
	Willowbrook	WM-1	WM-1
	Twin Lakes Church (A unit)	TLM-1A	TLM-1A
	Twin Lakes Church (BC unit)	TLM-3BC	None
Provide a response retention time of no less than 2 months (at least 2 months upgradient of the nearest drinking water well)	Monterey	MM-1, MM-2	MM-1,MM-2
	Willowbrook	WM-1, WM-2	WM-1,WM-2
	Twin Lakes Church (A unit)	TLM-1A, TLM-2A	TLM-1A,TLM-2A
	Twin Lakes Church (BC unit)	TLM-3BC, TLM-4BC	TLM-2BC, TLM-3BC,TLM-4BC

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8 ACRONYMS & ABBREVIATIONS

AEM.....Analytic Element Method
AF/yr .....acre-feet per year
B&C .....Brown and Caldwell
bgs……..below ground surface
DWR .....California Department of Water Resources
EIR .....Environmental Impact Report
HFB.....MODFLOW Horizontal Flow Barrier Package
GRR……Groundwater Replenishment with Recycled Water
GSP .....Groundwater Sustainability Plan
gpm .....gallons per minute
M&A .....Montgomery and Associates
MGA .....Santa Cruz Mid-County Groundwater Agency
MNW2 .....MODFLOW Multi-Node Well 2 Package
msl……..mean sea level
NGVD 29…..National Geodetic Vertical Datum of 1929
PWS .....Pure Water Soquel
SCWD.....City of Santa Cruz Water Department
SMC .....sustainable management criteria
SqCWD.....Soquel Creek Water District
SWIP .....seawater intrusion prevention
USGS .....United States Geological Survey
UWMP .....Urban Water Management Plan

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

Appendix A

Pure Water Soquel Phase 2 Modeling: Refined Particle Tracking Simulations

MONTGOMERY & ASSOCIATES

Contents

1 INTRODUCTION 1
2 METHODOLOGY FOR CALCULATING REFINED FLOW FIELDS FOR PARTICLE TRACKING 2
2.1 Refined Modeling Approach 2
2.2 Refined Modeling Tools 3
2.3 Refined Modeling Assumptions 4
3 BASIN MODEL INFORMATION USED FOR REFINED PARTICLE TRACKING 5
3.1 Selection of Steady State Simulation Period from the Basin Model 5
3.2 Two-Dimensional Flow Output from Basin Model 6
3.3 Representation of Aquifer Parameters for Simulation of Inter-Well Gradients 10
4 ANALYTIC ELEMENT METHOD MODEL 13
4.1 Model Setup 13
4.2 AEM Model Calibration 13
4.3 AEM Superposition at Actual Well Locations 17
5 PARTICLE TRACKING ANALYSIS 20
5.1 Methodology 20
5.2 Refined Particle Tracking Results 20
6 REFERENCES 24
7 ACRONYMS & ABBREVIATIONS 26

Tables

Table 1. Average Simulated Recharge and Extraction Rates Allocated by Model Layer for Water Year 20246
Table 2. Average aquifer properties assigned to each AEM Model tranmissivity zone for each aquifer unit. 10
Table 3. Travel times in A Aquifer unit to assumed locations of private wells 21

Figures

Figure 1. GSFLOW Basin Model processing results for the Purisima BC Unit (Basin Model layer 5), showing annually averaged simulated hydraulic head contours for WY 2025, in feet MSL (at two-foot contour intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. Easting and Northing coordinate scale in feet. 8
Figure 2. GSFLOW Basin Model processing results for the Purisima A Unit (Basin Model layer 7), showing annually averaged simulated hydraulic head contours for WY 2025, in feet MSL (at two-foot contour intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green

represents higher head values and darker blue represents lower heads. Easting and Northing coordinate scale in feet. 9
Figure 3. Basin Model Purisima BC Unit (Layer 5) transmissivity field and boundaries of high- and medium-transmissivity zones defined for use in AEM Model 11
Figure 4. Basin Model Purisima A Unit (Layer 7) transmissivity field and boundaries of high- and medium-transmissivity zones defined for use in AEM Model 12
Figure 5. Results of AEM Model calibration process for Purisima BC Unit (Basin Model Layer 5) with wells located at centers of Basin Model grid cell locations. Head contours in feet MSL shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. 15
Figure 6. Results of AEM Model calibration process for Purisima A Unit (Basin Model Layer 7) with wells located at centers of Basin Model grid cell locations. Head contours in feet MSL shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. 16
Figure 7. Results of refined AEM Model for Purisima BC Unit (Basin Model Layer5) with wells located at actual positions (as opposed to center of Basin Model grid cells). Head contours in feet MSL are are shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. . 18
Figure 8. Results of refined AEM Model for Purisima A Unit (Basin Model Layer 7) with wells located at actual positions (as opposed to center of Basin Model grid cells). Head contours in feet MSL are are shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. . 19
Figure 9. Refined particle tracking results in Purisima BC Unit (Basin Model layer 5), showing three-year particle paths color-coded by travel time for pumping and recharge rates representative of WY2025 averages..... 22
Figure 10. Refined particle tracking results in Purisima A Unit (Basin Model layer 7), showing three-year particle paths color-coded by travel time for pumping and recharge rates representative of WY2025 averages..... 23

1 INTRODUCTION

Modeled retention time estimates are necessary for the purpose of siting Pure Water Soquel (PWS) Seawater Intrusion Prevention (SWIP) wells during project planning to meet California regulations for Groundwater Replenishment with Recycled Water until a tracer study is performed. Modeled retention time is the modeled travel time between recharge at a SWIP well and a production well. The discussion below refers to travel times as time since recharge in the aquifer for water that has not reached a production well.

The Basin Model used to evaluate the PWS project is a calibrated numerical finite difference model using the USGS GSFLOW code, but does not have a grid discretization that will accurately represent retention times between wells. The Basin Model utilizes an 800x800 foot grid cell size, which is relatively large with respect to short term groundwater travel times on the time scale of months. This reduces the ability of the Basin Model to show travel times on the shorter times scales required for permitting. Additionally, the coarse model grid cannot accurately reflect the steeper hydraulic gradients that would occur at sub-grid scales around recharge and pumping wells, which may have a large effect on short term travel times. Furthermore, the representation of the positions of the recharge and pumping wells within the Basin Model is limited to the wells being located at the center of the existing grid cells, which may be some distance away from the actual well locations. In the case of the Monterey and Tannery II wells and the Twin Lakes Church (TLC) and Estates wells, for example, the separation distance between the actual positions of the wells is almost double the separation distance between the simulated positions at the center of the grid cells. Finally, the particles in the Basin Model particle tracking are released and captured at the edges of the grid cells containing the wells, rather than at their actual locations, which can result in either over- or under-estimation of the travel distance between the wells. These issues support the application of a refined particle tracking simulation approach to more precisely represent the inter-well retention times.

As described in detail below, the refined particle tracking simulation is constructed based on the calibration of the Basin Model and simulates flows that are consistent with regional flow simulated by the Basin Model while more accurately representing well locations and near-well gradients.

2 METHODOLOGY FOR CALCULATING REFINED FLOW FIELDS FOR PARTICLE TRACKING

In order to address technical challenges of using the relatively large 800x800 foot grid cell size of the Basin Model for estimating retention times, a methodology for refining flow fields for particle tracking is developed and applied. This methodology incorporates the Basin Model results with analytic elements that can represent local effects from Pure Water Soquel SWIP wells. The methodology and analysis results are presented below.

2.1 Refined Modeling Approach

Conceptually, the approach uses the principle of linear superposition of solutions to the groundwater flow equations to combine regional predicted hydraulic heads from the GSFLOW Basin Model with local scale (near-field) hydraulic heads around the SWIP wells and selected pumping wells simulated by the analytic element method (AEM). The hydraulic head results from the Basin Model are interpolated onto a finer numerical grid and combined with AEM results for the hydraulic heads associated with the mounding/depression around recharge/extraction wells (termed "analytic elements"), and which have been evaluated on the same refined grid. The analytic elements have the advantage that they can be defined with the wells located at their actual real-world coordinates instead of at the centers of the Basin Model grid cells.

A brief introduction to the analytic element method is warranted. The analytic element method is a numerical groundwater modeling approach, which like the finite-difference method (FDM) or finite element method (FEM), can be used to simulate relatively complex groundwater flow problems through the solution of the governing groundwater flow equations. The method was introduced by Professor Otto Strack and co-workers (Strack & Haitjema, 1981a,b), and the theoretical framework and application of the method is comprehensively documented in text books by these authors (Strack, 1989; Haitjema, 1995). An analytic element is a mathematical function that is associated with a particular hydrologic feature to be modeled and which by itself is an exact solution to the governing groundwater water flow equation. The solved system of equations results in composite equations for the groundwater head and discharge throughout the model domain.

In order to solve relatively complex groundwater flow problems, the AEM method mathematically combines the effects of multiple analytic elements using the principle of linear superposition. Based on this principle, the AEM method develops a system of simultaneous equations that is solved using standard numerical solvers. As there can be many (sometimes thousands) analytic elements, the AEM method requires solving a system of many (such as

thousands) simultaneous equations. The solved system of equations results in calculations of groundwater head and discharge throughout the model domain. This is an advantage over the finite-difference and finite element method because the AEM method does not require discretizing the model domain into finite sized grid nodes or elements where model input and output are constrained to pre-determined and limited locations. For most flow problems, the AEM solution is exact at all locations and is mass conservative in contrast to finite-difference or finite-element models where the accuracy of the solution may depend on the grid size.

Anderson *et al.* (2015) describes AEM models as well suited for complex 2-dimensional flow problems and new analytic elements to represent additional hydrologic features and stresses continue to be developed. There are a wide range of commercial and open-source AEM software packages available, including AnAqSim, GFLOW, TIMML, and WhAEM , the U.S. EPA modeling code developed for modeling and delineation of well head protection zones in support of Wellhead Protection Programs (WHPP), and Source Water Assessment Planning for public water supplies in the United States.

To avoid "double-counting" of the mounds/cones of impression/depression around the recharge and extraction wells from both the Basin Model and the analytic elements, the Basin Model is first re-run with the recharge rates and the extraction rates of the closest pumping wells set to zero, but with all other model inputs unchanged. This produces a head surface to which the analytic elements for the head contribution from the recharge wells and local pumping wells are added back in.

The combined solution provides improved approximation of the near-field steeper hydraulic gradients around active recharge and pumping wells, consistency with the GSFLOW Basin Model results at the regional model grid scale, and provides a refined head grid suitable for two-dimensional particle tracking at a finer grid scale.

2.2 Refined Modeling Tools

The data processing, refined grid interpolation, AEM modeling, and particle tracking, were performed using the SciPy Python scientific programming framework (Jones *et al*., 2001), with the following specialized Python modules:

- GSFLOW model results were processed with the USGS FloPy module for working with MODFLOW datasets (Bakker *et al*., 2016; 2018),
- AEM modeling of the recharge and pumping wells was performed using the TimML Python module for multi-layer analytic element groundwater modeling (Bakker & Strack, 2003; Bakker, 2010)

- Particle tracking was performed using the ESRI ArcGIS Spatial Analyst Groundwater Toolset accessed via the ArcPy module (ESRI, 2016).

2.3 Refined Modeling Assumptions

The following simplifying assumptions were made for the analytic element modeling of the drawdown/mounding produced by each recharge and pumping well:

1. Flow can be approximated as being at steady-state during the period of interest (e.g. the hydraulic head field and pumping and recharge rate at each well are constant). For the purposes of particle tracking, the travel distance based on the average groundwater velocity is a valid approximation.

2. Flow is assumed to be two-dimensional, an assumption which is generally consistent with the Basin Model construction where the aquifers of interest are modeled as individual layers separated by aquitards (HWRI, 2015), and the three-dimensional Basin Model MODPATH particle tracking results also show injected water remains within the injected aquifer unit (M&A, 2019b);

3. The spatial variation (heterogeneity) in the aquifer transmissivity (the product of horizontal hydraulic conductivity and aquifer thickness), which can vary spatially between each 800x800 foot grid cell in the Basin Model, can be approximated by grouping grid cells of similar transmissivity value ranges into simplified polygonal zones. This is appropriate for the purposes of calculating the steady-state drawdown and draw-up from the recharge and extraction wells because the hydraulic head field varies much more smoothly than the heterogeneous distribution of transmissivities.

The following section discusses the application of these assumptions based on the Basin Model.

3 BASIN MODEL INFORMATION USED FOR REFINED PARTICLE TRACKING

The refined particle tracking simulation is based on information from the Basin Model as follows.

3.1 Selection of Steady State Simulation Period from the Basin Model

The Basin Model was used to simulate potential recharge and pumping conditions between Water Year (WY) 2016 and WY 2069. The simulated recharge and municipal pumping rate schedules and simulated water level hydrographs from the Basin Model were reviewed and evaluated to identify a simulated water year near the beginning of the project during which gradients between recharge wells and nearby pumping wells would be greatest and during which a steady-state approximation based on annual averages could be reasonably approximated for the purposes of flow modeling and particle tracking. It was determined that WY 2025, running from October 1st, 2024 through September 30th, 2025, was found to best fit these criteria. This water year is during a period when recharge rates and pumping rates are highest and after those rates have been implemented for two years. This also corresponds to the period before the Cunnison Lane production well comes online, and during which the pumping rates at each well are higher because the total pumping is distributed over fewer wells. This represents conditions when gradients between the SWIP recharge wells and municipal pumping wells are greatest as pumping is distributed among fewer municipal wells.

During WY 2025 the simulated PWS SWIP wells recharge rates are constant. The pumping rates of the nearby municipal wells vary seasonally throughout the year, in a sinusoidal pattern such that end of year pumping rates are similar to the beginning year. The local hydraulic heads during this period also vary sinusoidally according to the seasonal pumping cycle, with gradients steepening during higher pumping, and becoming shallower during lowest pumping. The groundwater velocities around each well will also vary sinusoidally throughout the year with equal periods of faster and slower water movement. As stated above, the travel distance based on the average groundwater velocity is a valid approximation for the purposes of particle tracking. For this reason, the use of a steady-state approximation based on the annually averaged pumping rates and annually averaged hydraulic head field is a reasonable approximation for this analysis.

Table 1 shows the annually averaged recharge rates for each SWIP well and averaged extraction rate for each municipal pumping well in the PWS area from the Basin Model. The table also shows the amount and percentage of total flow from/to each well distributed to each of the target aquifer units (Purisima BC and Purisima A) in the Basin Model simulations. Note that for

extraction wells screened across multiple aquifers, the total percentage of flow distribution may not add to 100% because some flow is coming from other aquifer units.

Table 1. Average Simulated Recharge and Extraction Rates Allocated by Model Layer for Water Year 2024

	FLOW RATE (AF/YR)[1]			PERCENT OF TOTAL RATE[2]	
WELL NAME	BC AQUIFER (LAYER 5)	A AQUIFER (LAYER 7)	TOTAL	BC AQUIFER (LAYER 5)	A AQUIFER (LAYER 7)
Monterey SWIP Well	0	500	500	0%	100%
Twin Lakes Church SWIP Well	53	689	742	7%	93%
Willowbrook SWIP Well	0	233	233	0%	100%
Estates Well	-5	-460	-465	1%	99%
Rosedale 2 Well	0	-417	-543	0%	77%
Cunnison Lane Well	0	0	0	0%	0%
Tannery Well II	0	-665	-689	0%	97%
Madeline 2 Well	-98	0	-98	100%	0%

[1] Positive flow rates indicate recharge, negative flow rates indicate extraction
[2] Total rate for pumping wells may include pumping from other model layers so totals may not add up to 100%

3.2 Two-Dimensional Flow Output from Basin Model

During this step the PWS Basin Model predictive simulations were re-run with both the SWIP recharge wells and closest active pumping wells (Estates, Rosedale 2, Tannery II, and Madeline 2) turned off. All other extraction well pumping rates and other inputs remained consistent with the PWS simulations. The resulting head values for the layer for each stress period are output and represent the heads with no replenishment from the SWIP wells and no extraction from the closest municipal wells, and will be referred to as the "Wells-Off" model runs. The PWS simulations run with the recharge and local pumping wells turned on will be referred to as the "Wells-On" Basin Model runs. In the Wells-On results, the SWIP wells and municipal pumping wells are positioned at the centers of the Basin Model grid cells, rather than at their actual real-world coordinates, because of the coarser grid size.

For the region of interest in the model layers that represent the Purisima BC and A unit aquifers, the simulated groundwater GSFLOW Basin Model results for each one-month stress period during WY 2025 from both the Wells-On and the Wells-Off simulations were used to calculate the average hydraulic head at each grid cell for that water year. The annually averaged Wells-Off heads were subtracted from the Wells-On heads to produce a grid of head values representing only the changes in groundwater heads (mounding and draw-down) due to the SWIP recharge wells and

local municipal pumping wells, with the impact of all further away pumping wells and regional flow gradients removed. This head difference map will be referred to as the "Wells-Only" results. The Wells-Only head results are based on the recharge and municipal pumping wells positioned at the center of the corresponding nearest Basin Model grid cell, rather than the actual real-world coordinates.

The annually averaged hydraulic heads for the Wells-Off, the Wells-On, and Wells-Only results from the coarser 800x800 foot grid cell Basin Model grid were then interpolated onto a refined grid with 50x50 foot grid cells using the radial basis function interpolation method.

The results of these steps for the Purisima BC unit are shown in Figure 2Figure 1 and for the Purisima A unit in Figure 2, which show (from top to bottom) the contours of the annually averaged head results with the wells turned on ("GSFLOW Wells On"); followed by the annually averaged contours of head from the GSFLOW run with the local pumping and SWIP recharge wells turned off ("GSFLOW Wells Off"); and at the bottom, the difference of those two showing only the drawdown (or mounding) due to the active wells in the region of interest with background regional gradients removed ("GSFLOW Wells Only"). The contours are in units of feet above mean sea level (ft MSL) with a contour interval of two feet and lighter green represents higher head values (e.g. mounding around TLC well). The centers of 800x800 foot GSFLOW grid cells are shown as blue dots. The smooth contours were calculated using radial basis function interpolation on the refined 50x50 foot grid.

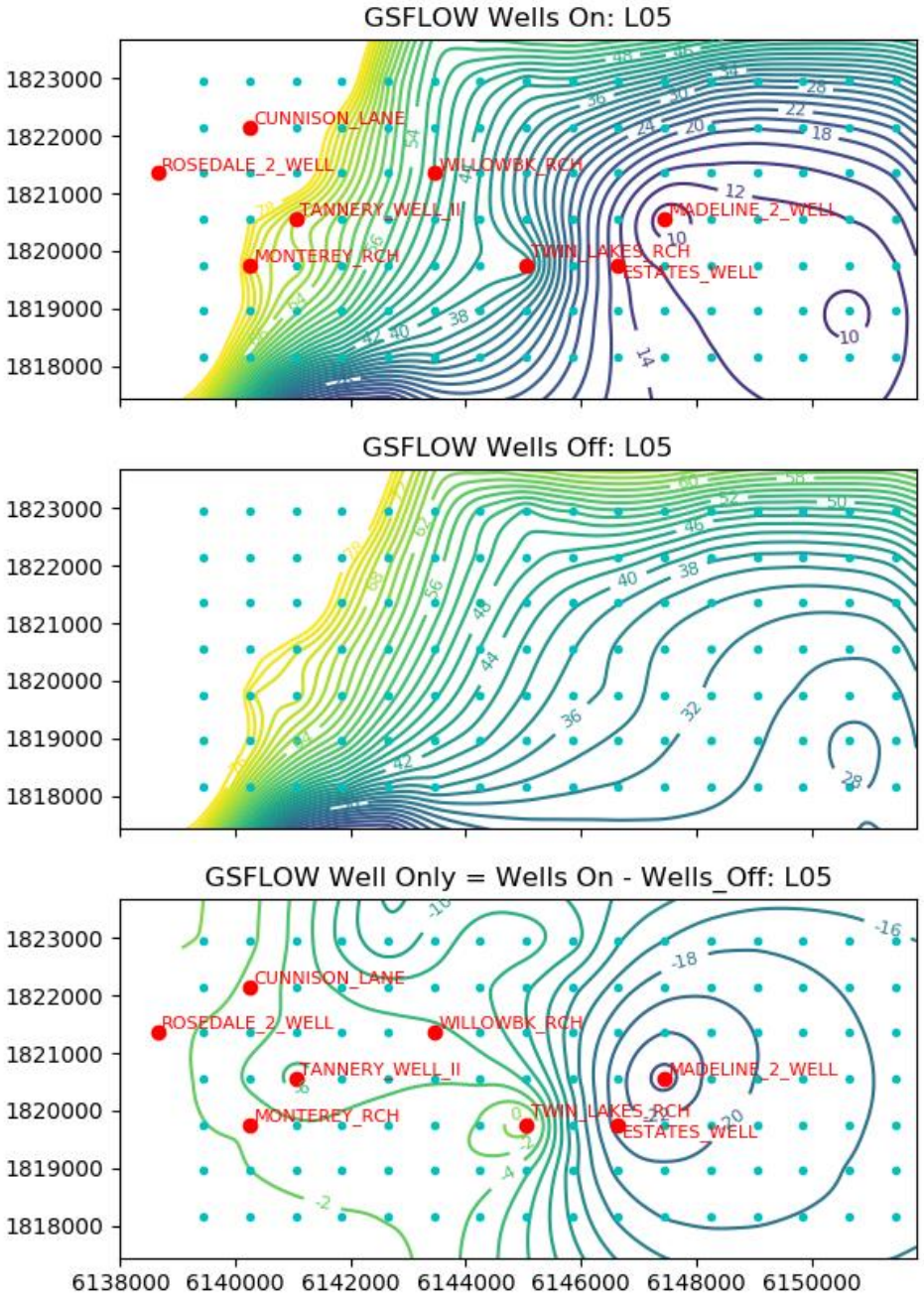

Figure 1. GSFLOW Basin Model processing results for the Purisima BC Unit (Basin Model layer 5), showing annually averaged simulated hydraulic head contours for WY 2025, in feet MSL (at two-foot contour intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. Easting and Northing coordinate scale in feet.

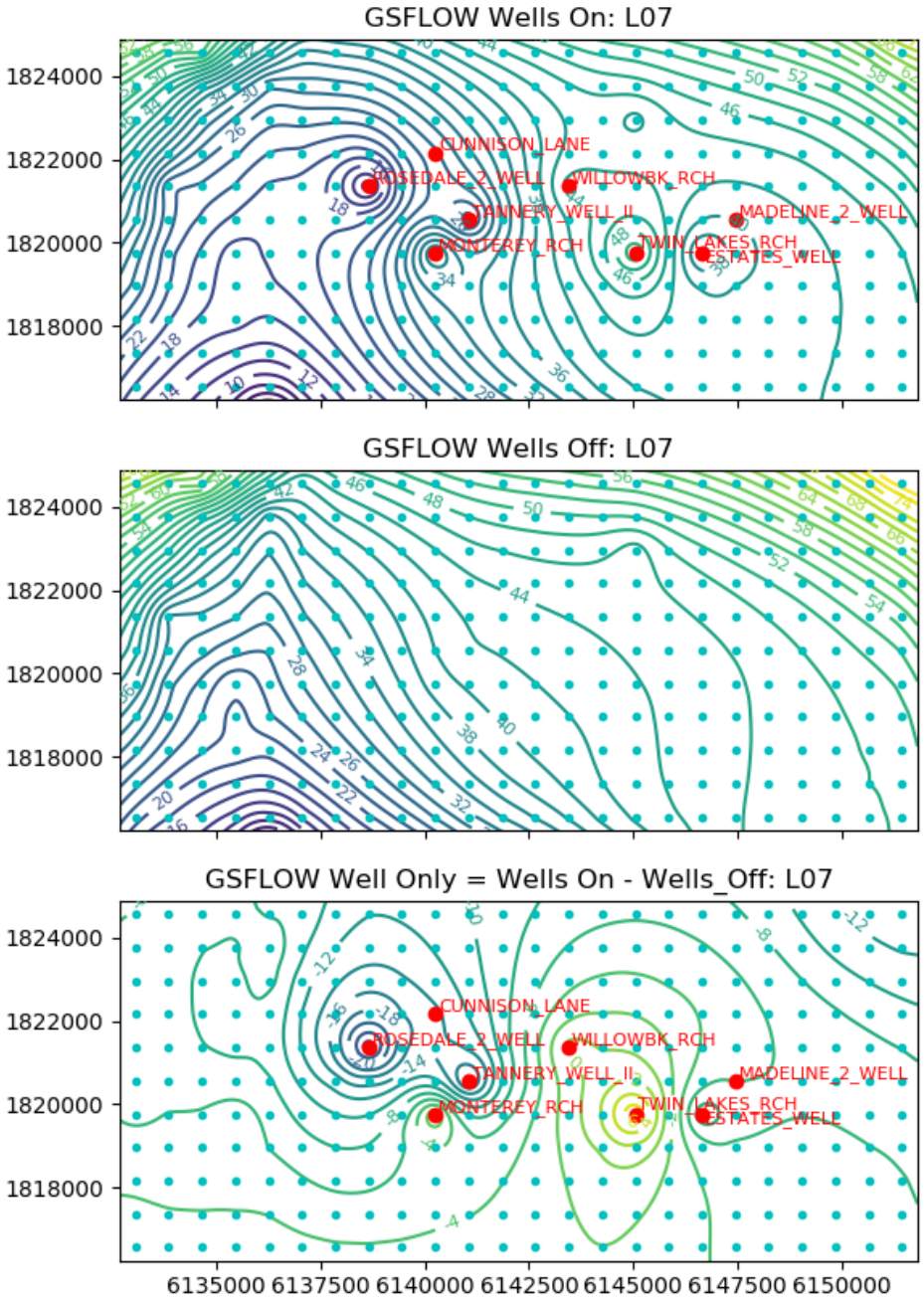

Figure 2. GSFLOW Basin Model processing results for the Purisima A Unit (Basin Model layer 7), showing annually averaged simulated hydraulic head contours for WY 2025, in feet MSL (at two-foot contour intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads. Easting and Northing coordinate scale in feet.

3.3 Representation of Aquifer Parameters for Simulation of Inter-Well Gradients

The hydraulic transmissivities in the Basin Model are not uniform spatially, and can vary by as much as an order of magnitude even within the local region of interest for this analysis, as shown for the Purisima BC unit in Figure 3, and for the A unit in Figure 4. This spatial variation (heterogeneity) in the aquifer transmissivity in the Basin model was approximated in the AEM Model by grouping grid cells of similar ranges of transmissivity value into simplified polygonal transmissivity zones as outlined in blue for the high transmissivity zone and green for the medium transmissivity zone for the BC (Figure 3) and A (Figure 4) aquifer units. The area outside the green outline is the background transmissivity zone. An average horizontal hydraulic conductivity and aquifer thickness was assigned to each zone based on the geometric mean (the mean of the logarithm) of the transmissivity value of all the Basin Model grid cells in the zone. These averaged aquifer properties for each zone in both the BC and A units are shown in Table 2. This approach to representing the spatial heterogeneity of the transmissivity field through zones of spatially averaged properties is appropriate for the purposes of calculating the steady-state drawdown and draw-up from the recharge and extraction wells because the hydraulic head field varies much more smoothly than the heterogeneous distribution of transmissivities. As will be described later, for the actual particle tracking analysis, the actual full grid of aquifer hydraulic conductivity and aquifer thicknesses values from the Basin Model are used.

Table 2. Average aquifer properties assigned to each AEM Model tranmissivity zone for each aquifer unit.

	BC UNIT AQUIFER (LAYER 5)			A UNIT AQUIFER (LAYER 7)		
TRANSMISSIVITY ZONE	AVERAGE[1] HORIZONTAL HYDRAULIC CONDUCTIVITY (FT/DAY)	AVERAGE[2] LAYER THICKNESS (FEET)	AVERAGE[1] TRANS-MISSIVITY (FT^2/DAY)	AVERAGE[1] HORIZONTAL HYDRAULIC CONDUCTIVITY (FT/DAY)	AVERAGE[2] LAYER THICKNESS (FEET)	AVERAGE[1] TRANS-MISSIVITY (FT^2/DAY)
High Transmissivity Zone	6.7	190	1,273	11.9	271	3,221
Medium Transmissivity Zone	1.0	188	190	5.9	259	1,528
Background Transmissivity Zone	0.29	189	55	2.2	251	545

[1] Geometric mean (mean of the log_{10} transformed values) grid cells in zone

[2] Geometric mean of transmissivity of grid cells in zone divided by geometric mean of hydraulic conductivity of grid cells in zone

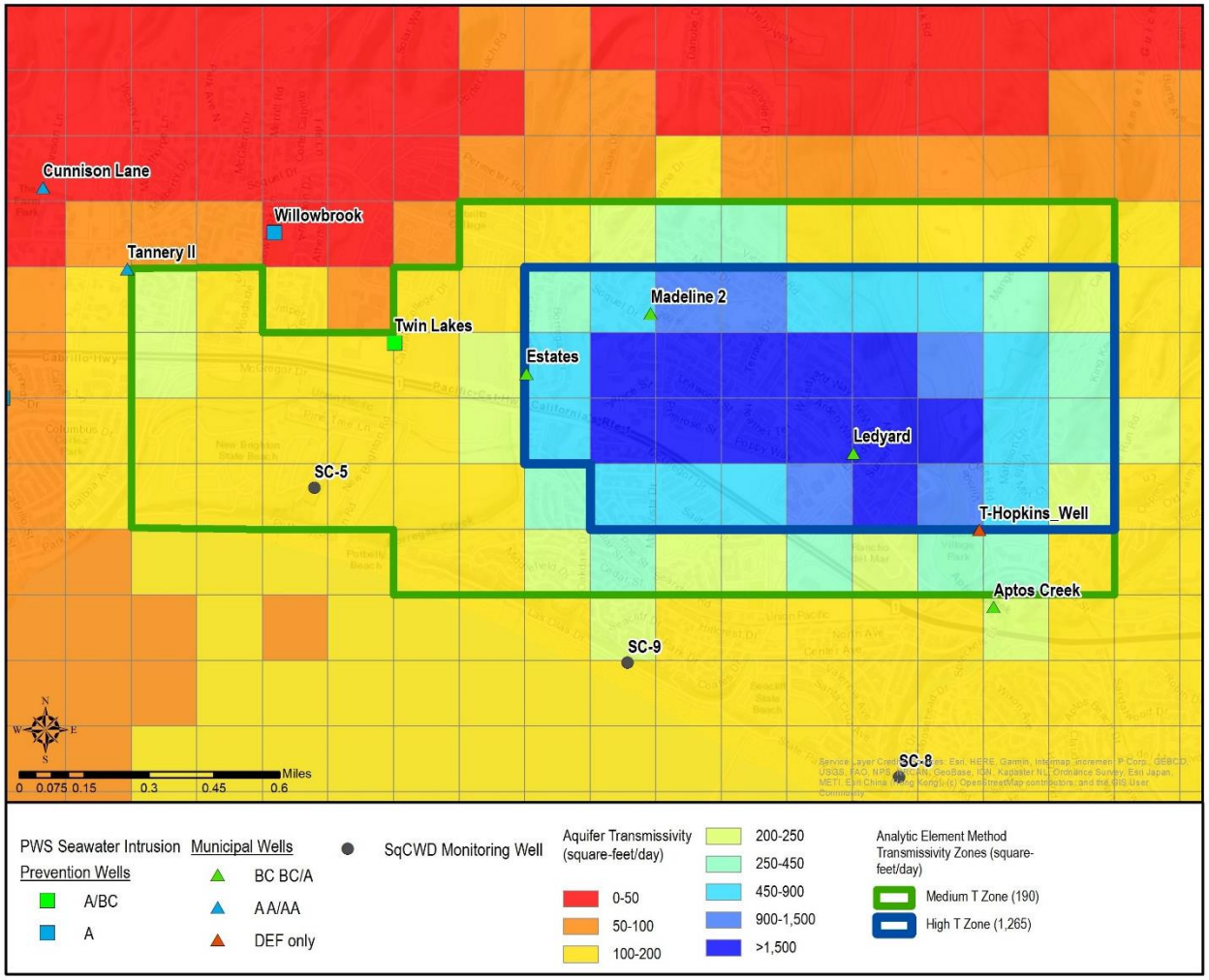

Figure 3. Basin Model Purisima BC Unit (Layer 5) transmissivity field and boundaries of high- and medium-transmissivity zones defined for use in AEM Model

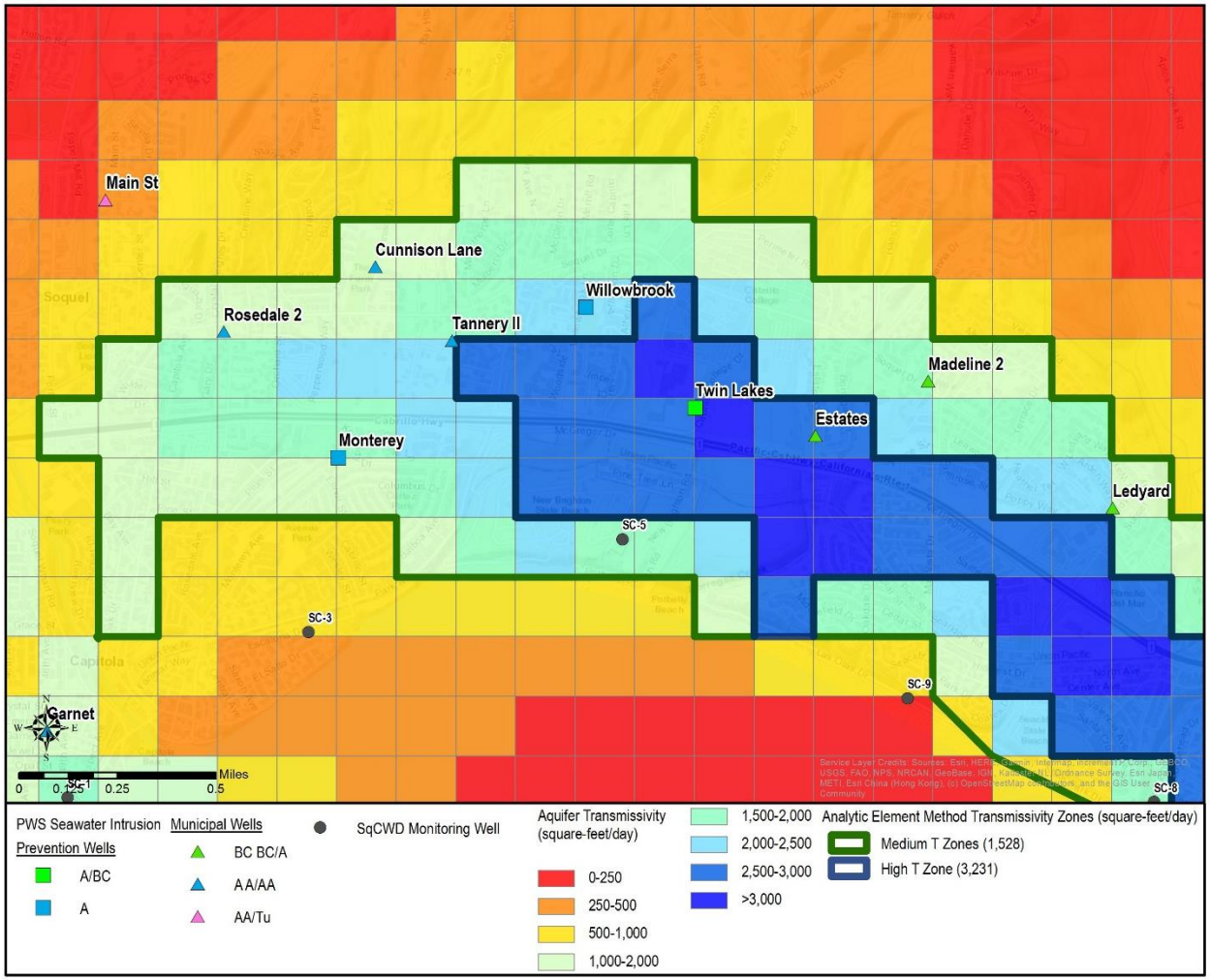

Figure 4. Basin Model Purisima A Unit (Layer 7) transmissivity field and boundaries of high- and medium-transmissivity zones defined for use in AEM Model

4 ANALYTIC ELEMENT METHOD MODEL

4.1 Model Setup

For the TimML analytic element method model (AEM Model), each confined aquifer unit is defined by a horizontal hydraulic conductivity and aquifer thickness and is assumed to be infinite in aerial extent. Polygonal zones with different values of hydraulic conductivity and thickness can be defined to represent areas with different hydrogeologic properties. Line sources and line sinks can be added to represent boundary conditions such as impermeable barriers, and line sources or sinks can be defined to represent hydrogeologic features such as impermeable faults and/or streams. The zones of differing transmissivities for each aquifer as shown in Figure 3 (BC unit) and Figure 4 (A unit) and their properties are tabulated in Table 2.

Each SWIP recharge well and each nearby extraction well is represented through an analytic element defined by its position and its pumping rate (positive for recharge and negative for extraction). Analytic elements representing impermeable barriers were assigned to represent the Aptos faulting to the north of the project area and also locations where the Purisima BC and A aquifer units outcrop and pinch out just to the west of the region of interest (M&A, 2019a). In the Basin Model, the Aptos area faulting is represented by the MODFLOW Horizontal Flow Barrier (HFB) package, and the places where layers pinch out are represented by inactive model cells which are treated as no-flow boundaries in MODFLOW. Constant head line sources were used to represent the effects of Soquel Creek on groundwater heads between 2,000 to 5,000 feet to the west of the Monterey SWIP well. The position and magnitude of the constant line sources was based on locations of the stream segments as defined in the Basin Model and also on an evaluation of the "Wells Only" head contours to identify places where additional sources of water impact the head contours.

The AEM Model also requires assigning a reference head at a fixed location, which can be thought of as representing the head value just outside the radius of influence of the local wells and line sources and sinks. The value and position of this reference head was initially determined by looking at head difference contour maps between the results of the Basin Model "Wells On" runs and the Basin Model "Wells Off" runs, to identify areas outside of the region of pumping influence. The location of the reference head was then used an additional calibration parameter.

4.2 AEM Model Calibration

The AEM Model for each of the target aquifer units was calibrated by comparing the AEM model head results (top plots of Figure 5 and Figure 6) with the corresponding "Wells Only" heads results (bottom plots of Figure 1 and Figure 2). For this purpose, the AEM Model was first

set up with the SWIP recharge wells and pumping well analytic elements located at their Basin Model grid cell center positions, rather than their actual "real-world" Easting and Northing coordinates. The extent and transmissivity ranges defining the polygonal transmissivity zones, the magnitude and position of the reference head elevation for each layer, and the positions and magnitudes of constant head line sources representing streams were adjusted so as to achieve a good match between the hydraulic heads and gradients at the Basin Model grid cells between each SWIP recharge well and the closest pumping wells. Note that because of the large Basin Model grid cell size, the modeled heads in grid cells containing simulated pumping and recharge wells will represent an average value that does not capture the steepest mounding or cone of depression. For this reason the AEM Model was calibrated not on GSFLOW head values within the grid cells containing active wells, but rather on matching the modeled heads and average gradients in grid cells outside the ones containing the pumping wells, with emphasis placed on best matching the heads and gradients at cells located between a recharge well and its nearest municipal pumping well, since this would represent the shortest travel path. The intent of the calibration process is to match the average gradients between the wells as simulated in the Basin Model, while still simulating the steeper gradients that will occur near the wells but which can't be represented with the coarser Basin Model grid cells.

The results of this calibration step, with the AEM Model wells simulated as being at the center of the Basin Model grid cells are shown in Figure 5 for the Purisima BC unit and Figure 6 for the Purisima A unit. In the region of interest, the heads and gradients match well, though further afield, outside the region of interest, towards the Aptos fault to the North, and in the areas to the west where the aquifers outcrop there are additional heterogeneity and vertical flow gradients that are not represented in the AEM Model. To evaluate the validity of the assumptions of two-dimensional flow within the area of interest, an analysis was conducted to evaluate if there are vertical gradients that would lead to three-dimensional flow within the region of interest. On the western edge of the regional Basin Model where the aquifer units outcrop, there are strong vertical gradients associated with downward natural recharge from these outcropping areas. However, these higher vertical gradient areas occur over very limited distances and are outside of the region of interest where pumping and proposed SWIP wells occur. The Basin Model simulates each of the confined aquifers as a single model layer, with the A and BC units separated by aquitards, and the pumping wells simulated as being screened over the entire layer thickness, such that vertical flow components in the confined layers are generally minimal. Additionally, the short-term travel time is dominated by the very strong horizontal gradients around the pumping and recharge wells. The 3D long term particle tracking analysis conducted with GSFLOW and MODPATH also did not show appreciable vertical flow components. For these reasons the assumption of two-dimensional flow is appropriate.

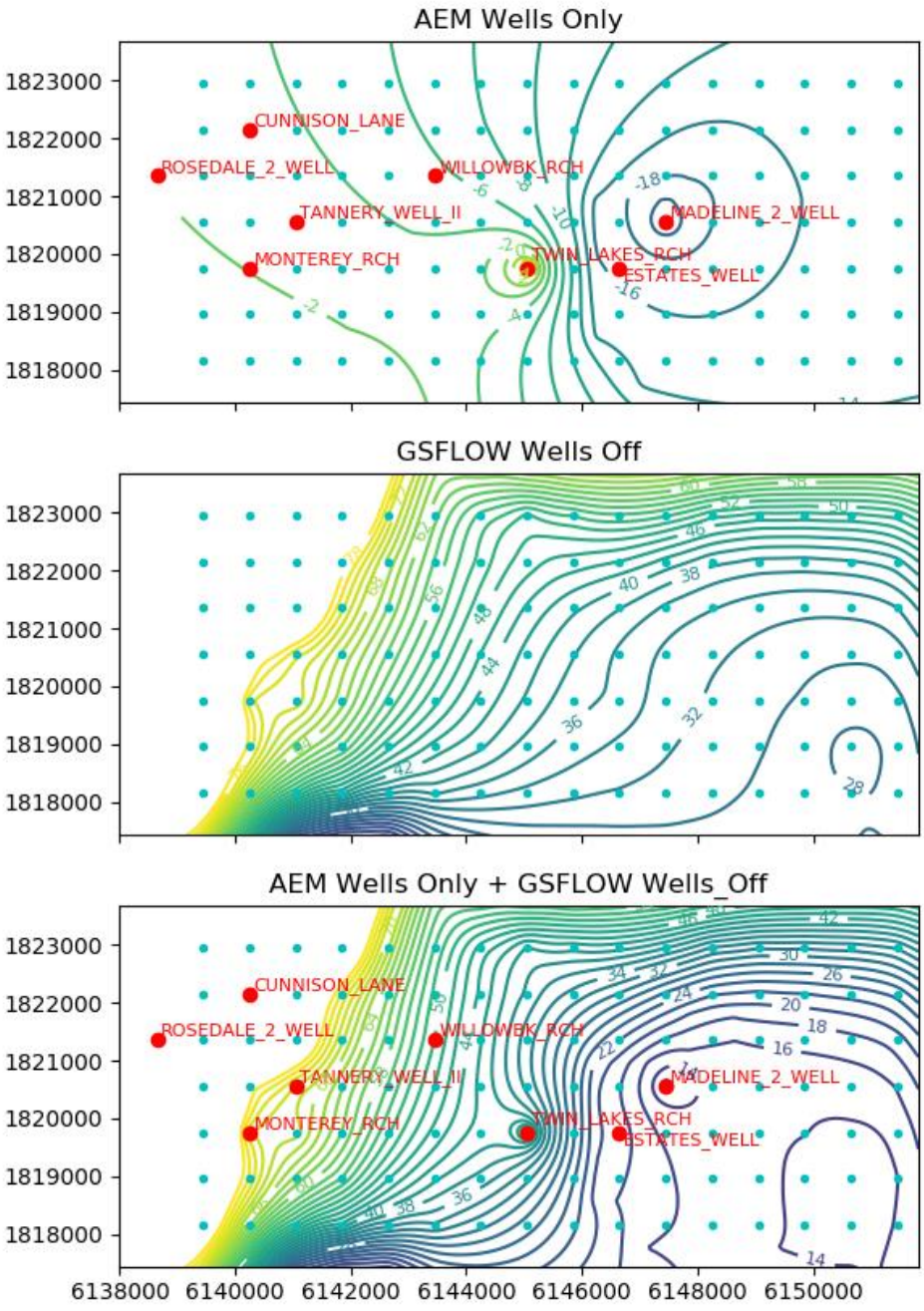

Figure 5. Results of AEM Model calibration process for Purisima BC Unit (Basin Model Layer 5) with wells located at centers of Basin Model grid cell locations. Head contours in feet MSL shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads.

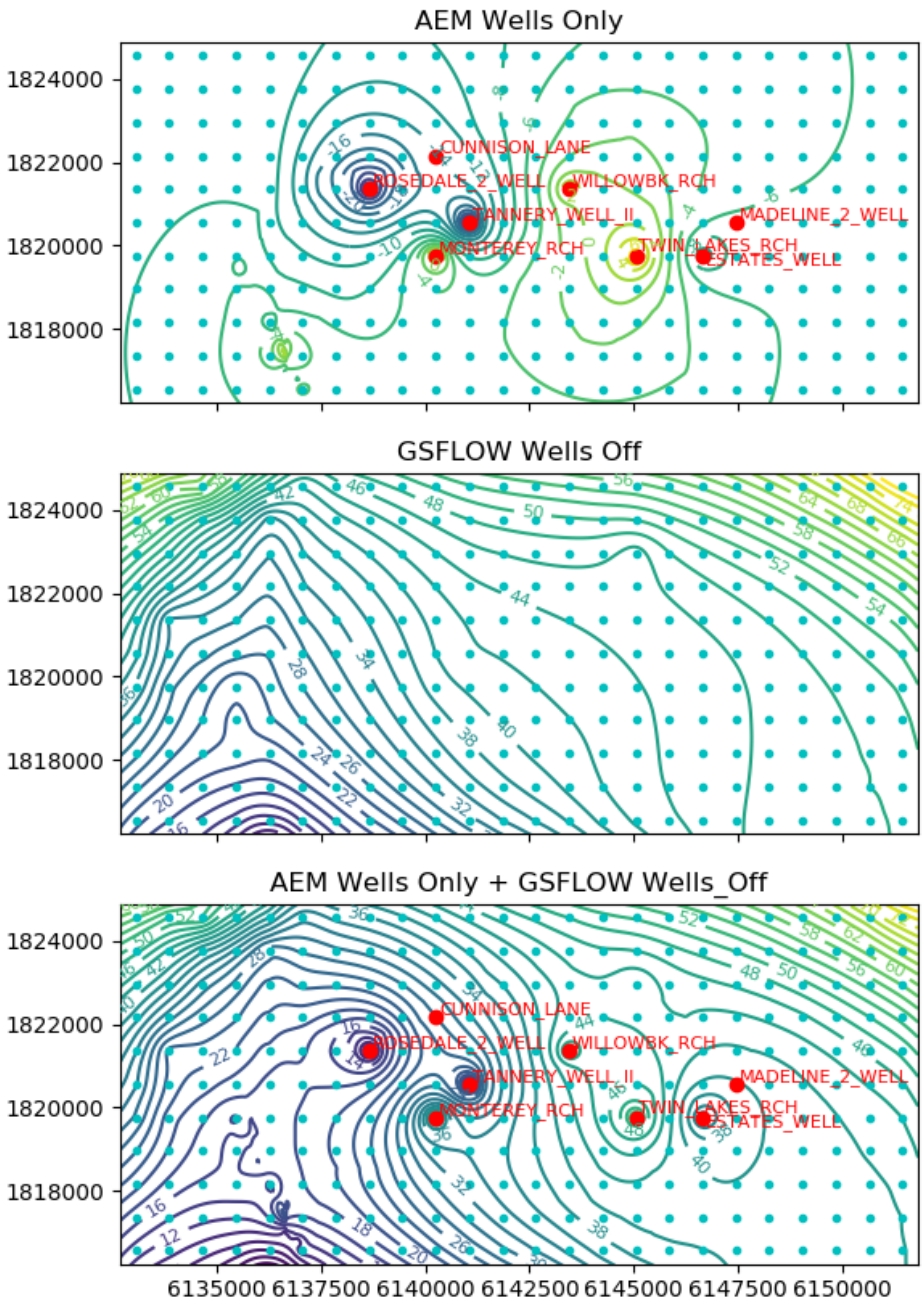

Figure 6. Results of AEM Model calibration process for Purisima A Unit (Basin Model Layer 7) with wells located at centers of Basin Model grid cell locations. Head contours in feet MSL shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads.

4.3 AEM Superposition at Actual Well Locations

After calibration, the analytic elements for each recharge and pumping well were re-assigned to their true real world Northing-Easting coordinate positions and the AEM Model was re-run. The AEM head map of mounding and depressions from the SWIP recharge and pumping wells was added to the Wells-Off head map to produce a final head map that included both the regional Basin Model head variations and the localized near-well effects. The results of this final step are shown for the Purisima BC unit in Figure 7 and Purisima A unit in Figure 8. The resulting grids of hydraulic heads on the refined grid for each aquifer unit are then exported to a file for input into the subsequent step of particle tracking.

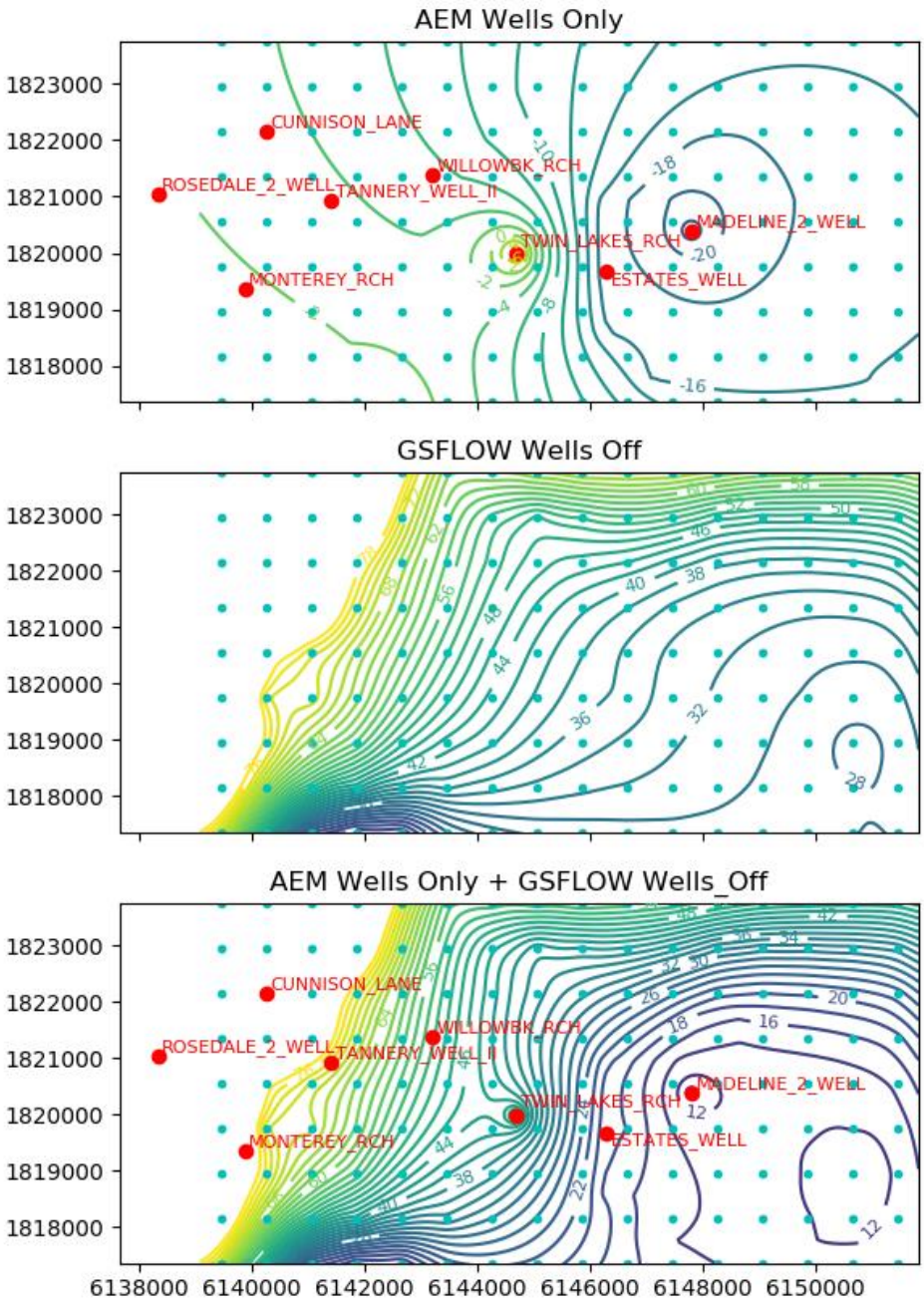

Figure 7. Results of refined AEM Model for Purisima BC Unit (Basin Model Layer5) with wells located at actual positions (as opposed to center of Basin Model grid cells). Head contours in feet MSL are are shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads.

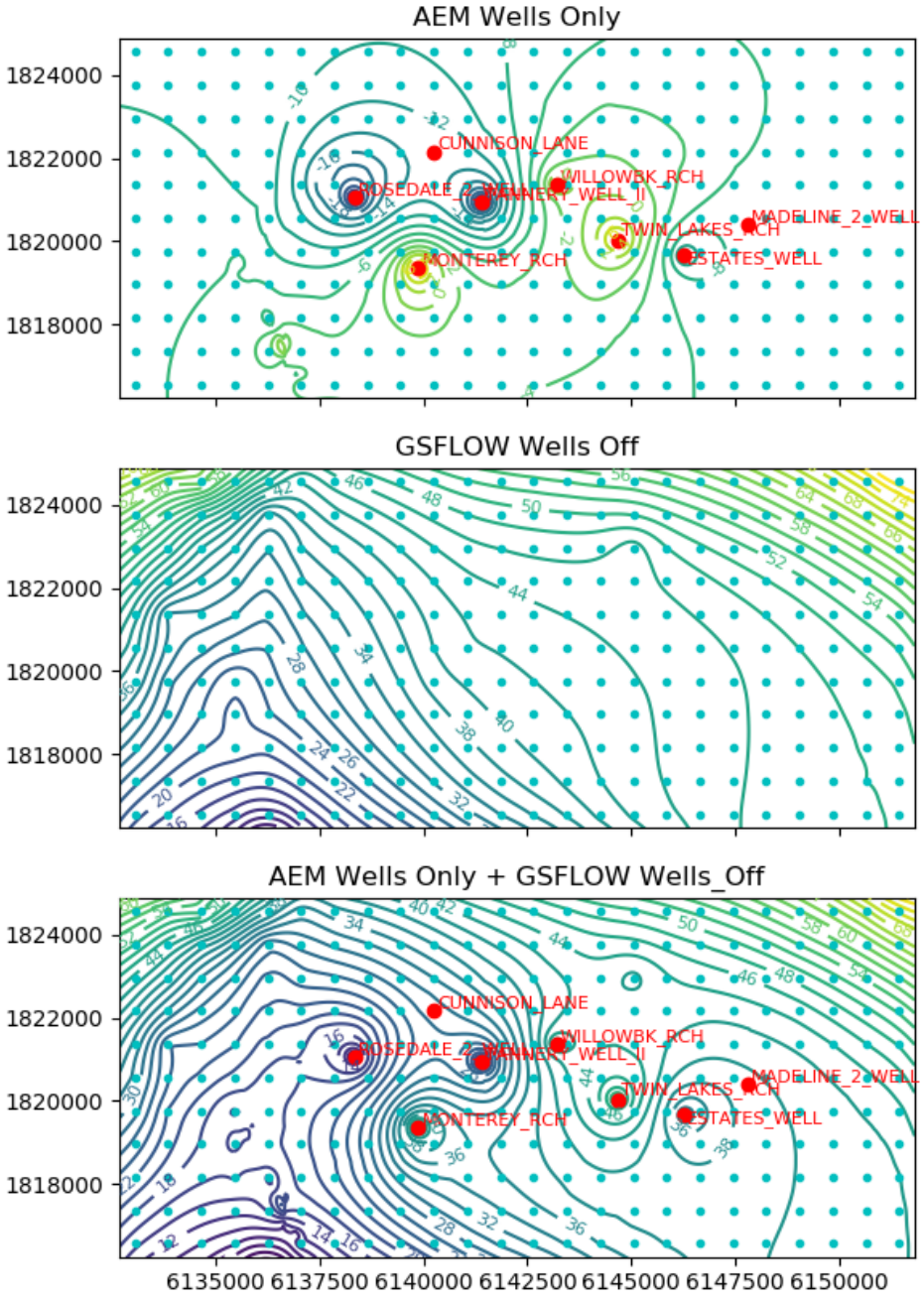

Figure 8. Results of refined AEM Model for Purisima A Unit (Basin Model Layer 7) with wells located at actual positions (as opposed to center of Basin Model grid cells). Head contours in feet MSL are are shown at two-ft intervals. Centers of 800x800ft Basin Model grid cell shown as blue dots. Lighter green represents higher head values and darker blue represents lower heads.

5 PARTICLE TRACKING ANALYSIS

5.1 Methodology

Particle tracking analysis was carried out using the Groundwater Toolset in the ESRI ArcGIS Spatial Analyst Toolbox, accessed programmatically via the ArcPy ArcGIS Python scripting library (ESRI, 2016). The Groundwater Toolset takes as inputs grids of steady state hydraulic head elevation values, effective porosities, and hydraulic conductivities, and uses Darcy's Law to calculate the magnitude and direction of groundwater flow velocity at each grid cell, and then uses a grid-independent predictor-corrector particle tracking algorithm to track the path of particles released in the velocity field (Konikow & Bredehoeft, 1978; Tauxe, 1994). The analysis assumes two-dimensional, vertically mixed, horizontal, steady-state flow, though the hydraulic conductivity, aquifer thickness, and porosity can be spatially variable. The analysis considers only advective groundwater transport and does not consider spreading from hydrodynamic dispersion which would have the effect of some particle flow paths getting farther out in a shorter amount of time.

The effective porosity for each aquifer unit was assumed to be uniform throughout each layer, with an assigned effective porosity of 9% for the BC Unit Aquifer (model layer 5), and 13% for the A Unit Aquifer (model layer 7), consistent with the effective porosities used in the long term particle tracking conducted for the Basin Model using MODPATH (M&A, 2019b) based on specific yields implemented in the Basin Model. The spatially variable hydraulic conductivity and aquifer thickness grid for each aquifer unit was based on the horizontal hydraulic conductivities and model layer thicknesses from the respective model grid layers of the updated Basin Model. Basin Model hydraulic conductivities and layer thicknesses were mapped from the 800x800 foot regional model grid cells onto the 50x50 foot cell refined grid. Three hundred and sixty (360) particles where released around each of the proposed recharge wells in each aquifer unit, uniformly spread along a circle of 50 foot radius centered at the actual position of each proposed SWIP well. A particle tracking step length of 2 feet was used for the predictor-corrector particle tracking algorithm. The released particles are tracked through the velocity field until they either enter a depression (such as the cone of depression of a pumping well), exit the grid, or the specified maximum travel time is reached, which for this analysis particles is three years.

5.2 Refined Particle Tracking Results

The three-year particle tracks, color-coded by travel times of 0-6 months, 6-12 months, 12-18 months, 18-24 months, 24-30 months, and 30-36 months, are shown in Figure 9 and Figure 10 for the Purisima BC and A units, respectively. For both aquifers, the greatest rate of travel occurs

in the first months when the particles experience the greatest hydraulic gradient closest to the recharge wells. The particle velocities then begin to decrease logarithmically away from the SWIP recharge wells. In the A aquifer unit, the particle travel distances are generally shortest around the Willowbrook SWIP well primarily due to the lower recharge rate as compared to the TLC and Monterey SWIP wells, although the fastest particles from all three wells have maximum three-year travel distances on the order of 1,000 feet. By contrast, in the BC unit, the maximum three-year particle travel distance is under 500 feet from the TLC SWIP well, attributable to the much lower recharge rate in the BC unit as well as the lower aquifer transmissivities.

No particles released at any of the SWIP wells in either the BC or A unit reach any municipal pumping wells within three-years. In the BC unit, particles released at the TLC well travel only 30% of the distance to the Estates well, whereas particles released at TLC in the A unit travel 65% of the distance to the Estates well, while particles released at the Willowbrook and Monterey SWIP wells travel on the order of only 50% the distance to the nearest municipal pumping wells.

In the A aquifer unit (Figure 10) particles released from the Monterey SWIP well reach the locations of two assumed private domestic wells identified in the Monitoring Well Network Analysis (B&C, 2019b) approximately 33 months into the three-year refined particle tracking period, as summarized in Table 3.

Table 3. Travel times in A Aquifer unit to assumed locations of private wells

SOURCE SWIP WELL	ASSUMED PRIVATE WELL LOCATION	TRAVEL TIME (DAYS)	TRAVEL TIME (MONTHS)
Monterey	APN 3719112	1,009	33.2
Monterey	APN 3717109	1,020	33.5

The average annual individual pumping rate for private domestic wells is estimated at 0.23 AF/yr (HWRI, 2017) and is several orders of magnitude lower than the rate in the municipal pumping wells and the drawdown from individual private wells are not simulated in the analytic element modeling. In the Basin Model the estimated aggregate pumping of private wells within a grid cell is represented by a well centered at that grid cell. This aggregated non-municipal pumping is also incorporated in the refined particle tracking approach through the superposition of the regional Basin Model heads results, although the head gradients from this aggregated pumping are spatially averaged over the coarser Basin Model grid cell size.

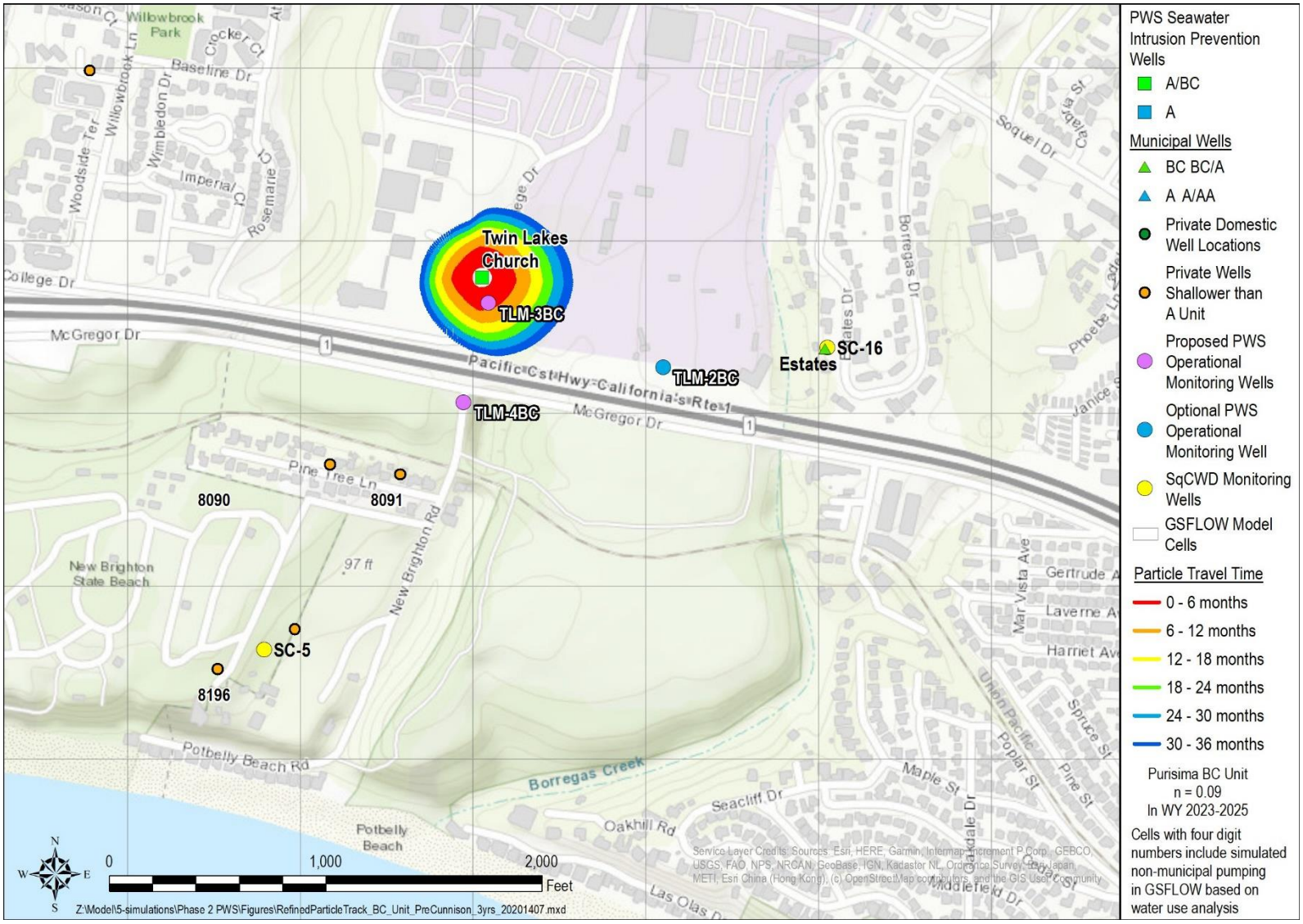

Figure 9. Refined particle tracking results in Purisima BC Unit (Basin Model layer 5), showing three-year particle paths color-coded by travel time for pumping and recharge rates representative of WY2025 averages.

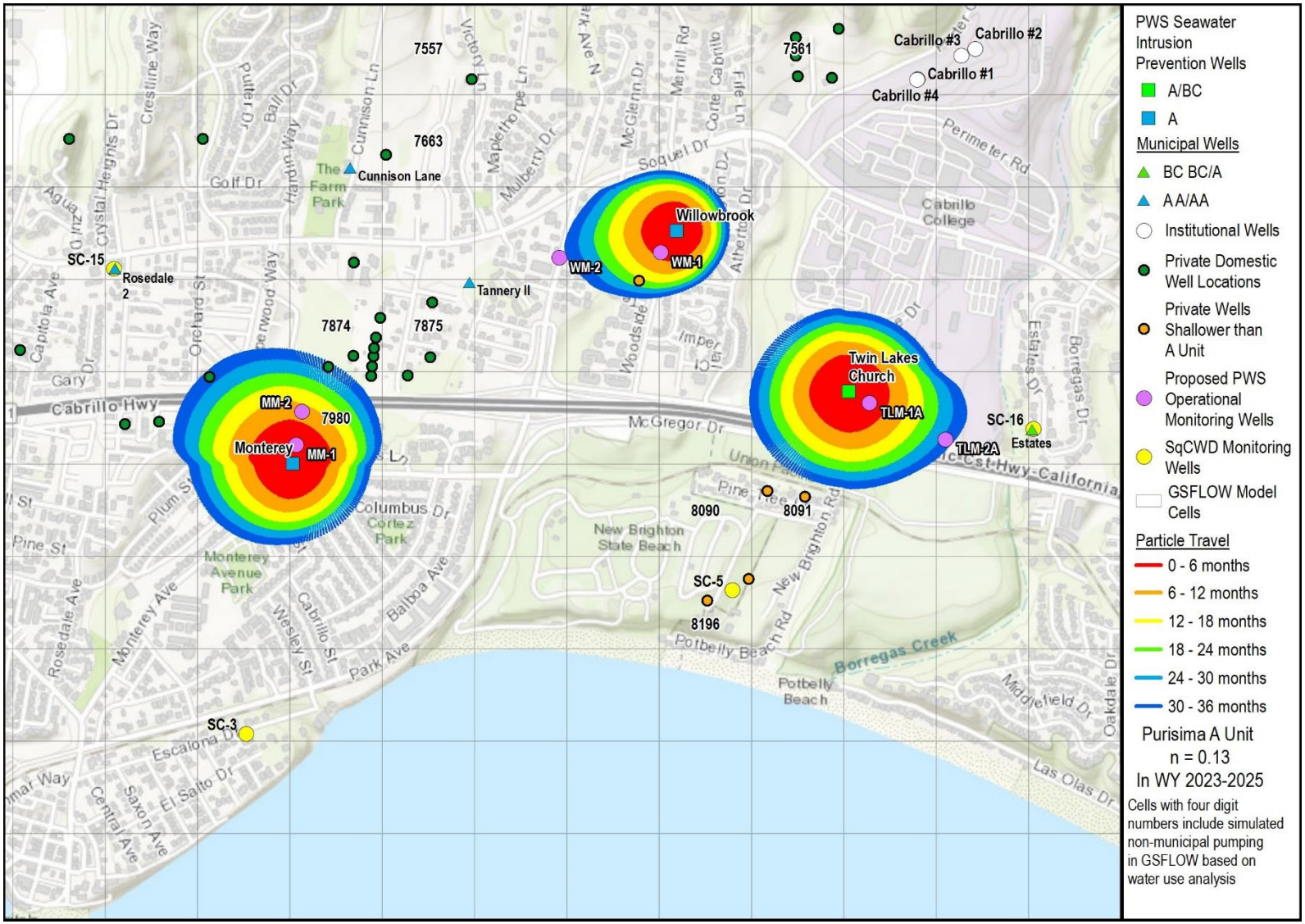

Figure 10. Refined particle tracking results in Purisima A Unit (Basin Model layer 7), showing three-year particle paths color-coded by travel time for pumping and recharge rates representative of WY2025 averages.

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7 ACRONYMS & ABBREVIATIONS

AEM.....Analytic Element Method
AF/yr.....acre-feet per year
B&C.....Brown and Caldwell
bgs……..below ground surface
HFB.....MODFLOW Horizontal Flow Barrier Package
M&A.....Montgomery and Associates
MNW2 .....MODFLOW Multi-Node Well 2 Package
msl……..mean sea level
NGVD 29…...National Geodetic Vertical Datum of 1929
PWS .....Pure Water Soquel
SWIP.....seawater intrusion prevention
TLC.....Twin Lakes Church
USGS .....United States Geological Survey

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Appendix F: Final Phase II Potential Injection Aquifer Geochemical Characterization Report

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Brown AND Caldwell

Prepared for
Soquel Creek Water District, Soquel, California

SOQUEL CREEK WATER DISTRICT

Final Phase II Potential Injection Aquifer Geochemical Characterization Report

February 2020 | DRAFT









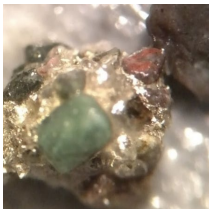

Table of Contents

List of Figures iv
List of Tables v
List of Abbreviations vi
1. Introduction 1-1
    1.1 Phase I Geochemical Investigation 1-2
    1.2 Phase II Geochemical Characterization 1-3
2. Sample Collection and Analysis 2-1
    2.1 Drill Cuttings Sample Collection 2-1
    2.2 Drilling Mud Sample Collection 2-2
    2.3 Groundwater Sample Collection 2-3
    2.4 Geochemical Laboratory Analyses 2-4
        2.4.1 Soil Leaching Analysis 2-5
        2.4.2 Mineralogical Analysis 2-7
3. Geochemical Analysis Results 3-1
    3.1 Drilling Mud Analysis 3-1
        3.1.1 Drilling Mud Water Quality 3-1
        3.1.2 Drilling Mud Mineralogy 3-7
    3.2 Zone Groundwater Quality Analysis 3-8
    3.3 Injection Test Groundwater Quality Analysis 3-11
    3.4 Soil Leaching Analysis 3-12
        3.4.1 Phases I and II Soil Leaching 3-13
        3.4.2 Purified Water Chemistry 3-17
        3.4.3 Purified Water Soil Leaching 3-18
        3.4.4 Modified Meteoric Water Mobility Procedure - Column Testing 3-27
        3.4.5 Hydroxylamine-Hydrochloride Extraction Leaching 3-35
    3.5 Mineralogical Analysis 3-39
        3.5.1 Visual Examination 3-39
        3.5.2 XRD Analysis 3-40
        3.5.3 Whole-Rock Analysis 3-41
4. Potential Water Quality Considerations 4-1
5. Recommendations 5-1
6. Limitations 6-1
7. References 7-1
Appendix A: Phase II Sampling and Analysis Plan ..... A
Appendix B: Field Logs ..... B

Appendix C: Sample Photos C
Appendix D: Lab Reports ..... D

List of Figures

Figure 1-1. TLC pilot well location 1-4
Figure 1-2. Hydrogeologic conceptual model of Soquel Creek Water District's service area 1-5
Figure 2-1. Grab sample collected from 95 feet below ground surface (bgs) 2-1
Figure 2-2. Chip tray of archived individual 5-foot sample splits 2-2
Figure 3-1. Drilling mud and groundwater chemistry 3-3
Figure 3-2. Soil leaching and drilling mud water quality 3-5
Figure 3-3. Piper diagram of zone test and TLC Pilot SWIP well water quality 3-8
Figure 3-4. Piper diagram of SWIP and District monitoring groundwater wells 3-9
Figure 3-5. Total and dissolved metals from Zone water quality samples 3-11
Figure 3-6. Phase I and II modified SPLP leaching results 3-15
Figure 3-7. Modified SPLP leaching for purified and deionized waters 3-23
Figure 3-8. Metals concentrations of the modified SPLP soil leaching for purified and deionized waters 3-25
Figure 3-9. Modified MWMP column test results 3-29
Figure 3-10. Modified SPLP and MWMP column test results 3-33
Figure 3-11. Hydroxylamine-hydrochloride extraction results 3-37
Figure 3-12. Example of sulfide mineral phases identified in samples at 735 feet bgs 3-39
Figure 3-13. Coarse-grained sand unit from 720 feet bgs 3-40
Figure 3-14. Whole rock results 3-45
Figure 4-1. Classification of constituents and potential mobility 4-2

List of Tables

Table 2-1. Phase II Geochemical Characterization Laboratory Analysis 2-4
Table 2-2. Analytical Parameters for Soil Leaching Analysis..... 2-5
Table 2-3. Advanced Water Purification Facilities Specifics 2-6
Table 3-1. Water Quality of Drilling Mud Samples 3-1
Table 3-2. Drilling Mud XRD Mineral Analysis 3-7
Table 3-3. Zone Testing Water Quality..... 3-10
Table 3-4. Water Quality Before and After Injection Testing 3-12
Table 3-5. Water Quality of Purified Waters for Soil Leaching Analysis..... 3-17
Table 3-6. Soil Leaching Results from SPLP Analysis..... 3-19
Table 3-7. Soil Leaching Results from Modified MWMP Column Analysis 3-27
Table 3-8. Soil Leaching HA-HCl Extraction Results..... 3-35
Table 3-9. Drill Cutting XRD Mineral Analysis..... 3-41
Table 3-10. Whole Rock Data 3-42

List of Abbreviations

afy	acre feet per year
AWPF	Advanced Water Purification Facility
ASTM	American Society for Testing and Materials
BC	Brown and Caldwell
bgs	below ground surface
District	Soquel Creek Water District
EPA	Environmental Protection Agency
ESA	Environmental Science Associates
HA-HCl	hydroxylamine-hydrochloride
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGA	Santa Cruz Mid-County Groundwater Agency
MWMP	Meteoric Water Mobility Procedure
NWRI	National Water Research Institute
Panel	Independent Advisory Panel
pCi/L	picocuries per liter
ppm	part(s) per million
PWS	Pure Water Soquel
SAP	Sampling and Analysis Plan
SPLP	Synthetic Precipitation Leachate Procedure
SWIP	Seawater Intrusion Prevention
TDS	total dissolved solids
TLC	Twin Lakes Church
XRD	X-ray diffraction

Section 1

Introduction

The Soquel Creek Water District (District) is a county water district formed under Section 30000 et. seq. of the California Water Code, providing potable drinking water and groundwater resource management in a portion of Santa Cruz County, California. The District's service area includes portions of the city of Capitola and the unincorporated communities of Aptos, La Selva Beach, Rio Del Mar, Seascape, Seacliff Beach, and Soquel. The District serves approximately 14,438 connections, of which 94 percent are residential, and a population of approximately 40,400 (Carollo 2017). The District currently obtains 100 percent of its water supply from aquifers in the Santa Cruz Mid-County Groundwater Basin. These aquifers are located within two geologic formations that underlie the District's service area, the Purisima Formation and the Aromas Red Sands aquifer. The Purisima Formation provides most of the District's water needs.

The District's groundwater supply is currently in a state of critical overdraft meaning more water has been extracted from the aquifers than the natural rate of recharge via rainfall, resulting in depressed groundwater levels. The District has declared a Groundwater Emergency (ongoing since 2014). The Santa Cruz Mid-County Groundwater Agency (MGA) commissioned a study of the salinity of groundwater aquifers along the Monterey Bay coastline, including in the Twin Lakes Church (TLC) Seawater Intrusion Prevention (SWIP) Pilot Project vicinity. The study indicates that seawater intrusion is occurring along the entire coastline of the District's service area immediately offshore as well as on shore in the Aromas Red Sands aquifer. Moreover, the results of the study demonstrate the extent of elevated salinity levels among coastal aquifers is substantial in this area. The study's finding regarding proximity of the interface to the coast emphasizes the need for actions that would facilitate the recovery, maintenance, and protection of groundwater levels to present further onshore intrusion (Hydrometrics WRI 2018). For those reasons, the District has determined a supplemental water supply is required to restore groundwater levels basin-wide, create a seawater barrier, and aid in meeting the mandates of the Sustainable Groundwater Management Act that basin groundwater use be sustainable by 2040. Based on current hydrologic evaluations, and the desired level of risk/uncertainty, the District plans to limit its net average groundwater pumping to no more than 2,300 acre feet per year (afy) to contribute to basin recovery based on the proportion of its consumptive use from the basin. To recover the basin and establish a seawater barrier, the District would need to secure approximately 1,500 afy of supplemental supply (Environmental Science Associates (ESA), 2018). An estimated 3,000 afy of supplemental supply could be required to address basin-wide groundwater overdraft. Plans to achieve basin-wide sustainability are currently being evaluated and refined through an independent effort under the MGA.

In November 2017, the District completed a Recycled Water Feasibility Study (Carollo 2017) for recharging the local groundwater aquifer with advanced purified water. The goal of this work was to identify potentially feasible engineering solutions for securing supplemental water supply through the indirect use of purified water to raise coastal water levels and protect the local groundwater basin. Building upon the feasibility study recommendations, additional discussions with stakeholders, and the District's consultant team, as well as input from the public, the District identified three potential sites for the Pure Water Soquel (PWS) treatment facilities, five potential sites for SWIP/injection wells, and several options for conveyance pipeline alignments. Details of the overall project facilities and environmental impacts are described in the *Pure Water Soquel: Groundwater Replenishment*

and Seawater Intrusion Prevention Project, Draft Environmental Impact Report, State Clearinghouse No. 2016112045 (ESA 2018).

Replenishment of purified water into a groundwater aquifer can lead to geochemical reactions such as mineral dissolution, oxidation, or desorption (Pyne 2005). Naturally occurring metals can be released due to mineral dissolution or desorption from iron and manganese oxide minerals. Oxidation of mineral phases such as sulfides can also occur due to the higher oxidation-reduction potential of the purified water injected into the groundwater aquifer. Changes in water quality could lead to operational difficulties and potentially degrade the water quality of the aquifer. The potential for oxidation or mineral dissolution to occur can be mitigated through purified water post-treatment stabilization prior to injection. For example, Orange County Water District observed arsenic mobilization in a small portion of its groundwater aquifer due to injection of purified water and implemented a post-treatment water quality target to help mitigate against arsenic mobilization (Wang et al. 2015, Fakhreddine et al. 2015).

1.1 Phase I Geochemical Investigation

In 2016, a geochemical characterization investigation was conducted by Brown and Caldwell (BC) to determine the mineralogical composition and leaching potential of aquifer units and adjacent aquitard materials within the District's service area hereafter called the Phase I geochemical characterization. Sediment samples from the Phase I geochemical characterization were derived from archived cuttings from previously drilled wells within the vicinity of proposed recharge wells for the PWS program, and the volume of material available for analysis was limited. Samples were analyzed for mineralogical composition using x-ray diffraction (XRD) and soil leaching using Synthetic Precipitation Leachate Procedure (SPLP) methods that required very little sample volume.

Data from the Phase I geochemical investigation (BC 2016) suggested there is a potential for aquifer and aquitard materials to react with the purified water, without post treatment, in a way that could release constituents from naturally occurring minerals and affect the groundwater quality. Results from the Phase I SPLP analysis indicate a potential for some regulated metals, such as arsenic, cadmium, and nickel, to be released. The Phase I geochemical characterization work was conducted using simulated purified water without any post-treatment. The purpose of the Phase I geochemical characterization leaching study was to identify which constituents, and relative concentrations, could be released due to injection of the purified water into the aquifer.

In 2016, the District commissioned the National Water Research Institute (NWRI) to form an Independent Advisory Panel (Panel) to provide expert peer review of the technical, scientific, and regulatory aspects of the PWS Groundwater Replenishment Project. The NWRI "Final Report for Panel Meeting #1" concluded that 1) the samples used in the Phase I geochemical investigation may have been oxidized during storage prior to analysis; therefore, the results may not represent the in situ geochemical conditions, and 2) the non-stabilized deionized water used in the soil leaching analysis may not be representative of the future injection water and supported bench-scale geochemical and additional mineralogical analysis (NWRI 2016).

The limited scope of the Phase I geochemical characterization left several data gaps which would require additional analysis to meet the objectives of the TLC SWIP Pilot Project. For example, the Phase I geochemical investigation was not able to evaluate the potential effects of treated purified water on the aquifer water quality. Additional geochemical characterization work (Phase II) was planned to address the data gaps from the Phase I geochemical characterization, provide information for the water treatment design, and address recommendations of the Panel. Samples for the Phase II geochemical analysis were collected during the drilling and installation of the TLC SWIP pilot well. Results from the geochemical characterization will be used to evaluate if treated finished

water quality characteristics can be optimized to reduce the potential for operational difficulties or aquifer water quality degradation.

1.2 Phase II Geochemical Characterization

The District commissioned the construction of the TLC Pilot SWIP located at 2701 Cabrillo College Drive, Aptos, California (Figure 1-1). The goals for this test pilot project included:

1. Construct one SWIP pilot well
2. Determine the injection capacity to inform recharge rates and groundwater modeling
3. Collect sufficient aquifer soil samples for subsequent geochemical analysis

The TLC Pilot SWIP well was drilled utilizing the reverse-circulation rotary drilling method. Drill cuttings were collected from the shaker table at approximately 5-foot intervals throughout the entire depth of the pilot borehole. Drilling of the pilot borehole commenced on February 11, 2019 and was completed on February 16, 2019. The borehole was drilled with an 18-inch-diameter tri-cone button bit from 50 feet to the target depth of 1,020 feet. Geophysical logging for electric resistivity, sonic, natural gamma, focused guard (Laterolog), caliper, and Nuclear Magnetic Resonance were conducted after the pilot borehole was drilled to the total depth. Following review of the geophysical and lithologic logs, four permeable zones were selected to conduct isolated depth-specific zone testing. The pilot borehole was reamed to 30-inch diameter from below the surface casing to 220 feet and 26-inch diameter from 220 to 880 feet. A summary of the pilot well construction and hydrogeologic characterization is available in the draft report titled, *Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well* (BC 2019).

The Phase II Sampling and Analysis Plan (SAP) provides details on the geochemical laboratory analysis and is included as Appendix A. Descriptions of the samples based on visual observations made during the installation of the pilot borehole are in Appendix B. Photographs of the individual samples collected are in Appendix C. All laboratory reports for the geochemical analysis are included in Appendix D. Laboratory reports from the zone groundwater analyses are in the TLC Pilot SWIP well completion report (BC 2019).

The objective of the Phase II geochemical characterization program was to collect samples from the pilot borehole for geochemical laboratory analyses, evaluate the geochemical conditions present in the aquifer units of the injection well, identify the constituents which could become mobilized during the injection process, and evaluate if the chemistry of the treated water could be adjusted to minimize or mitigate constituent mobilization. The geochemical characterization program was not designed to replicate the geochemical conditions which would occur during the injection process due the logistical difficulties of collecting undisturbed core samples and retaining the redox conditions of the aquifer during drilling and laboratory analysis. Data and results from the geochemical characterization analysis should not be interpreted as representations of the potential water quality resulting from the injection process due to the differences between the in-situ geochemistry in the aquifer and the laboratory environment. Additional details on the laboratory methodologies are discussed in this report and can be found in the *Twin Lakes Church Seawater Intrusion Prevention Pilot Well Geochemical Characterization SAP* (BC 2018).

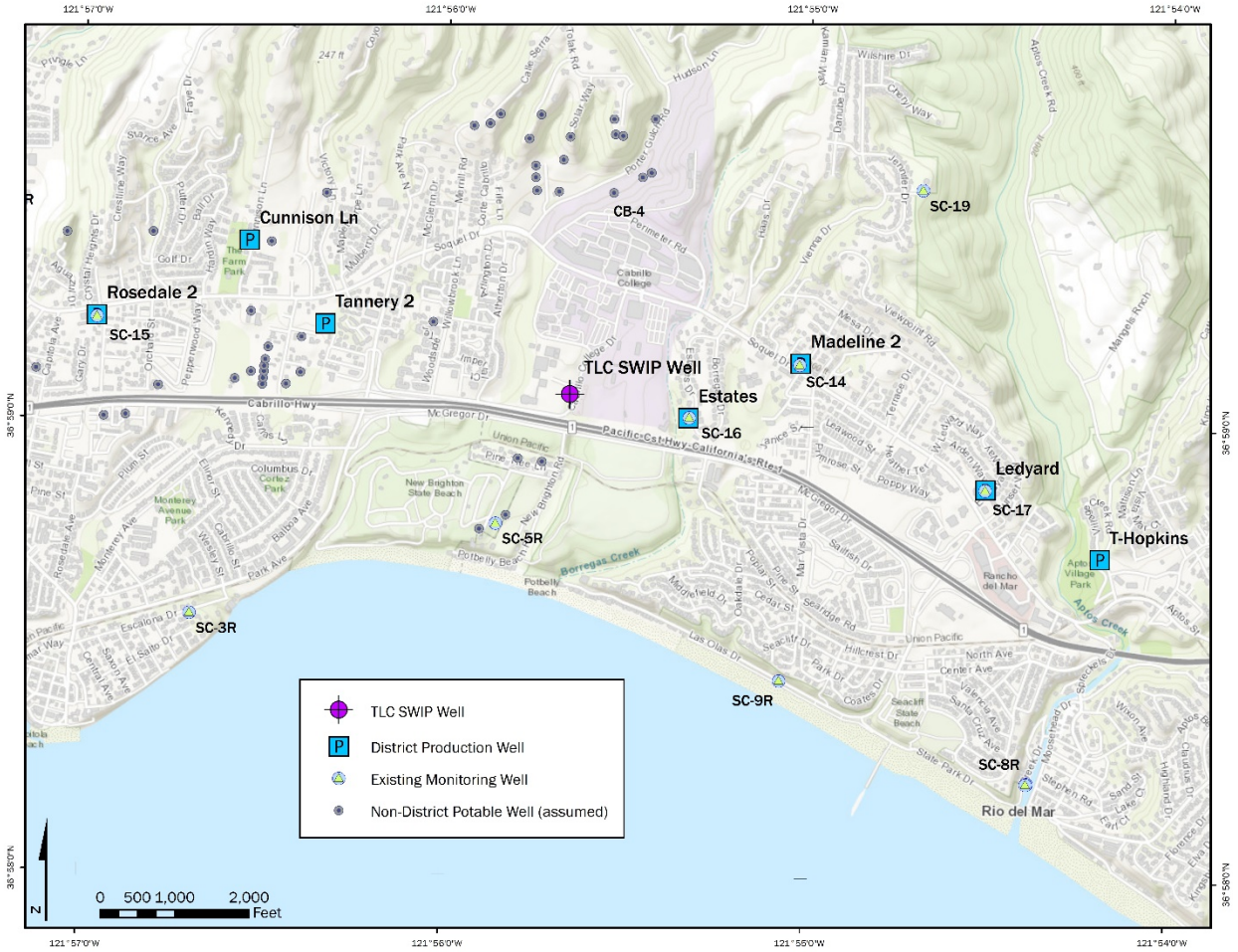

Figure 1-1. TLC pilot well location

Geochemical characterization can provide vital data to inform the design of an advanced water purification facility (AWPF) and ultimately minimize the reactions between the target aquifer units and the purified water. For this evaluation, the Purisima A and BC units are the screened intervals of the TLC Pilot SWIP well (Figure 1-2) and are the units targeted to mitigate further seawater intrusion. Adjacent Purisima formation units D, B, and AA are also included in this Phase II geochemical characterization, as these units may also be exposed to purified water during injection (Figure 1-2).

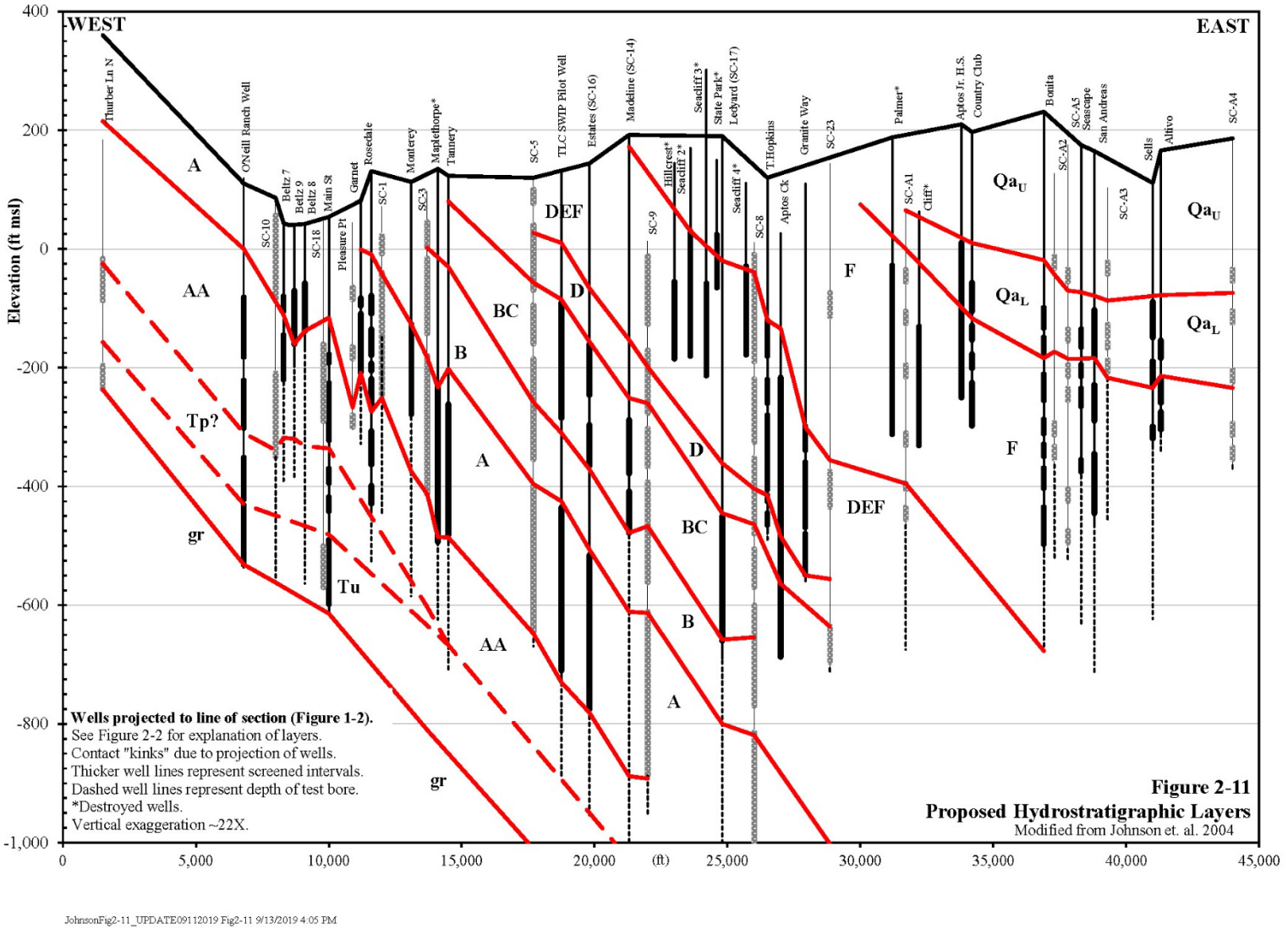

Figure 1-2. Hydrogeologic conceptual model of Soquel Creek Water District's service area

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Section 2

Sample Collection and Analysis

This section summarizes the collection of field data, sample collection process, and laboratory analyses conducted to provide the data needed for Phase II geochemical characterization/modeling efforts for the District's TLC Pilot SWIP well. Additional details on the sample collection and geochemical analyses are in the SAP (Appendix A).

2.1 Drill Cuttings Sample Collection

Grab samples for aquifer soil drill cuttings were collected from the drilling shaker table by members of the drilling crew at approximately 5-foot intervals, placed in plastic zip-top bags, photographed, labelled by depth interval, and stored in 5-gallon buckets until the drilling operations were completed (Figure 2-1). A portion of each sample was retained in a plastic chip tray for archival purposes (Figure 2-2). Individual 5-foot interval grab samples were composited to generate materials for geochemical testing analysis. Grab sample materials remaining after sample compositing were archived at the District office.



Figure 2-1. Grab sample collected from 95 feet below ground surface (bgs)



Figure 2-2. Chip tray of archived individual 5-foot sample splits

The sample compositing process was performed by the site geologist by combining individual 5-foot grab samples from the same lithologic unit using an equal volume from each sample. The lithological units were determined by evaluating the geophysical logs and the sample geologic descriptions. Once the depths of each target aquifer unit were identified from the available information, the sample bags from the corresponding depths were combined to represent the materials from each of the target aquifer and adjacent units, with composited samples representing the Purisima AA, A, B, BC, and D units. Samples were not composited across units to ensure the materials from the target units were not combined with materials from adjacent units. Individual grab samples that were not within the pilot well screen or filter pack depths were not included in the composite samples to ensure materials that may not be exposed to purified water were not composited.

2.2 Drilling Mud Sample Collection

Drilling of the TLC Pilot SWIP well was conducted using the reverse circulation method. Drilling fluids, comprised of water from the TLC fire hydrant and PAC-L[1], were required during operations to maintain circulation and retrieve boring cuttings. No other drilling additives were added to the mud circulation tank during the pilot borehole drilling. A shaker tank was used during the drilling process to remove large size fractions of the drill cuttings returns (naturally occurring rock fragments of the formations) from the drilling fluid. The drilling fluid from the shaker tank was recirculated back into the borehole during drilling operations to reduce the need for water from the TLC fire hydrant. Fine-grained cuttings generated during the drilling process from the Purisima formation were recirculated into the borehole from the shaker tank.

[1] PAC-L™, by Baroid, is modified natural cellulosic polymer provides filtration control in most water-based drilling fluids without substantially increasing viscosity yielding a drilling fluid suitable for drilling in sandy formations.

Drilling mud samples were collected in a plastic sample bottle from the mud tank at the surface as a grab sample of the fluid and analyzed for major ion and metals water quality constituents. The drilling mud was pressure filtered by the laboratory using a 0.45-micron filter apparatus to remove the solid particles prior to the water quality analysis. The solids collected on the filter paper were allowed to air dry and were sent for XRD mineralogy analysis to evaluate the mineral phases in the drilling mud.

2.3 Groundwater Sample Collection

Hydrologic testing within depth-specific zones of the target units was conducted between February 19, 2019 and March 12, 2019. Zonal groundwater testing was conducted by installing a temporary well within the target injection units to collect water quality samples. Zonal groundwater samples were not collected using the same methodology as samples collected from the District monitoring well network. The zonal groundwater samples were collected after drilling the pilot hole by constructing small diameter temporary wells drawing from 20 foot long intervals at selected depths. Additional details on the zonal groundwater sampling methodology are described in the *Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well* report (BC 2019).

The bottom of the pilot hole was backfilled with sand-cement grout from the total depth of the pilot boring, to the target depth of the first zone test interval. The temporary well for each zone comprised 6-inch-diameter steel drill pipe equipped with a 20-foot perforated section. The perforated pipe was lowered into the pilot hole and aligned with the deepest water-bearing formation of interest. Gravel pack material was installed upward by tremie pipe from the bottom to the top of zone of interest. An impervious layer of bentonite seal material was placed on top of the gravel pack to isolate the target formation of interest. Specific well construction details are included in the *Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well* report (BC 2019).

The temporary well was developed by air lifting for a minimum period of 12 hours, the water being pumped was clear to the eye, and the electrical conductivity and pH of the water had stabilized for 4 hours. A submersible pump was then installed into the temporary well and pumped for 8 hours prior to collecting water quality samples.

During the zone testing well purging, the pH of the purge water was measured using a hand-help meter by collecting a grab sample of the water at 15-minute intervals (BC 2019). ORP was measured using a separate Ultrameter II hand-held test kit using reagents to measure the ORP of a grab sample collected from the test well discharge. Data collected during the zone testing is located in the *Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well* (BC 2019).

After the pilot test well was designed, installed and developed, injection testing was performed to estimate the long-term injection rate that could be achieved at the TLC Pilot SWIP well. Additional details on the injection testing can be found in the *Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well* (BC 2019). The injection testing plan included one test across the entire pilot well (Purisima A and BC units together) and one test of the A unit. The Purisima A and BC unit test, Test 1, was completed between May 16 and May 19, 2019. The A test, Test 2, was completed between May 29 and June 1, 2019. Water quality samples of the injection water and water pumped from the completed well after the injection test were collected.

The objectives of the zone hydrologic and injection testing were to inform the pilot well design. Therefore, the list of parameters of the water samples collected during the zone and injection tests varied from the list of analytes for the geochemical laboratory analysis.

2.4 Geochemical Laboratory Analyses

The Phase II geochemical characterization analyses were selected to build upon the data collected from the Phase I geochemical characterization by utilizing several of the same methods. Additional analyses for Phase II were selected to attempt to fill data gaps and resolve uncertainty from the Phase I by: (1) evaluating three different purified waters in addition to laboratory quality deionized water in the soil leaching experiments and (2) providing more information on the potential mechanism for constituents being released during the injection of purified water.

The objective of the Phase II characterization was to provide the District with more information to optimize the advanced purified water treatment design and minimize the potential for constituent mobilization. The laboratory analyses were not designed to simulate the in-situ geochemical conditions within the target injection units. All laboratory analyses are performed under normal atmospheric conditions, room temperature and in accordance with the standard analytical methodology as discussed in the SAP (Appendix A). An overview of the analytical methods, the units to be analyzed, and additional notes on the methodology are summarized in Table 2-1.

Table 2-1. Phase II Geochemical Characterization Laboratory Analysis

Analysis	Target Units	Number of Composite Samples	Investigation	Methodology Details
Soil Leaching				
Modified SPLP (EPA 1994)	Purisima D, BC, B, A, AA	5	Phase I and Phase II	De-ionized and 3 stabilized pure water aliquots
Modified MWMP (ASTM 2013)	Purisima BC, A	2	Phase II	One water type, week-long submersion, repeated 4 times
HA-HCL (Tessier et al. 1979)	Purisima BC, D, B, A, AA	5	Phase II	Metals only
Mineralogical Characterization				
Whole-rock chemistry	Purisima D, BC, B, A, AA	5	Phase II	Major, minor and trace elements
XRD	Purisima D, BC, B, A, AA	5	Phase I and Phase II	Major and trace mineral phases

ASTM = American Society of Testing Materials
EPA = Environmental Protection Agency
HA-HCl = hydroxylamine-hydrochloride
MWMP = Meteoric Water Mobility Procedure.

The Phase II SAP (Appendix A) included scanning electron microscopy analysis; however, the fine-grained nature of the target unit samples collected from the pilot well were not well suited to meet the objective of identifying the mineral phases with potentially leachable constituents. Therefore, the XRD mineral analyses and field visual observations of the samples provide the sample mineralogy.

2.4.1 Soil Leaching Analysis

Three types of soil leach tests (modified SPLP, modified column, and HA-HCl extraction) were conducted to provide an indication of the leachability of aquifer materials when exposed to purified water. The analytes selected for the soil leaching analysis are listed in Table 2-2 and are based on California State Water Resources Control Board Drinking Water regulated constituents and major ions for water characterization, which are the same list of parameters that was used for the Phase I geochemical characterization investigation (BC 2016). The list of parameters shown in Table 2-2 was modified for the HA-HCl extraction analysis as the analytical laboratory advised the quantification of several parameters was not appropriate for the methodology.

Table 2-2. Analytical Parameters for Soil Leaching Analysis

Major Anions		
Chloride	Fluoride [a]	Sulfate
Major Cations		
Calcium	Magnesium	Potassium
Sodium		
Dissolved Metals		
Aluminum [a]	Antimony [a]	Arsenic [a]
Barium [a]	Beryllium [a]	Boron
Cadmium [a]	Chromium [a]	Copper [a]
Iron	Lead [a]	Manganese
Mercury [a]	Molybdenum	Nickel [a]
Selenium [a]	Silver	Silica
Strontium [a]	Thallium [a]	Uranium [a]
Zinc		

a. Constituent is a regulated for drinking water contaminate.

2.4.1.1 Modified SPLP Analysis

SPLP Method 1312 uses a 20:1 solution to solids mass ratio to extract readily dissolvable solid phases (Environmental Protection Agency [EPA] 1994). However, the high solution to solids ratio can also dilute constituents below the analytical detection limit. To achieve the characterization objective, a modified SPLP with a solution to solids ratio of 4:1 was used during the Phase I geochemical investigation to identify potential constituents of concern while still meeting the analytical sample mass requirements. Phase II modified SPLP methodology will utilize the same 4:1 solution to solids ratio to be able to directly compare the data from the Phase I investigation.

For the Phase I geochemical investigation, de-ionized laboratory reagent grade water was used in the modified SPLP analysis to dissolve constituents and simulate a “worst-case” scenario (e.g., reverse osmosis permeate that has not undergone post-treatment or stabilization). Due to limited sediment sample volume for the Phase I investigation, there was not enough sample to analyze multiple potential purified waters.

For Phase II, de-ionized laboratory reagent grade water was used again to be able to directly compare results between Phase I and Phase II studies. Additionally, Phase II analyses included purified waters from three advanced water purification facilities in California. The results and data from three treated water aliquots are identified anonymously as AWPF1 through AWPF3 report at the request of the three water agencies. Details on the treatment plant system for each of the AWPF facilities are provided in Table 2-3.

Table 2-3. Advanced Water Purification Facilities Specifics

Advanced Water Purification Technology	AWPF1	AWPF2	AWPF3
Ozone	X		
Membrane Filtration	X	X	X
Reverse Osmosis	X	X	X
Ultraviolet/Advanced oxidation process	X	X	
Ultraviolet disinfection			X
Post-Treatment/Stabilization [a]	X	X	X
Full scale operational		X	X
Purified Water End Use	Pilot Facility for Groundwater Replenishment	Groundwater Replenishment	Title 22 unrestricted (e.g., landscape irrigation)

a. *Post Treatment for AWPF1 =decarbonation, pH adjustment and lime addition, secondary disinfection. Post Treatment for AWPF2 = decarbonation, lime addition and pH adjustment, Post Treatment for AWPF3 = decarbonation, pH adjustment and lime addition, blending with non-potable recycled water, for non-potable uses*

Samples selected for SPLP analysis included the target injection aquifers (Purisima A and BC) and adjacent units that could come into contact with the injection water (Purisima D, B, and AA). The objective of testing each unit with each type of water was to determine the potential mobility of constituents from the de-ionized water results and the potential mitigation benefits of water stabilization.

2.4.1.2 Modified Meteoric Water Mobility Procedure Column Analysis

Soil leaching column analyses, such as the MWMP, were not conducted during the Phase I geochemical characterization due to limited availability of sample material. Phase II conducted a modified MWMP methodology to evaluate the release of constituents and identify changes in the water quality parameters with prolonged and repeated exposure of the target units to the treated injection water. Purified water will be continuously injected into and moving through the target unit over the course of the PWS program. Column leaching may provide a better estimate of constituent release over time by repeatedly exposing the soil materials to purified water for long periods of time than the modified SPLP analyses.

Standard MWMP analysis methodology (ASTM 2013) is commonly used in the environmental compliance industry. The MWMP method was modified by extending the length of time in which the solution and solids can react and using multiple consecutive rinses. The purpose of the modifications was to observe changes in the concentration over multiple rinses to evaluate reactions such as may be expected for continuous injection of purified water during the PWS. Modifications to the standard MWMP test included fully saturating the column material at a 1:1 ratio at the beginning of the test instead of slowly percolating the solution into the column over 24 hours. Additionally, the

modified method increased the length of time the fluid can react to six days, allowing the column to drain for 24 hours on the seventh day. Leachate from the modified MWMP column analysis was collected on the seventh day and analyzed for the parameters listed in Table 2-2. At the completion of the first week of leaching and draining of the leachate, the column was then filled with purified water solution at a 1:1 ratio and allowed to react for another six days. The modified column tests were repeated for a total of four cycles using the same solid materials each week. The purified water leachate that is drained from the column was not reused in subsequent column cycles to avoid dissolved constituents being redeposited in subsequent test cycles. The modifications were designed to more closely simulate the injection water saturating and reacting with the aquifer materials.

Only material from the target aquifer units (Purisima A and BC) were analyzed for the modified column analysis. The purified water from the AWPF1 facility was used for the modified MWMP column analysis as it represents the most likely water treatment design for the SWIP.

2.4.1.3 Hydroxylamine-Hydrochloride Extraction Test

Metals bound to iron or manganese oxide mineral phases through adsorption could be a potential source of constituents released when purified water is injected into the aquifer. HA-HCl extraction tests were conducted to measure the amount of hydrous ferric oxide in the samples and estimate the potential for metals to desorb from iron and manganese oxide mineral phases (Tessier et al 1979). All aquifer and aquitard units were selected for HA-HCl extraction analysis. Leachate from the HA-HCl analysis were only analyzed for metals (Table 2-2) due to interferences between the extraction solution and other elements.

The HA-HCl analyses are part of a technique called sequential extraction, multi-step process intended to progressively release constituents from solid soil samples. Constituents released from each step are as follows:

1. Adsorbed and exchangeable cations;
2. Metals contained in carbonates;
3. Metals bound in iron and manganese oxides
4. Constituents contained in organic matter and sulfides; and
5. Constituents contained within silicate minerals.

Readily dissolvable mineral phases, as would be measured in step 1 of the sequential extraction analysis, were evaluated by the modified SPLP analysis. Dissolution and release of constituents from carbonate or silicate minerals from reactions to strong acids, steps 2 and 5 of the sequential extraction, were not required as the injected purified water will be near neutral pH. Constituents release during the oxidation of organic matter or sulfide mineral phases, step 4 of the sequential extraction analysis, represent long-term surficial processes that occur in nature when these mineral phases are exposed to atmospheric oxygen. Oxidation of organic carbon and sulfide mineral phases may not occur due the anoxic conditions present in the aquifer. The constituents adsorbed or bound in the iron and manganese oxide mineral phases, as estimated using step 3, are of greatest interest for the Phase II geochemical characterization

2.4.2 Mineralogical Analysis

Mineral phases were evaluated using visual observations, whole-rock chemistry, and XRD analysis. These data were used to identify potential reactive mineral phases, such as sulfides or iron oxides, that could leach constituents.

2.4.2.1 Visual Examination

General descriptions of the particle size, color, texture, predominant mineral forms and geological characteristics of the drill cuttings were described by an on-site SWIP Pilot Project geologist during the drilling of the initial pilot borehole. Visual examination of the boring samples was performed using a binocular scope with up to 30 times magnification.

2.4.2.2 Whole-Rock Chemical Analysis

Whole-rock chemical analysis were conducted using EPA Method 3052 to determine the elemental composition of the composite samples. Solid samples are digested prior to analysis by inductively coupled plasma with mass spectrometry to quantify the concentrations of major, minor, and trace elemental composition of the solid samples. Results from the whole-rock chemical analysis, when combined with the visual observations and XRD analysis, provide information on the potential mineral phases. Additionally, the whole-rock chemical analysis data were compared to the soil leaching results to evaluate which constituents are mobile or immobile.

2.4.2.3 X-ray Diffraction Analysis

XRD identifies mineral phases and quantities from peaks created by the scattering of radiation into three dimensional arrays of atoms unique to each mineral. Mineral phases are identified by comparing locations and intensities of diffraction peaks with those of mineral reference standards. Results were summarized as approximate mineral weight percent. Estimates of mineral percentages were based on relative peak heights/areas on the XRD scans. The detection limit for an average mineral in a sample is approximately 1 to 3 percent of the sample mass and the analytical reproducibility is approximately equal to the square root of the mass of mineral present. Amorphous mineral phases cannot be identified with XRD. Samples from the Phase I geochemical characterization were analyzed using XRD, and the results from the Phase II analysis were compared to the mineralogy of the Phase I investigation to evaluate the mineralogical changes spatially within the target units.

Section 3

Geochemical Analysis Results

Data collected from the field and laboratory analyses were combined to evaluate the potential water quality effects of the purified water interacting with the injection units and adjacent aquifer materials. Results from the Phase I investigation were combined with the results of the Phase II geochemical analysis to examine the geochemical conditions for the TLC Pilot SWIP well and the regional geologic units.

3.1 Drilling Mud Analysis

Drilling of the TLC Pilot SWIP well was conducted using potable water from a fire hydrant on the TLC property. The drilling mud was circulated through the borehole to return the cuttings to the surface. The drilling mud was passed through a shaker to separate out the cuttings then drilling mud was recirculated into the borehole. Fine-grained particles generated during the drilling process are not removed and become part of the "drilling mud." During the drilling process PAC-L, a polyanionic cellulose polymer drilling additive, manufactured and sold by Baroid, was added to the drilling mud to aid in the drilling circulation. Two samples of the drilling mud were collected after the drilling additive PAC-L was added and sent to water quality and mineralogy analysis to evaluate if the PAC-L potentially contaminated the drill cuttings collected for the geochemical analysis.

3.1.1 Drilling Mud Water Quality

Results of the drilling mud water quality analysis are listed in Table 3-1. Drilling mud represents a combination of the fine-grained particles circulating within the borehole, water added during the drilling process from the potable water source (TLC fire hydrant), groundwater flowing into the open hole during drilling, and any chemical drilling additives. Each of these sources could potentially have a different chemical signature and be represented in the drill mud collected for water quality analysis. To determine the chemical signature of the drilling additive, the other potential sources of chemical loading to the drilling mud were evaluated.

Table 3-1. Water Quality of Drilling Mud Samples

Analyte (mg/L)	Drill Mud 1	Drill Mud 2	Analyte (mg/L)	Drill Mud 1	Drill Mud 2
Total Alkalinity	174	200	Iron, dissolved	<0.02	0.05
Bicarbonate as $CaCO_3$	174	200	Lead, dissolved	<0.0001	<0.0001
Carbonate as $CaCO_3$	<2	<2	Manganese, dissolved	0.054	0.057
Hydroxide as $CaCO_3$	<2	<2	Mercury, dissolved	<0.0002	<0.0002
Calcium, dissolved	66.8	84	Molybdenum, dissolved	0.12	0.12
Chloride	120	201	Nickel, dissolved	<0.008	0.01
Magnesium, dissolved	14.9	18.7	Nitrate/Nitrite as N, dissolved	<0.02	0.05
Sodium, dissolved	184	239	Nitrite as N, dissolved	<0.01	<0.01
Sulfate	269	292	Nitrogen, ammonia	0.41	<0.05
Aluminum, dissolved	<0.03	<0.03	Nitrogen, total Kjeldahl	0.5	0.4

Table 3-1. Water Quality of Drilling Mud Samples

Analyte (mg/L)	Drill Mud 1	Drill Mud 2	Analyte (mg/L)	Drill Mud 1	Drill Mud 2
Antimony, dissolved	0.0043	0.0042	Phosphorus, dissolved	<0.1	<0.1
Arsenic, dissolved	0.0076	0.0092	Potassium, dissolved	10.4	10.7
Barium, dissolved	0.024	0.041	Selenium, dissolved	0.0031	0.0021
Beryllium, dissolved	<0.00008	<0.00008	Silver, dissolved	<0.1	<0.1
Cadmium, dissolved	<0.00005	<0.00005	Strontium, dissolved	0.631	0.699
Chromium, dissolved	<0.01	<0.01	Thallium, dissolved	<0.0001	<0.0001
Copper, dissolved	<0.01	<0.01	Uranium, dissolved	0.0074	0.0072
Fluoride	0.28	0.32	Zinc, dissolved	<0.01	<0.01

< = concentrations were not measured above the method detection limit
mg/L = milligrams per liter.

A limited number of constituents were analyzed on the water from the TLC fire hydrant used for the drilling operations and for the injection testing. Additionally, drilling mud metals concentrations were measured on the filtered portion of the sample as the high volume of suspended solids in the drilling mud likely have erroneously elevated metals concentrations due to the digestions of the solid particulates in the drilling mud. Direct comparisons between the TLC fire hydrant water used for drilling and the drilling mud are difficult based on the differences in the list of analytes tested and the different fraction of the solution analyzed (dissolved vs. total). The total arsenic concentrations of the TLC fire hydrant water were below the detection limit; therefore, the dissolved arsenic concentrations measured in the drilling mud are likely not due to constituent loading from the TLC fire hydrant water used while drilling.

Groundwater from the formations could have comingled in the borehole with the drilling mud. Data from the groundwater zonal testing was evaluated to determine if the drilling mud was similar to the groundwater from the Purisima A and BC units. Groundwater sulfate and bicarbonate concentrations from the Zone 3 well test are similar to the drilling mud (Figure 3-1). Zones 1 and 2 and the TLC Pilot SWIP well concentrations of dissolved iron, dissolved manganese, and barium are near the concentration or higher than the drilling mud samples. Dissolved arsenic concentrations in the drilling mud are higher than all of the groundwater data. The groundwater may have flowed into the borehole and contributed to the overall chemistry of the drilling mud, but the arsenic values measured in the drilling mud are likely from a different source.

The likely source of arsenic and other constituents measured in the drilling mud is from the dissolution of desorption of elements from the fine-grained particles of the drilled lithologies generated during the drilling process continuously recirculating within the borehole or from the drilling mud itself. Constituents could have become mobilized from the fine-grained cuttings and influenced the water quality of the drilling mud. The drilling mud metal concentrations were consistently near or below the concentrations of the Phase II soil leaching results (Figure 3-2). The metal concentrations in the drill mud likely are the result of mobilization of constituents from the fine-grained particles suspended within the drilling mud.

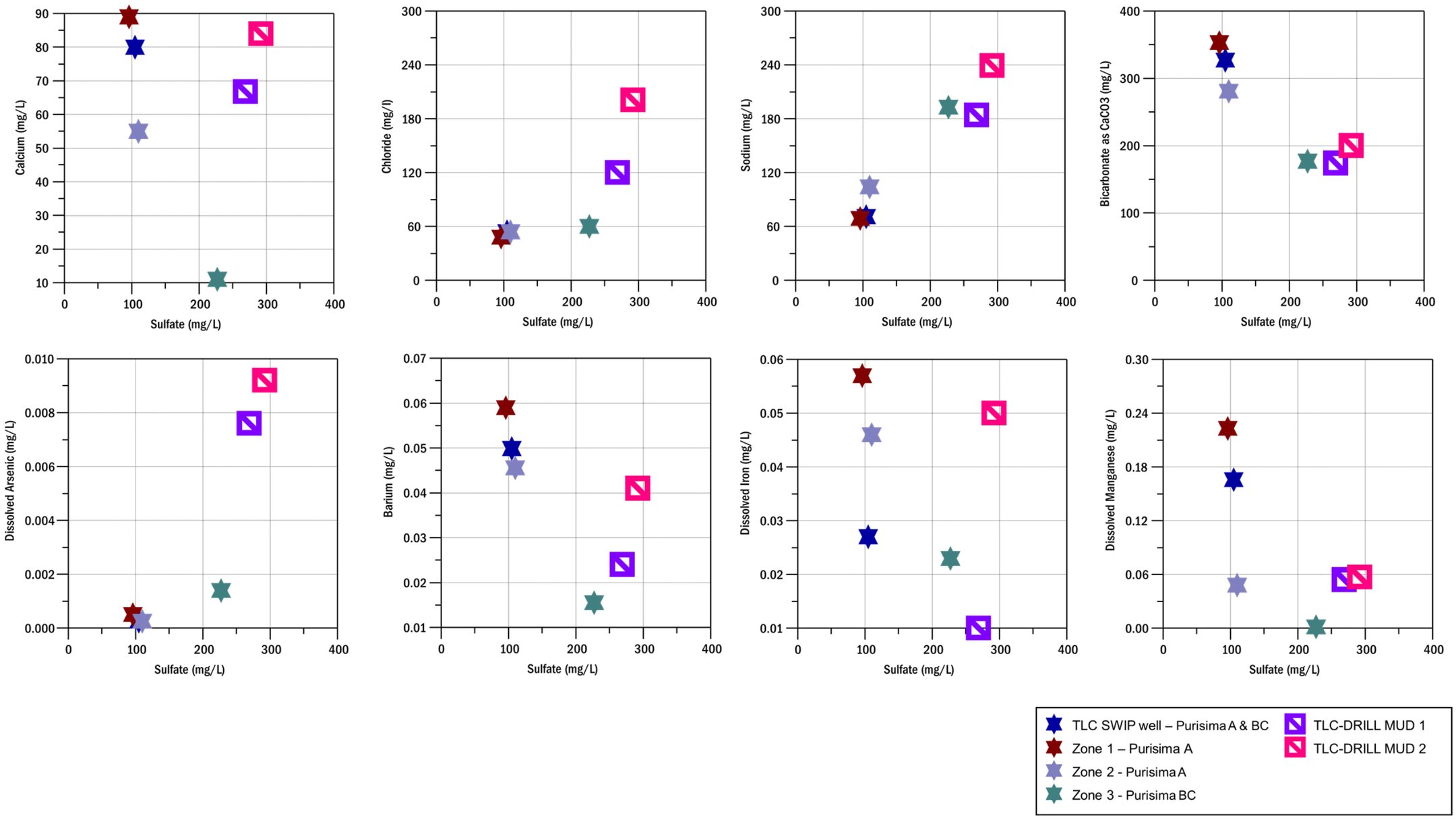

Figure 3-1. Drilling mud and groundwater chemistry

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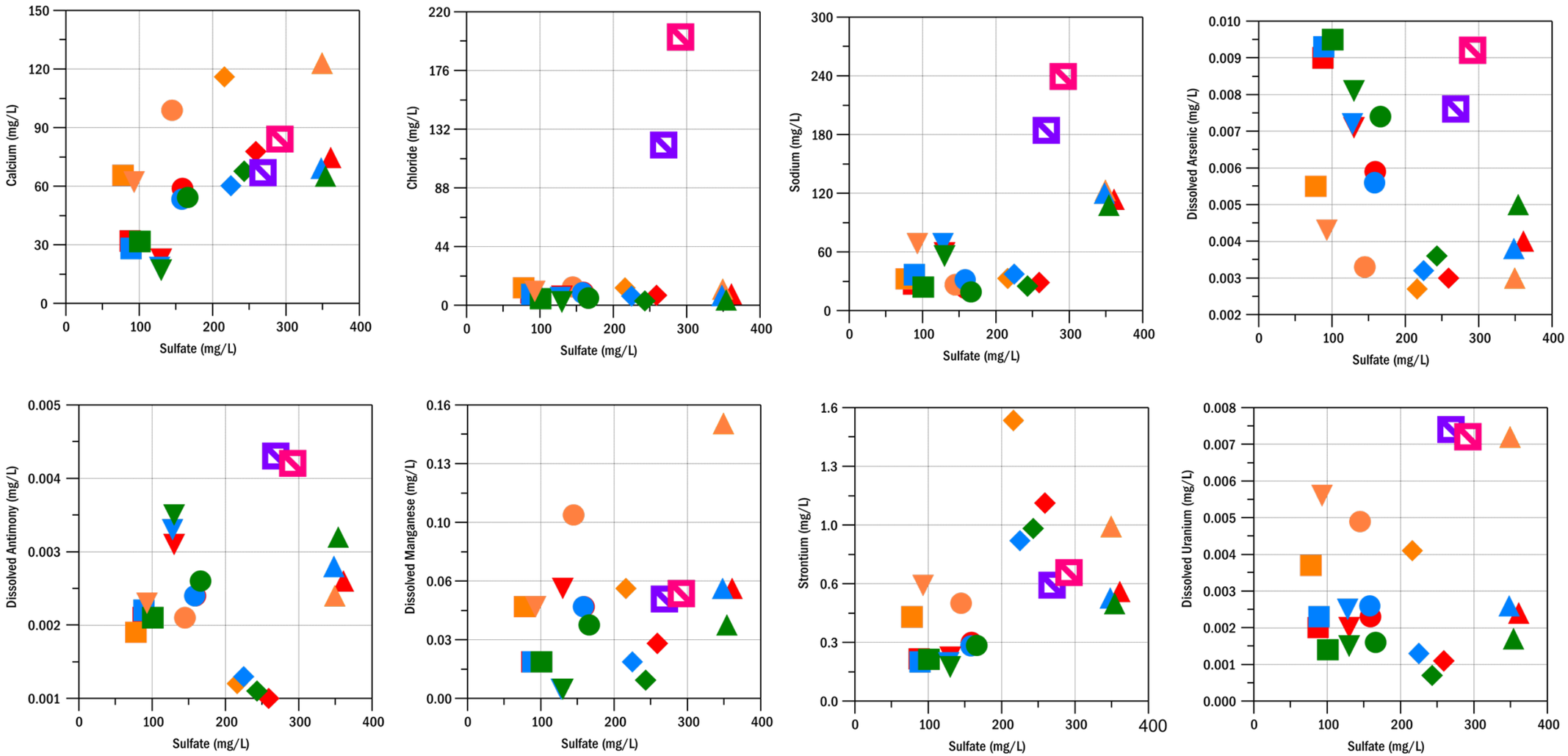

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited and the water tested.

Figure 3-2. Soil leaching and drilling mud water quality

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Chloride concentrations measured in the drilling mud are higher than the soil leaching and groundwater results (Figures 3-1 and 3-2). The chloride concentrations in the drilling mud could represent the water used for drilling from the TLC fire hydrant or could represent constituents dissolved from the PAC-L additive. The water used for drilling was not analyzed for major ions making it difficult to determine if the water used during the drilling process or PAC-L contributed concentrations to the drilling mud. The drilling additive PAC-L likely did not contaminate the cutting samples collected for geochemical analysis.

3.1.2 Drilling Mud Mineralogy

Prior to the water quality analysis of the drilling mud, the samples were pressure filtered to remove the particulate content (fine-grained solids) of the drilling mud. Drilling mud solid particles collected during the filtering process were analyzed for XRD mineralogy (Table 3-2). Smectite, illite, and chlorite clay minerals represent at least a third of the mineral phases found in the drill mud samples. No drilling solids, such as bentonite, were added during the pilot well drilling meaning the clay mineral phases identified in the drilling mud are from the lithologies being drilled.

Table 3-2. Drilling Mud XRD Mineral Analysis

		Drill Mud 1	Drill Mud 2
Mineral Name	Chemical Formula	Approximate weight %	Approximate weight %
Quartz	SiO_2	9%	11%
Plagioclase feldspar	$(Na,Ca)Al(Si,Al)_3O_8$	29%	33%
K-feldspar	$KAlSi_3O_8$	5%	5%
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$	<3?%	<3%
Smectite	$(Ca,Na)_x(Al,Mg,Fe)_4(Si,Al)_8O_{20}(OH,F)_4 \bullet nH_2O$	38%	33%
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH,F)_2$	<5%	<3?%
Chlorite	$(Mg,Fe,Al)_6(Si,Al)_4O_{10}(OH)$	5%	<5%
Clinoptilolite	$(Na,K,Ca)_6(Si,Al)_{36}O_{72} \bullet 20H_2O$	<5%	<3%
Calcite	$CaCO_3$	–	<3%
Pyrite	FeS_2	<3%	<3%
"Unidentified"	?	<5%	<5%

The other mineral phases in the drilling mud samples are the same mineral phases found in the drill cutting samples (Table 3-9). The similar mineralogy between the drill mud and the drill cuttings is an additional line of evidence the drill mud water quality is likely due to the mobilization of constituents from the fine-grained particles circulating in the borehole during the drilling process.

3.2 Zone Groundwater Quality Analysis

Piper diagrams plot the relative concentrations of the majority of the ions in solution for most natural waters including calcium, magnesium, sodium, potassium, chloride, sulfate, bicarbonate, and carbonate. Water quality data were converted from concentrations to milliequivalents based on the valence and atomic weight of the constituent. The percentage of each ion relative to the total is then calculated. The resulting relative percentage of each ion is plotted on trilinear plots (Piper diagrams) and projected onto the central diamond shape plot.

A Piper diagram of the groundwater data was created to compare the individual zone tests to the completed TLC Pilot SWIP well. Water quality of the groundwater samples collected from the individual zones tested during the pilot well installation show slight differences in the water quality between the Purisima A and BC units (Figure 3-3). The Piper diagram also indicates the water quality of the completed pilot well across both screened intervals (TLC Pilot SWIP well) is similar to the lower Purisima A unit water quality.

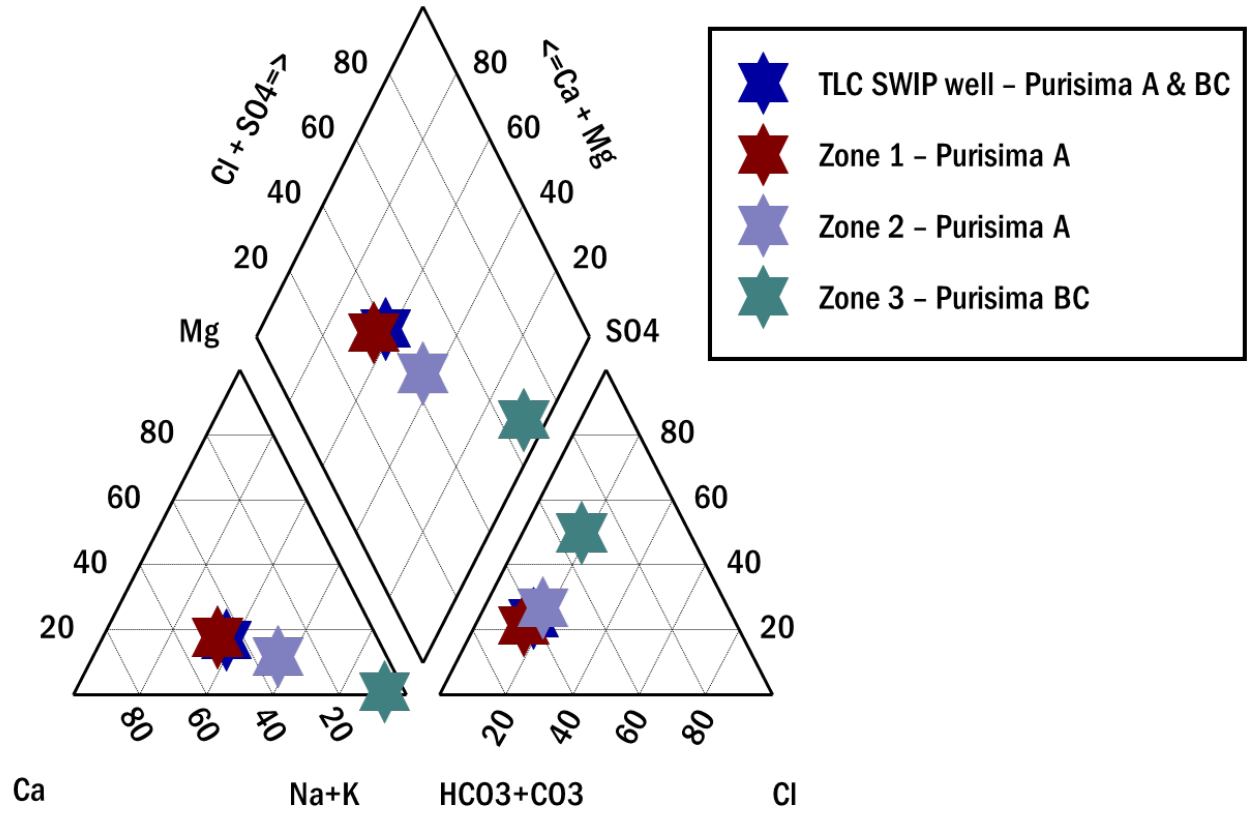

Figure 3-3. Piper diagram of zone test and TLC Pilot SWIP well water quality

The water quality of the TLC Pilot SWIP well is similar to SC-5R-A water quality (Figure 3-4). Other existing District monitoring wells have slightly different major ion signatures, indicating regionally there are geochemical differences even within the same aquifer.

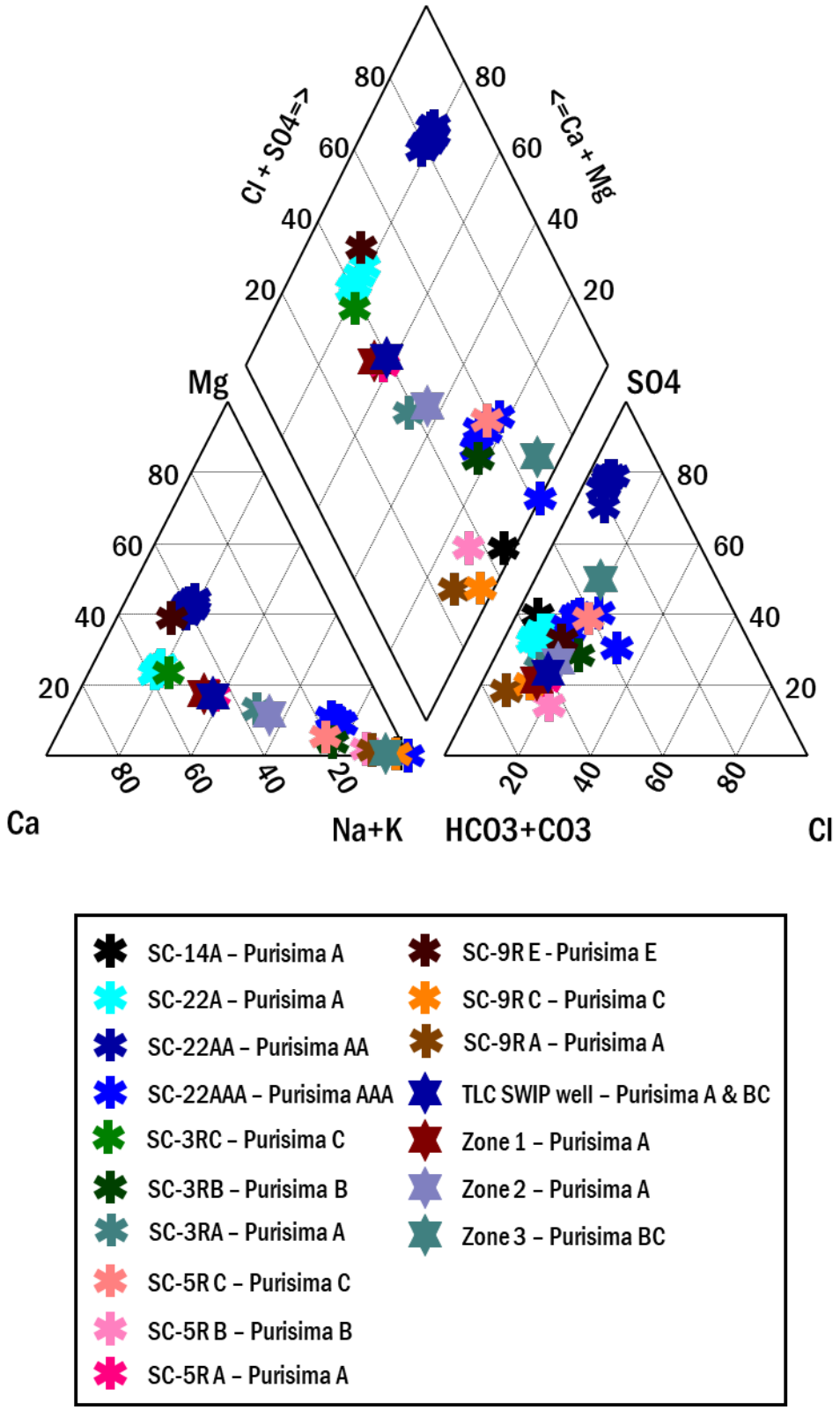

Figure 3-4. Piper diagram of SWIP and District monitoring groundwater wells

Concentrations of arsenic in the zonal groundwater data were well below the regulatory standards (Table 3-3). Total iron and manganese in the zonal groundwater data are above the secondary drinking water standard. Total concentrations are measured on unfiltered water samples meaning mineral or soil particulates suspended in the solution are digested and measured during the total concentration analysis. Elevated total metals concentrations could reflect higher proportions of suspended solids not filtered out during the sample preparation. Zonal water quality samples collected prior to the construction and development of the well may not represent the water quality of the well after measures such as installing a filter pack in the well annual volume, well development, and purging the well have been conducted to reduce the potential suspended solids in the well water.

Table 3-3. Zone Testing Water Quality

Analyte (mg/L)	MCL	Zone 1	Zone 2	Zone 3
pH (Laboratory)	-	7.6	7.7	8.8
Alkalinity, Total (as $CaCO_3$)	-	289	230	145
Bicarbonate (as HCO_3-)	-	353	281	177
Carbonate as $CaCO_3$	-	<10	<10	<10
Hydroxide	-	<0.010	<0.010	<0.010
Hardness (as $CaCO_3$)	-	307	185	32
Dissolved Arsenic	0.01	0.0005	<0.0005	0.0014
Total Arsenic	0.01	0.0006	0.0006	0.0013
Calcium	-	89	55	11
Chloride	250[a]	48	54	60
Chromium VI	-	<0.00005	<0.00005	<0.00005
Total Copper	1[a]	<0.010	<0.010	<0.010
Fluoride	2[a]	0.3	0.2	0.1
Dissolved iron	0.3[a]	0.057	0.046	0.023
Total Iron	0.3[a]	0.224	0.157	**0.356**
Magnesium	-	20	12	1
Dissolved Manganese	0.05[a]	**0.223**	0.048	<0.003
Total Manganese	0.05[a]	0.234	0.047	<0.010
Nitrate as N	10	<0.1	<0.1	0.1
Potassium	-	8.4	5.9	2.4
Sodium	-	69	104	193
Sulfate	250[a]	96	110	227
Total Dissolved Solids (TDS)	500[a]	**572**	**554**	**618**
Total Zinc	5[a]	0.015	<0.010	<0.010

a. Secondary Drinking Water maximum contaminant level (MCL).
< = concentrations were not measured above the practical quantitation limit.
mg/L = milligrams per liter, concentrations measured above the MCL are in bold

Comparisons of the total and dissolved fractions of arsenic, iron, and manganese in the zonal groundwater samples indicates total iron concentrations are likely reflective of suspended solids in solution. Total versus dissolved concentrations of iron plot well below a 1:1 concentration line indicating a portion of iron in the total concentrations are able to be filtered, resulting in a much lower dissolved iron concentration (Figure 3-5). Arsenic and manganese concentrations plot very close to the 1:1 line indicating the dissolved and total fractions concentrations are nearly the same.

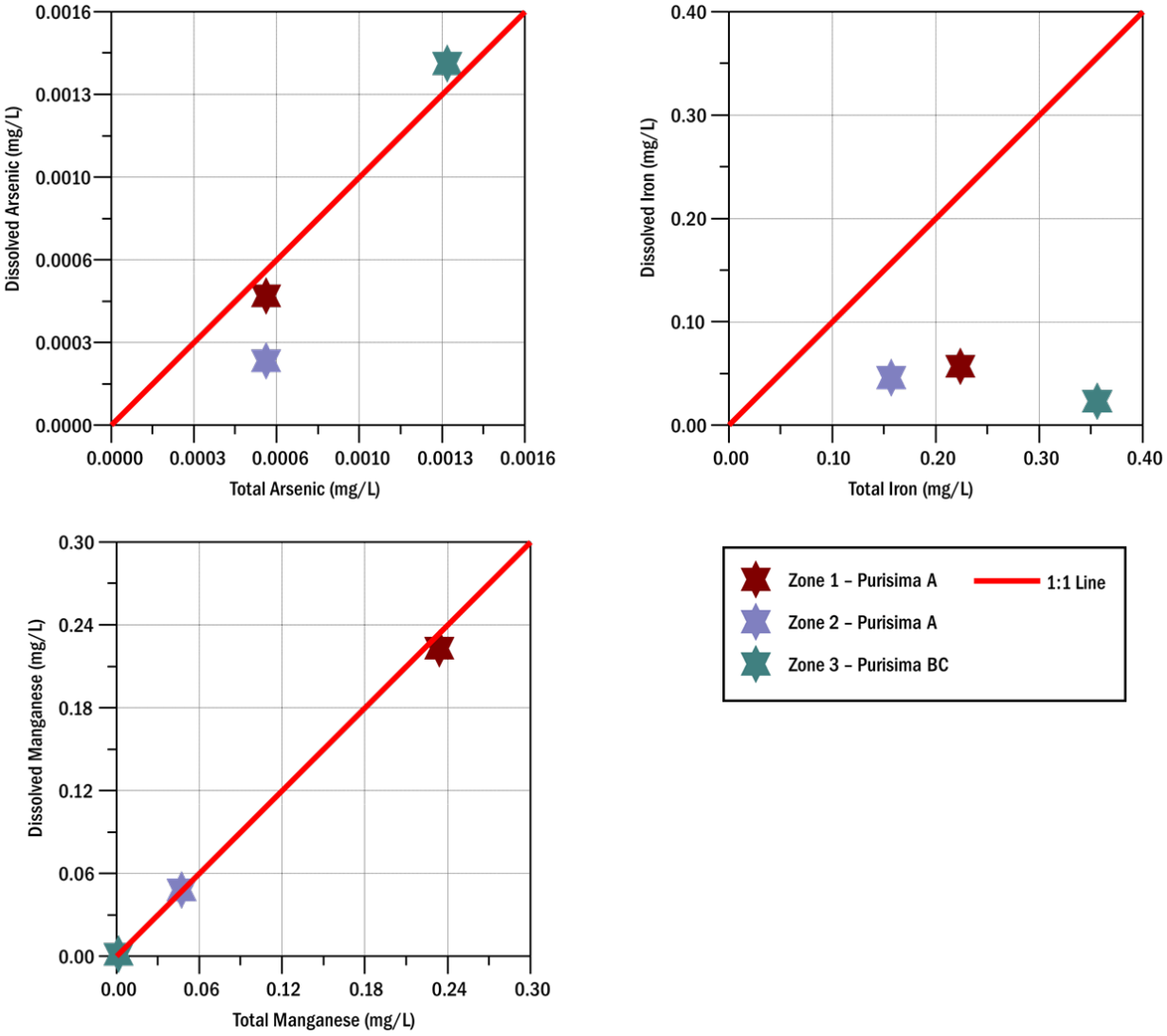

Figure 3-5. Total and dissolved metals from Zone water quality samples

3.3 Injection Test Groundwater Quality Analysis

Samples of the water injected into the pilot well (injectate) and the water withdrawn from the pilot well post-injection were analyzed for a shortened list of analytes including total arsenic, total iron, total manganese, nitrate, TDS, and pH (Table 3-4). Water from the TLC fire hydrant used for the injection test was treated groundwater that had undergone iron and manganese removal, resulting in low concentrations of these constituents. Additional details on injection test are provided in the

Hydrogeologic Characterization and Completion Report for Twin Lakes Church Pilot Seawater Intrusion Prevention Well (BC 2019). The post-injection water quality showed a slight increase in total arsenic compared to the injectate and the pre-injection TLC Pilot SWIP well groundwater results. Total iron and manganese concentrations were lower in the post-injection water quality data than the Zone 1 (A unit) sample. All of the post-injection test results are the same order of magnitude as the zonal groundwater results.

Table 3-4. Water Quality Before and After Injection Testing

Analyte (mg/L)	MCL	Pre-Injection Test Groundwater Extraction Samples				Injectate Sample (TLC fire hydrant)	Extraction Sample of Post-Injection Test TLC Pilot SWIP well (Purisima A and BC units)
		Zone 1 (Purisima A unit)	Zone 2 (Purisima A unit)	Zone 3 (Purisima BC unit)	TLC Pilot SWIP well (Purisima A and BC units)		
pH (std. units)		7.6	7.7	8.8	7.7	7.5	7.5
Arsenic, total	0.01	0.0006	0.0006	0.0013	<0.0005	<0.0005	0.0017
Iron, total	0.3[a]	0.057	0.157	**0.356**	0.129	0.029	0.293
Manganese, total	0.05[a]	0.234	0.047	<0.00005	0.172	0.004	0.056
Nitrate, as N	10	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
TDS	500[a]	**572**	**554**	**618**	572	534	514

a. Secondary drinking water MCL; TDS = total dissolved solids, concentrations measured above the MCL are bold

The changes in the concentrations of the water samples collected from the TLC Pilot SWIP well pre- and post-injection likely reflects natural variability in the groundwater. Only one sample from each groundwater zone test and one sample from the post-injection test were collected. In order to effectively evaluate if the water quality is changing from the injection of potable drinking water into the well, a larger data set of samples from the TLC Pilot SWIP well pre- and post-injection would need to be generated and statistical analyses would need to be performed.

3.4 Soil Leaching Analysis

Soil leaching results were evaluated to identify constituents with the potential to be mobilized during future replenishment and injection operations. Constituents of concern include metals with a regulated drinking water MCLs or other constituents which could degrade the aquifer water quality. Comparisons between the laboratory results and the MCLs are to identify samples that are orders of magnitude above or below the allowable drinking water limits for the range of potential inorganic contaminants of concern. Soil leaching results are based on a laboratory test which may not be representative of conditions within the aquifer during the injection process including temperature, reactions with native groundwater, solution-to-solids ratio, etc. The soil leaching results allows for an evaluation of the purified water and target units based on their respective likelihoods for leaching constituents from the groundwater aquifer.

The modified SPLP soil leaching results were evaluated to determine:

- the potential leachability of the soils collected from wells multiple locations;
- if the Phase I samples were affected from being stored for several years prior to laboratory analysis; and

- if the leaching potential is affected differently by purified water that has undergone different advanced water purification treatment processes and post-treatment, in some cases (see Table 2-3).

This Phase II study also collected data from the modified column tests to determine if leaching concentrations changed with successive exposure to purified water chemistry (using AWPF1 water).

3.4.1 Phases I and II Soil Leaching

Results from the soil leaching analysis from Phase I were compared to the results from the Phase II TLC Pilot SWIP well data. The Phase I samples were collected from archived splits of materials generated during the installation of three monitoring wells that had been drilled in the area between 2009 and 2013, with samples representing several different geologic units.

Results of the soil leaching analysis indicate almost all the Phase I samples have a different geochemical signature compared to the results of the Phase II soil leaching analyses (Figure 3-6). Calcium, magnesium, and sulfate concentrations were higher in the Phase I samples, with the exception of Phase I sample SC-22-SS (Figure 3-6). TLC Pilot SWIP well samples have higher arsenic concentrations but lower cadmium and manganese concentrations than several of the Phase I samples.

Differences in the soil leaching results between the Phase I and II samples could be related to either spatial differences within the lithological units or differences in the condition of the samples prior to the laboratory analysis. Wells SC-9R and SC-22 are located approximately 1 to 2 miles south of the TLC Pilot SWIP well (Figure 1-1). Cabrillo 4 (CB-4) is located less than 1 mile north of the TLC Pilot SWIP well. Differences in the soil leaching results could be related to natural variability of the lithological units; however, proof of the variability cannot be definitively determined using the data collected since the SC-9R, SC-22, and CB-4 samples were collected and stored for several years prior to the collection of the TLC Pilot SWIP well samples.

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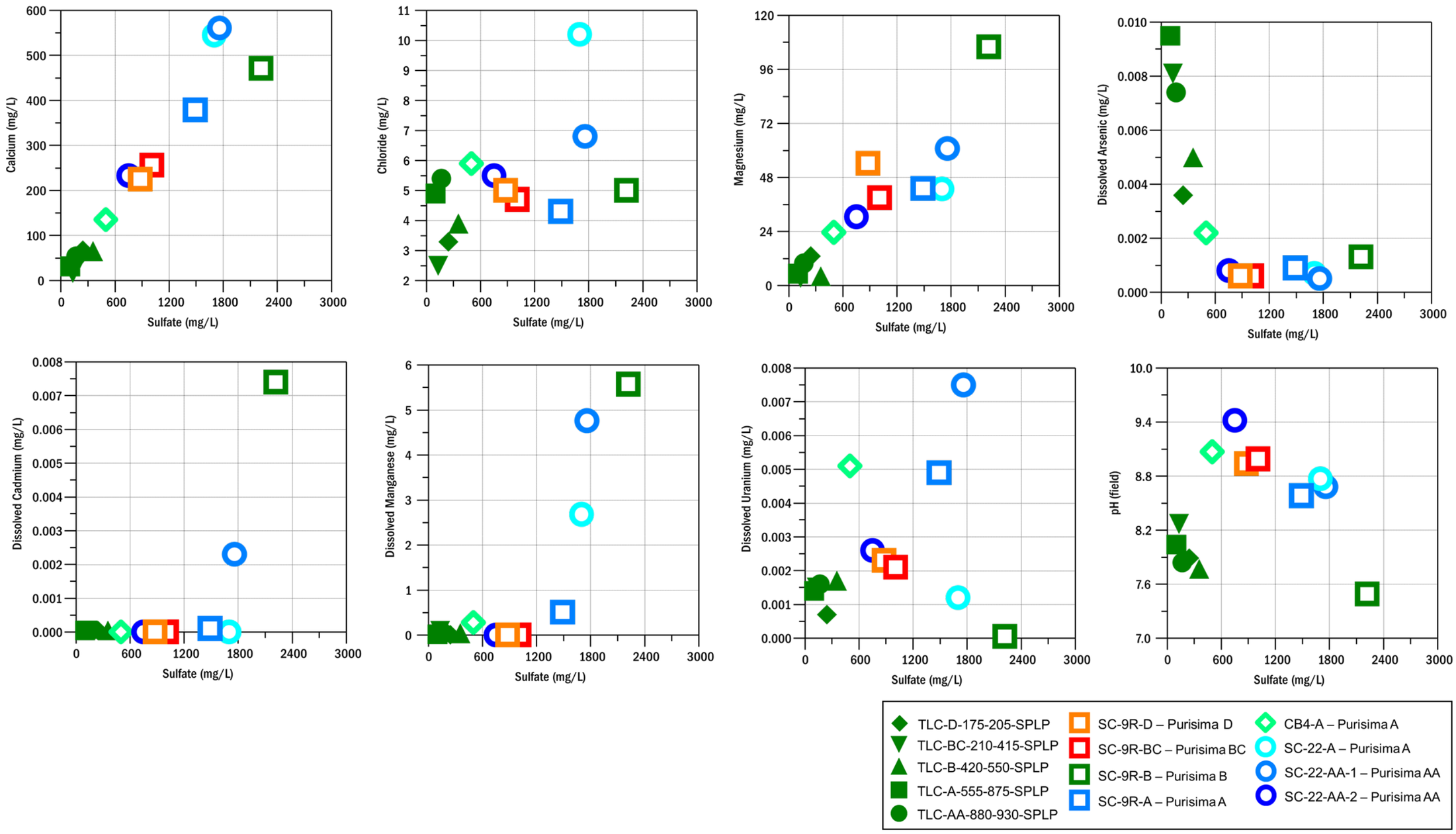

Figure 3-6. Phase I and II modified SPLP leaching results

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Splits of materials collected from wells SC-9R, SC-22, and CB-4 were stored in chip trays or plastic zip-top bags from 2009 to 2013. Phase I sample collection and analysis on these samples were performed in 2016. The length of time exposed to atmospheric conditions in storage could have resulted in chemical reactions (oxidation) to mineral phases, such as sulfide minerals, present in the Phase I samples. Oxidation of sulfides and other minerals during storage could have released metals attached or contained within those mineral phases. Evidence of possible chemical oxidation of sulfides could be the elevated sulfate concentrations in the Phase I soil leaching results.

3.4.2 Purified Water Chemistry

Water was collected from three advanced water purification facilities for the soil leaching analysis. All three purified waters have metal concentrations near or below the detection limit (Table 3-5). Major ion concentrations (calcium, chloride, magnesium, potassium, sodium, and sulfate) are also low compared to groundwater collected from the TLC Pilot SWIP well (Table 3-5). AWPFAWPF1 purified water has the highest concentrations of major ions.

Table 3-5. Water Quality of Purified Waters for Soil Leaching Analysis

Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF3 (mg/L)	Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF3 (mg/L)
pH (std. units)	8.0	7.9	7.9	Lead	< 0.0002	< 0.0002	< 0.0002
Total Alkalinity	199	42	41.5	Magnesium	1	< 0.2	< 0.2
Bicarbonate as $CaCO_3$	199	42	41.5	Manganese	0.03	< 0.01	< 0.01
Carbonate as $CaCO_3$	<2	<2	<2	Mercury	< 0.0002	< 0.0002	< 0.0002
Aluminum	< 0.05	< 0.05	< 0.05	Molybdenum	< 0.02	< 0.02	< 0.02
Antimony	< 0.0008	< 0.0008	< 0.0008	Nickel	< 0.008	< 0.008	< 0.008
Arsenic	< 0.0004	< 0.0004	< 0.0004	Potassium	1	0.4	0.5
Barium	0.008	0.007	0.007	Selenium	< 0.0002	< 0.0002	< 0.0002
Beryllium	< 0.0002	< 0.0002	< 0.0002	Silica	1.7	0.3	< 0.2
Boron	0.24	0.2	0.23	Silver	< 0.0002	< 0.0002	< 0.0002
Cadmium	< 0.0001	< 0.0001	< 0.0001	Sodium	8.2	4.5	17.7
Calcium	71.3	13.7	< 0.1	Strontium	0.195	< 0.009	< 0.009
Chloride	10	4.2	3.5	Sulfate	< 1	< 1	< 1
Chromium	< 0.001	< 0.001	< 0.001	Thallium	< 0.0002	< 0.0002	< 0.0002
Copper	0.08	< 0.01	< 0.01	Uranium	< 0.0002	< 0.0002	< 0.0002
Fluoride	0.3	< 0.1	0.2	Zinc	0.01	< 0.01	< 0.01
Iron	< 0.03	< 0.03	< 0.03				

< = concentrations were not measured above the method detection limit; mg/L = milligrams per liter.

3.4.3 Purified Water Soil Leaching

The modified SPLP test used a 4:1 ratio of water to soil to avoid diluting leached constituents below the analytical detection limit and to more closely simulate the ratio of solids the purified water would contact in the injection formation, relative to the standard 20:1 water to soil ratio. Soil leaching data from each of the sampled units indicates the regulated constituents they were analyzed for were measured below their respective MCLs and several were not detected (Table 3-6). Regulated drinking water constituents measured above the detection limit, but below the MCL, in the soil leaching analyses discussed below include arsenic, antimony, barium, cadmium, manganese, strontium, and uranium. All laboratory concentrations are reported as the dissolved concentration per the standard laboratory procedure for the SPLP analyses (EPA 1994). Direct comparisons between the dissolved concentrations of the laboratory results and regulatory standards based on total metals concentrations may not be useful for constituents such as aluminum, antimony, arsenic, cadmium, iron, lead, manganese, and zinc. These metals can be adsorbed onto particulates measured during the digestion of total recoverable water quality analyses. Dissolved concentrations of these metals may be much lower than the total metals concentrations in the same sample.

The potential for metals and other constituents to mobilize through desorption or dissolution is relatively consistent for all waters used in the laboratory analysis (Figures 3-7 and 3-8). Arsenic is measured in each of the TLC Purisima units tested regardless of the type of water used for the analysis (Figure 3-8). Arsenic concentrations of the AWPF2 tests are lower than the other three test results. These results could be interpreted to either indicate AWPF2 water mobilizes less arsenic, or the sample splits of the solid materials used for the test had variable concentrations of arsenic, particularly the Purisima A, BC, and AA units. However, the AWPF2 results are not the lowest results for other constituents such as barium, boron, iron, magnesium, potassium, silica, sodium, strontium, and uranium (Table 3-6). AWPF2 water constituent concentrations are often between the AWPF1 and AWPF3 concentrations (Table 3-5); however, the AWPF2 soil leaching results do not fall in between the results of the AWPF1 and AWPF3. The post-treatment approach for AWPF2 (lime-based alkalinity addition and elevation of pH) was developed to prevent mobilization of arsenic and similar minerals, although the alkalinity and pH of AWPF2 and AWPF3 are virtually the same and AWPF1's calcium and alkalinity were higher. The reason for this difference is not clear.

Slight variations in the concentrations of mobilized constituents between the purified waters may be the result of variations between the constituent concentrations in the sample splits of materials used for the analysis. The soil leaching analyses are not designed to simulate long-term weathering of mineral phases in the laboratory. The mechanism for the mobilization of metals from the soil leaching analyses are likely the desorption of constituents from iron and manganese oxides or dissolution of fine-grained, readily dissolvable mineral phases. Further analysis of the soil leaching results using geochemical modeling may be able to determine if the AWPF2 purified water mobilizes constituents in a different manner than the other treated waters used in the soil leaching analysis.

Table 3-6. Soil Leaching Results from SPLP Analysis

Analyte (mg/L)	MCL (mg/L)	TLC-D-175-205-AWPF1	TLC-D-175-205-AWPF2	TLC-D-175-205-AWPF3	TLC-D-175-205-SPLP	TLC-BC-210-415-AWPF1	TLC-BC-210-415-AWPF2	TLC-BC-210-415-AWPF3	TLC-BC-210-415-SPLP	TLC-B-420-550-AWPF1	TLC-B-420-550-AWPF2	TLC-B-420-550-AWPF3	TLC-B-420-550-SPLP
pH lab (std. units)	-	7.89	7.44	7.9	7.93	8.17	7.66	8.27	8.4	7.84	7.29	7.83	7.88
Aluminum [a]	1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Antimony	0.006	0.001	0.0012	0.0013	0.0011	0.0031	0.0023	0.0033	0.0035	0.0026	0.0024	0.0028	0.0032
Arsenic	0.01	0.003	0.0027	0.0032	0.0036	0.0071	0.0043	0.0072	0.0081	0.004	0.003	0.0038	0.005
Barium	1	0.023	0.033	0.02	0.02	0.007	0.01	< 0.007	< 0.007	0.012	0.017	0.012	0.012
Beryllium	0.004	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Boron	-	0.24	0.3	0.24	0.09	0.25	0.3	0.27	0.09	0.37	0.45	0.39	0.22
Cadmium	0.005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Calcium	-	77.7	116	60.2	67.7	22.6	62.2	18.4	17	74.7	123	69.3	65.2
Chloride [a]	250	7.6	13	6.8	3.3	6.8	10.5	6	2.5	8.4	12.2	7.4	3.9
Chromium	0.05	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride [a]	2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Iron [a]	0.3	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Lead	0.015	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001
Magnesium	-	15	21.8	12.3	13.1	4.9	12.1	3.9	3.5	4.7	7.7	4.4	4.1
Manganese [a]	0.05	0.03	0.06	0.02	0.01	0.06	0.05	< 0.01	< 0.01	0.06	0.15	0.06	0.04
Mercury	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	-	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.06	0.05	0.06	0.06
Nickel	0.1	0.009	0.024	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	0.021	< 0.008	< 0.008
Potassium	-	13.2	16.4	13.1	12.3	2.8	4.1	3	2.6	5.7	7.2	5.8	5.4
Selenium	0.05	0.0063	0.0062	0.0059	0.005	0.0016	0.0021	0.0017	0.0015	0.0034	0.0042	0.0036	0.0034
Silica	-	5.5	9.1	4.8	4.6	7.6	11.4	7.7	6.6	9.1	12.9	9	8.4
Silver [a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	-	28.8	32.9	37.3	25.1	59.1	68.5	68.4	55.9	114	123	120	108
Strontium†	-	1.08	1.53	0.875	0.942	0.24	0.631	0.208	0.187	0.597	0.952	0.562	0.532
Sulfate [a]	250	259	216	225	243	130	92.9	128	130	361	349	348	354
Thallium	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium†	0.03	0.0011	0.0041	0.0013	0.0007	0.002	0.0056	0.0025	0.0015	0.0024	0.0072	0.0026	0.0017
Zinc [a]	5	0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

a. secondary drinking water MCL
< = concentration was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in picocuries per liter (pCi/L); - = no MCL is established; mg/L = milligrams per liter.

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Table 3-6. Soil Leaching Results from SPLP Analysis (Cont.)

Analyte (mg/L)	MCL (mg/L)	TLC-A-555-875-AWPF1	TLC-A-555-875-AWPF2	TLC-A-555-875-AWPF3	TLC-A-555-875-SPLP	TLC-AA-880-930-AWPF1	TLC-AA-880-930-AWPF2	TLC-AA-880-930-AWPF3	TLC-AA-880-930-SPLP
pH lab (std. units)	-	8.1	8.03	8.08	8.09	7.85	7.72	7.87	7.83
Aluminum [a]	1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Antimony	0.006	0.0021	0.0019	0.0022	0.0021	0.0024	0.0021	0.0024	0.0026
Arsenic	0.01	0.009	0.0055	0.0093	0.0095	0.0059	0.0033	0.0056	0.0074
Barium	1	0.018	0.034	0.018	0.017	0.035	0.058	0.035	0.032
Beryllium	0.004	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Boron	-	0.25	0.29	0.27	0.08	0.24	0.28	0.26	0.07
Cadmium	0.005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00008	< 0.00005	< 0.00005
Calcium	-	31.9	65.6	28.1	31.7	58.9	98.9	53.4	54.3
Chloride [a]	250	9.4	13.1	8.2	4.9	9.9	13.7	9.3	5.4
Chromium	0.05	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride [a]	2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2
Iron [a]	0.3	< 0.03	0.06	< 0.03	< 0.03	< 0.03	0.06	< 0.03	< 0.03
Lead	0.015	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001
Magnesium	-	5.6	10.2	5.1	5.3	10.5	16.1	9.9	9.9
Manganese [a]	0.05	0.02	0.05	0.02	0.02	0.05	0.1	0.05	0.04
Mercury	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	-	0.03	0.03	0.03	0.04	0.05	0.04	0.05	0.05
Nickel	0.1	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	0.019	0.01	< 0.008
Potassium	-	4.9	7.1	5.1	4.6	4.5	6.4	4.9	4.2
Selenium	0.05	0.0012	0.0011	0.0012	0.001	0.0012	0.001	0.0012	0.0014
Silica	-	17.8	19.1	17.7	18.2	20.5	21.7	20.6	20.4
Silver [a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	-	27.3	32.5	36.7	24.1	22.6	26.5	31.6	19.2
Strontium†	-	0.231	0.459	0.213	0.228	0.32	0.533	0.302	0.303
Sulfate [a]	250	87.8	78	89	101	159	145	158	166
Thallium	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium†	0.03	0.002	0.0037	0.0023	0.0014	0.0023	0.0049	0.0026	0.0016
Zinc [a]	5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

a. secondary drinking water

< = concentrations was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in picocuries per liter (pCi/L); MCL; - = no MCL is established; mg/L = milligrams per liter.

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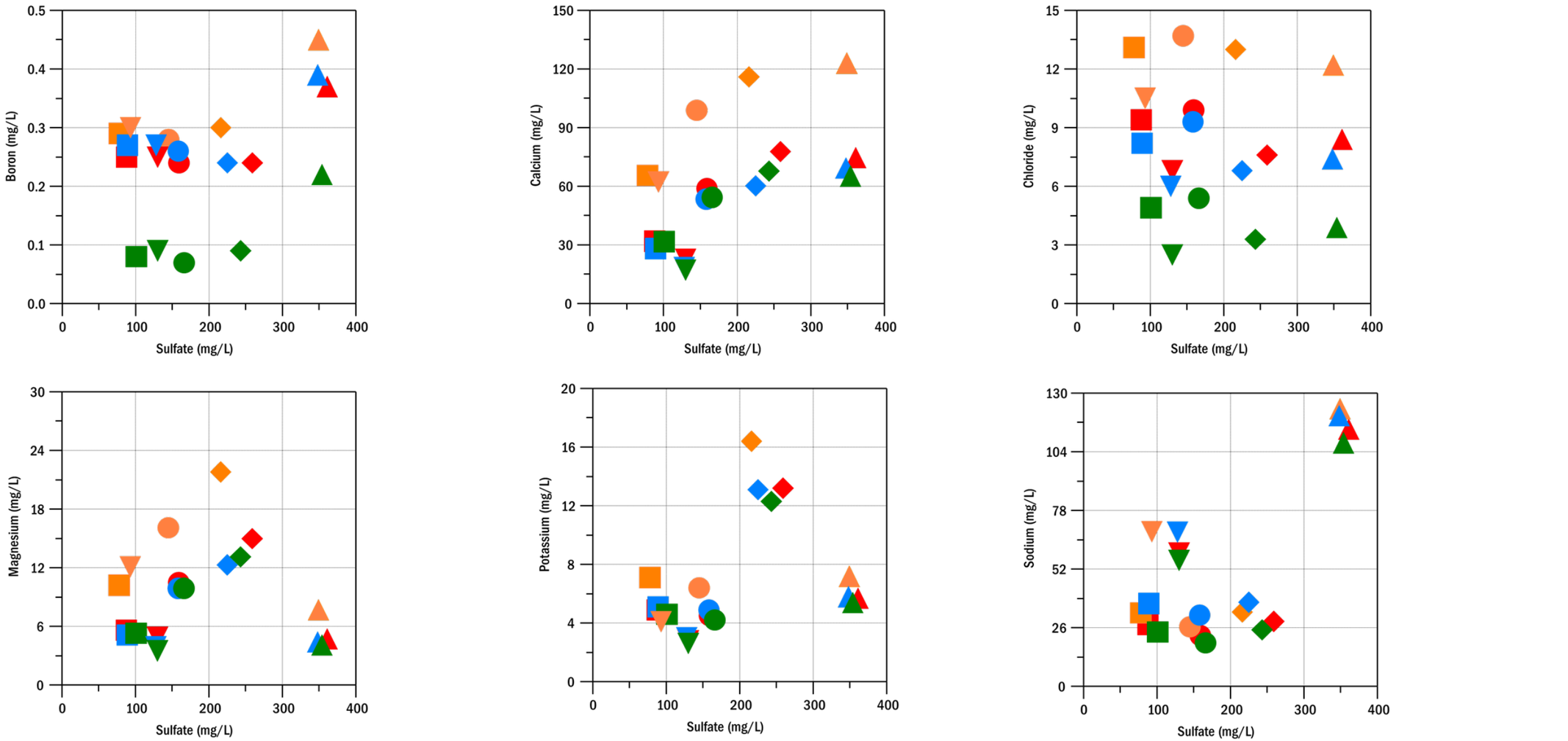

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited and the water tested.

Figure 3-7. Modified SPLP leaching for purified and deionized waters

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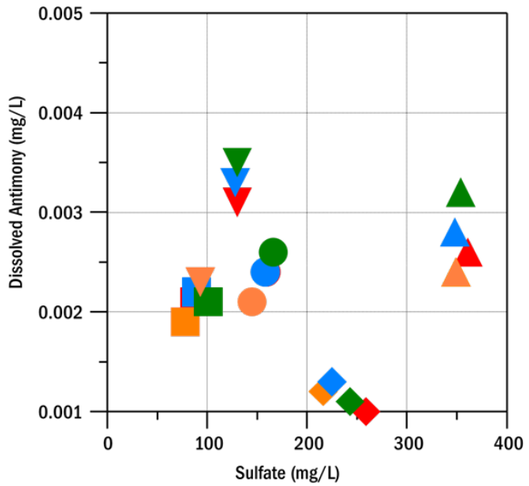

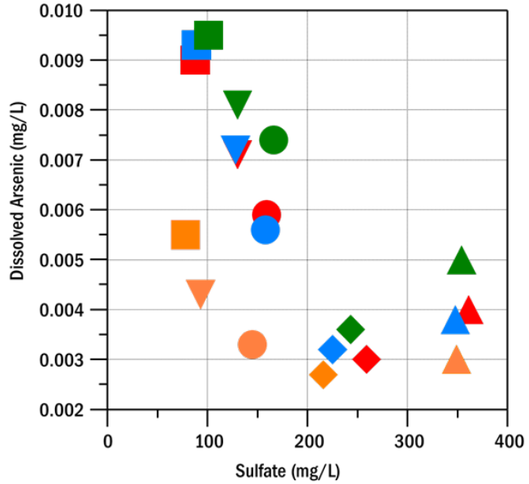

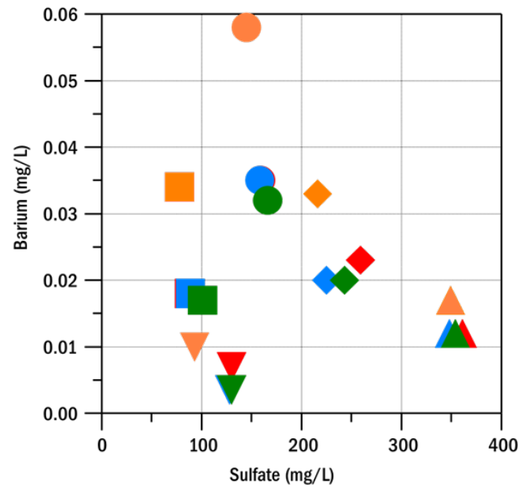

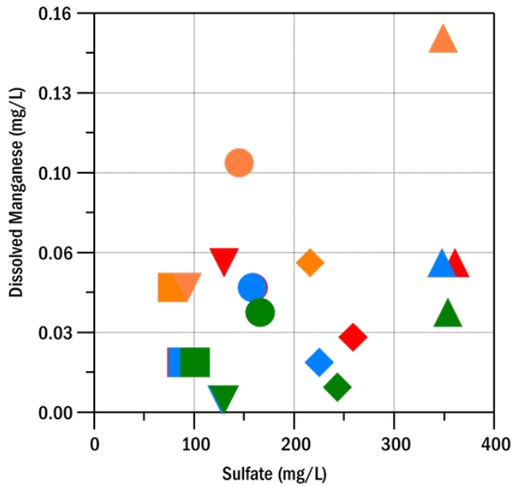

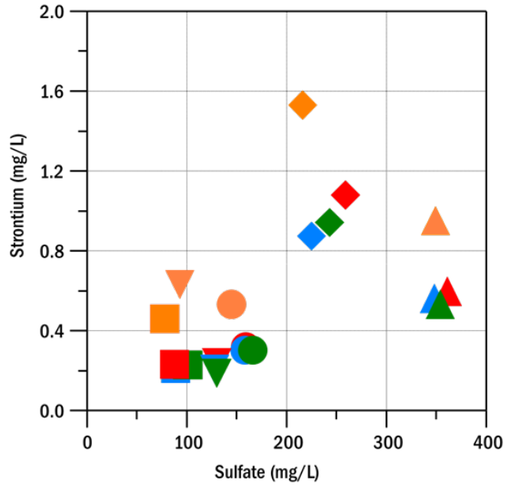

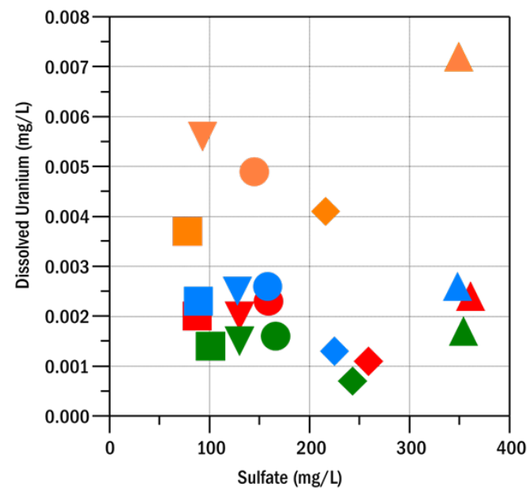

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited and the water tested.

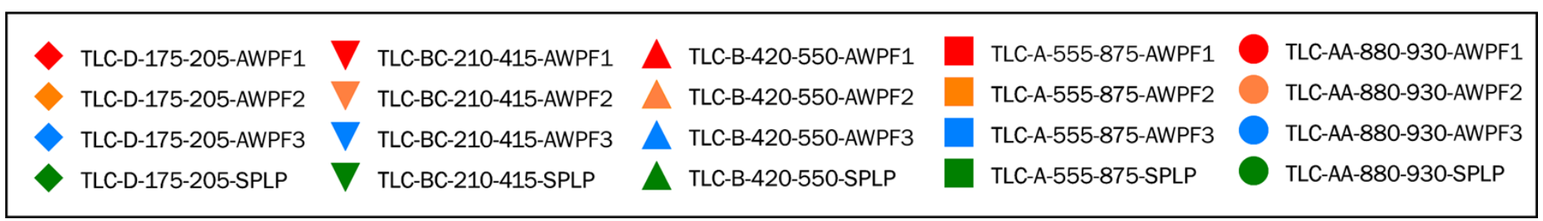

Figure 3-8. Metals concentrations of the modified SPLP soil leaching for purified and deionized waters

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3.4.4 Modified Meteoric Water Mobility Procedure - Column Testing

Sequential rinsing using the AWPF1 purified water in the modified column tests was conducted to determine if changes in concentrations of constituents could be observed after repeated exposure to the purified water. For example, if sulfide mineral oxidation were to occur as a result of oxygenated purified water reacting with sulfide mineral phases, then increases in sulfate or iron concentrations may be observed through successive rinses. Another possible trend would be a decrease in concentrations as metals or other constituents are desorbed from clay or iron and manganese oxide minerals.

Plots of the modified column data show decreasing concentrations with successive rinses for arsenic, barium, strontium, sulfate, and uranium in the A unit samples and less noticeable trends of the same constituents in the BC unit (Figure 3-8). Major ions calcium, chloride, potassium, and sodium also show decreasing trends with successive rinses (Table 3-7). Iron and manganese concentrations are at or slightly above the analytical detection limit with no identifiable trend with successive rinses for either unit. Minor changes in concentrations of manganese and iron could reflect the release of constituents due to the physical agitation when the columns were filled and drained of the purified water.

Table 3-7. Soil Leaching Results from Modified MWMP Column Analysis

Analyte (mg/L)	MCL (mg/L)	TLC-A-555-875-RUN1	TLC-A-555-875-RUN2	TLC-A-555-875-RUN3	TLC-A-555-875-RUN4	TLC-BC-210-415-RUN1	TLC-BC-210-415-RUN2	TLC-BC-210-415-RUN3	TLC-BC-210-415-RUN4
Extraction pH † (std. units)	-	7.19	8.08	8.2	8.2	7.19	8.08	8.2	8.2
Pre Filter pH † (std. units)	-	7.74	7.94	8.05	7.85	7.8	7.75	8.22	8.15
Post Filter pH † (std. units)	-	7.86	7.93	8.08	7.8	7.85	7.87	8.27	8.11
Total Alkalinity	-	147	154	138	129	131	146	142	134
Bicarbonate as $CaCO_3$	-	147	154	138	127	131	146	136	129
Carbonate as $CaCO_3$	-	< 2	< 2	< 2	2.6	< 2	< 2	5.5	5.1
Hydroxide as $CaCO_3$	-	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Aluminum [a]	1	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05
Antimony	0.006	0.0005	0.0007	0.0006	0.0006	0.0011	0.0012	0.0011	0.0011
Arsenic	0.01	0.0105	0.0076	0.0062	0.0052	0.0059	0.0083	0.0081	0.0067
Barium	1	0.027	0.018	0.015	0.017	0.008	< 0.007	< 0.007	< 0.007
Beryllium	0.004	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Boron	-	2.69	2.97	2.75	3.13	2.46	2.88	2.55	2.82
Cadmium	0.005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Calcium	-	86.2	50.8	37.9	37.8	55.1	30.9	20.4	22.7
Chloride [a]	250	22.6	11	8.9	8.5	15.6	10.1	8.1	8.2
Chromium	0.05	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

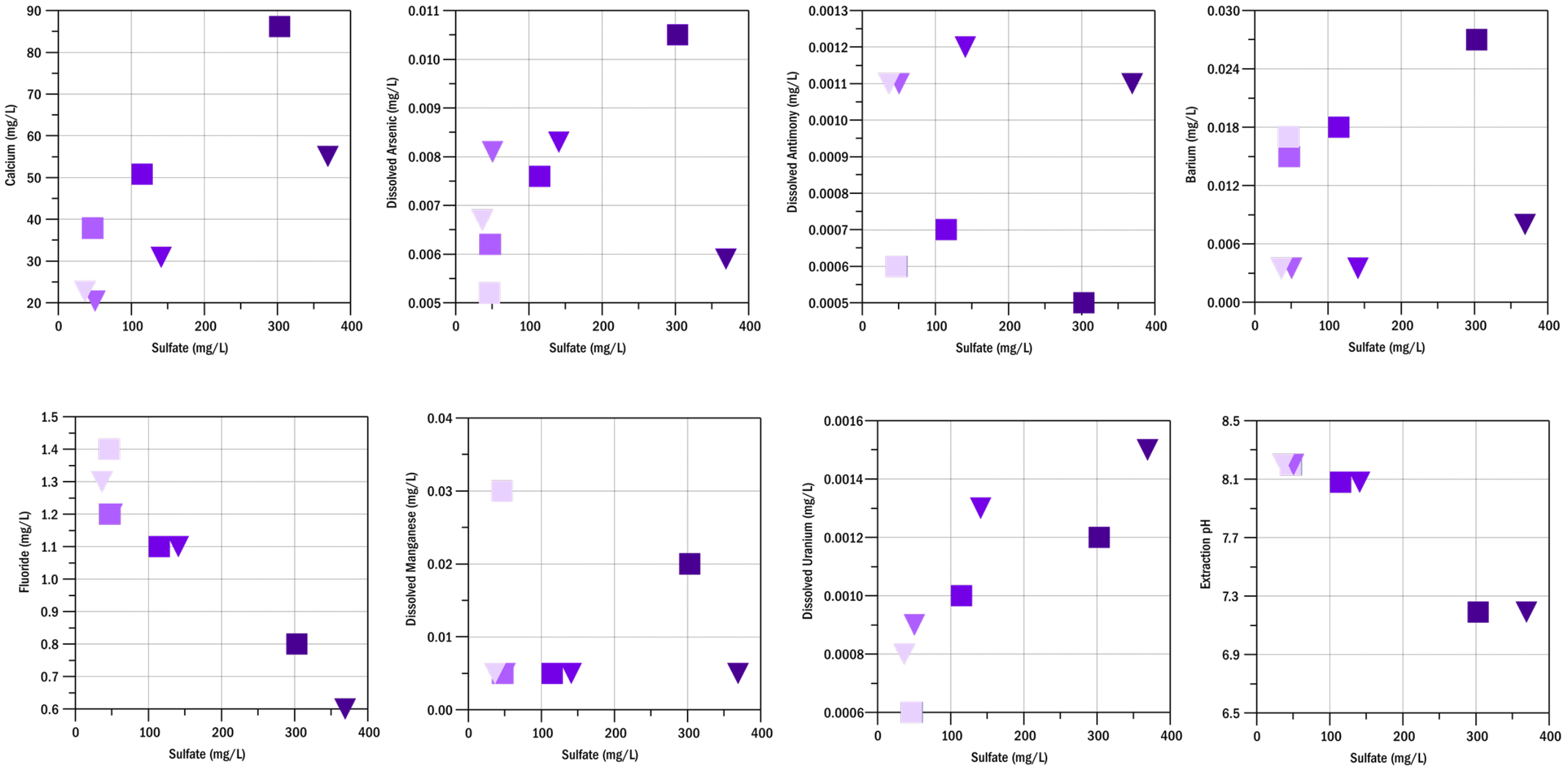
Table 3-7. Soil Leaching Results from Modified MWMP Column Analysis

Analyte (mg/L)	MCL (mg/L)	TLC-A-555-875-RUN1	TLC-A-555-875-RUN2	TLC-A-555-875-RUN3	TLC-A-555-875-RUN4	TLC-BC-210-415-RUN1	TLC-BC-210-415-RUN2	TLC-BC-210-415-RUN3	TLC-BC-210-415-RUN4
Fluoride [a]	2	0.8	1.1	1.2	1.4	0.6	1.1	1.2	1.3
Iron [a]	0.3	0.05	< 0.03	< 0.03	0.13	< 0.03	< 0.03	< 0.03	< 0.03
Lead	0.015	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001
Magnesium	-	15.6	8.6	5.7	5.9	11.6	5.8	3.6	4
Manganese [a]	0.05	0.02	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Mercury	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	-	0.05	0.03	< 0.02	< 0.02	0.06	0.03	< 0.02	< 0.02
Nickel	0.1	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008
Nitrate as N	10	0.03	0.12	0.25	0.64	2.61	0.73	0.4	0.73
Nitrite as N	1	0.02	0.11	0.13	0.19	0.31	0.29	0.25	0.19
Nitrate/Nitrite as N	-	0.05	0.23	0.38	0.83	2.92	1.02	0.65	0.92
Nitrogen, ammonia	-	0.61	0.57	0.58	0.54	0.52	0.43	0.32	0.33
Phosphorus	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phosphorus, ortho	-	0.02	0.01	0.04	0.04	0.01	0.01	0.05	0.05
Potassium	-	8	5.8	4.5	4.3	5.4	3.7	2.6	2.7
Selenium	0.05	0.0002	0.0004	< 0.0001	0.0003	0.0003	0.0004	< 0.0001	0.0003
Silica	-	27.3	26.5	23.3	25.8	29.9	29.5	28.7	31.8
Silver [a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	-	76.6	45.7	33.3	34.7	143	81.6	53.7	51.6
Strontium†	-	0.66	0.381	0.26	0.258	0.652	0.326	0.196	0.211
Sulfate	250	303	115	47.2	46.6	369	141	50.2	36.7
Thallium	-	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium†	0.03	0.0012	0.001	0.0006	0.0006	0.0015	0.0013	0.0009	0.0008
Zinc [a]	5	0.02	< 0.01	< 0.01	0.02	0.08	0.06	< 0.01	< 0.01

a. secondary drinking water MCL; † = Extraction pH is the pH of the water poured into the column, Pre Filter pH is the pH of the extract after is passes through the column, and Post Filter pH is the extract after it is filtered.

< = concentrations was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in pCi/L; - = no MCL is established; mg/L = milligrams per liter.

Fluoride shows an increasing trend for both units (Figure 3-9). Increases in fluoride concentration is likely the result of fluorite (formula as CaF) or apatite (formula as $Ca_5(OH,F)(PO_4)_3$) mineral dissolution. Neither fluorite nor apatite were mineral phases identified in the XRD analysis, indicating it is likely these mineral phases are a low proportion of the analyzed units. The dissolution of these mineral phases may be the result of the low concentrations of calcium in the purified water solution as lower calcium concentrations results in disequilibrium between the mineral phases and the contacting solution.



Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the number of rinses.
The sample ID name indicates the Purisima unit and the depths composited for the column tests.

Figure 3-9. Modified MWMP column test results

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Significant decreases in concentrations, such as sulfate decreasing for both units or arsenic decreasing in the A unit, likely represent the decrease in the overall mobility, either from desorption or dissolution, of the constituent. Meaning, with continued exposure to the purified water, the concentrations could reduce overtime until the geochemical system is exhausted of that constituent. However, the column leach tests represent only a short period of time compared to the long-term introduction of purified water into the target aquifer units through the SWIP/injection well. Additional geochemical reactions, such as the oxidation of sulfide minerals, could occur during the injection process that are not replicated in the 4 weeks of laboratory testing.

Results from the modified MWMP column test were plotted with the modified SPLP data from the AWPF1 results (Figure 3-10). The SPLP results fall within the range of concentrations from the column test results except for antimony, boron, fluoride, and uranium. Differences in the concentrations measured by the two laboratory methods could be due to slight differences in the mineral composition of the sample splits used for the different analyses. Furthermore, differences in the laboratory methods of the modified SPLP and column tests make direct comparisons between the concentrations difficult. The solution to solids ratio of the SPLP tests is 4:1 and the modified column tests use a ratio of 1:1 per rinse, indicating the SPLP solutions may be more diluted than the column test results. Samples for the SPLP test are ground prior to the analysis to increase the surface area and agitated during the test duration to increase the reactivity of the solid materials. Additionally, the SPLP test duration is only 24 hour compared to the 6 days the column tests are allowed to react.

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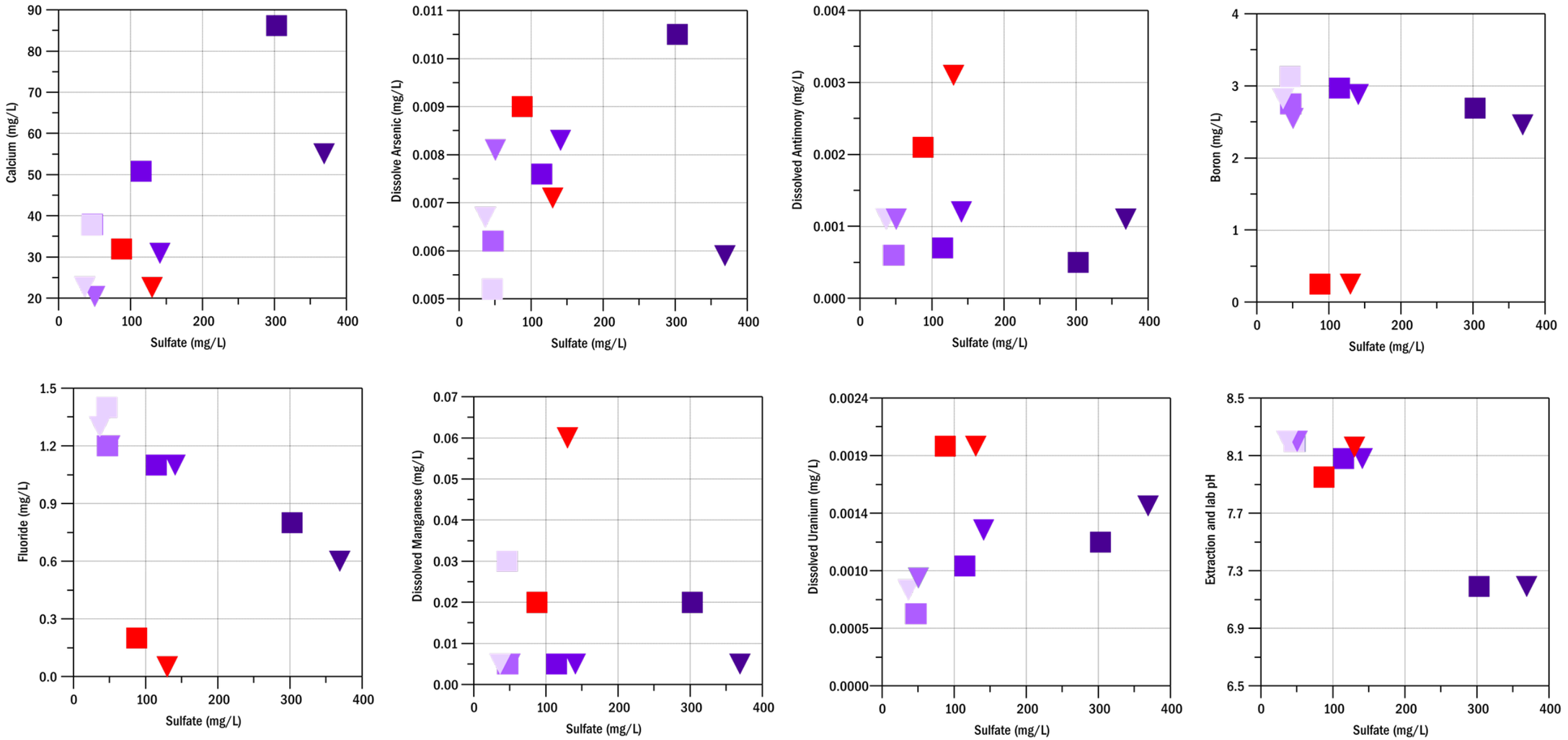

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the number of rinses.
The sample ID name indicates the Purisima unit and the depths composited for the column tests.
Red symbols are results from the modified SPLP analysis using the sample AWP as the modified column tests.

Figure 3-10. Modified SPLP and MWMP column test results

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3.4.5 Hydroxylamine-Hydrochloride Extraction Leaching

As described above in Section 2.4.1.3, for the Phase II geochemical characterization, only the third step of the HA-HCl sequential extraction, metals bound to iron and manganese oxide mineral, was conducted.

Results of the HA-HCl analysis demonstrate the differences in the relative potential release of constituents across the lithological units. Concentrations of aluminum, arsenic, cadmium, iron, manganese, nickel, and zinc are highest in unit B and lowest in unit A (Table 3-8). The target aquifer units Purisima A and BC, overall, have lower metals concentrations released than the adjacent units. The metal concentrations in the Purisima D, B, and AA units are likely due to higher proportions of the units being fine-grained clay minerals and/or iron and manganese oxides; thus, have higher proportions of metals adsorbed onto the fine-grained mineral phases. Plots of metals with iron concentrations show a general trend of higher iron and higher aluminum, arsenic, cadmium, nickel, thallium and zinc (Figure 3-11) which could indicate these metals are adsorbed onto iron oxide mineral phases. Iron and manganese show a general trend of increasing concentrations except for the sample collected from the BC unit.

Table 3-8. Soil Leaching HA-HCl Extraction Results

Analyte (mg/L)	MCL (mg/L)	TLC-D-175-205	TLC-BC-210-415	TLC-B-420-550	TLC-A-555-875	TLC-AA-880-930
Aluminum [a]	1	0.21	0.1	2.04	< 0.05	0.48
Antimony	0.006	< 0.0004	< 0.0004	< 0.0004	< 0.002	0.0005
Arsenic	0.01	0.0102	0.007	0.0151	0.006	0.0097
Barium	1	0.682	0.525	0.668	0.543	0.921
Beryllium	0.004	0.0005	0.00021	0.0026	< 0.0004	0.0009
Cadmium	0.005	0.00327	0.00252	0.00534	< 0.0003	0.00495
Calcium	-	927	757	542	1280	654
Chromium	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Copper [a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron [a]	0.3	40.3	40.4	90.7	< 0.03	57.5
Lead	0.015	0.04	0.04	0.04	< 0.03	< 0.03
Magnesium	-	67.3	69.2	54.7	26.7	43.1
Manganese [a]	0.05	5.57	17	10.9	4.87	9.2
Mercury	0.002	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Molybdenum	-	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nickel	0.1	0.435	0.226	0.479	< 0.008	0.171
Phosphorus	-	0.3	0.3	0.5	< 0.1	0.3
Potassium	-	52.1	39.9	46	30.4	34.4
Selenium	0.05	0.0026	0.001	0.0018	0.0008	0.0006
Silver [a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Sodium	-	18.1	32.7	52.4	14.9	16.2
Strontium†	-	6.03	4.45	4.71	1.56	1.53

Table 3-8. Soil Leaching HA-HCl Extraction Results

Analyte (mg/L)	MCL (mg/L)	TLC-D-175-205	TLC-BC-210-415	TLC-B-420-550	TLC-A-555-875	TLC-AA-880-930
Thallium	-	0.0006	0.0007	0.0011	< 0.0005	0.0011
Uranium†	0.03	< 0.0001	0.0001	0.0004	0.0006	0.0003
Zinc[a]	5	0.11	0.1	0.33	< 0.01	0.2

a. secondary drinking water MCL

< = concentration was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in pCi/L; - = no MCL is established; mg/L = milligrams per liter.

Metals such as chromium, copper, mercury, molybdenum, and silver are non-detect in the HA-HCl extractions for all units. Copper, mercury, and silver are also non-detect in the modified SPLP results. Chromium was measured in one modified SPLP sample. The low concentrations of chromium, copper, mercury, and silver in both analyses indicate these metals would likely not be released during the purified water injection process.

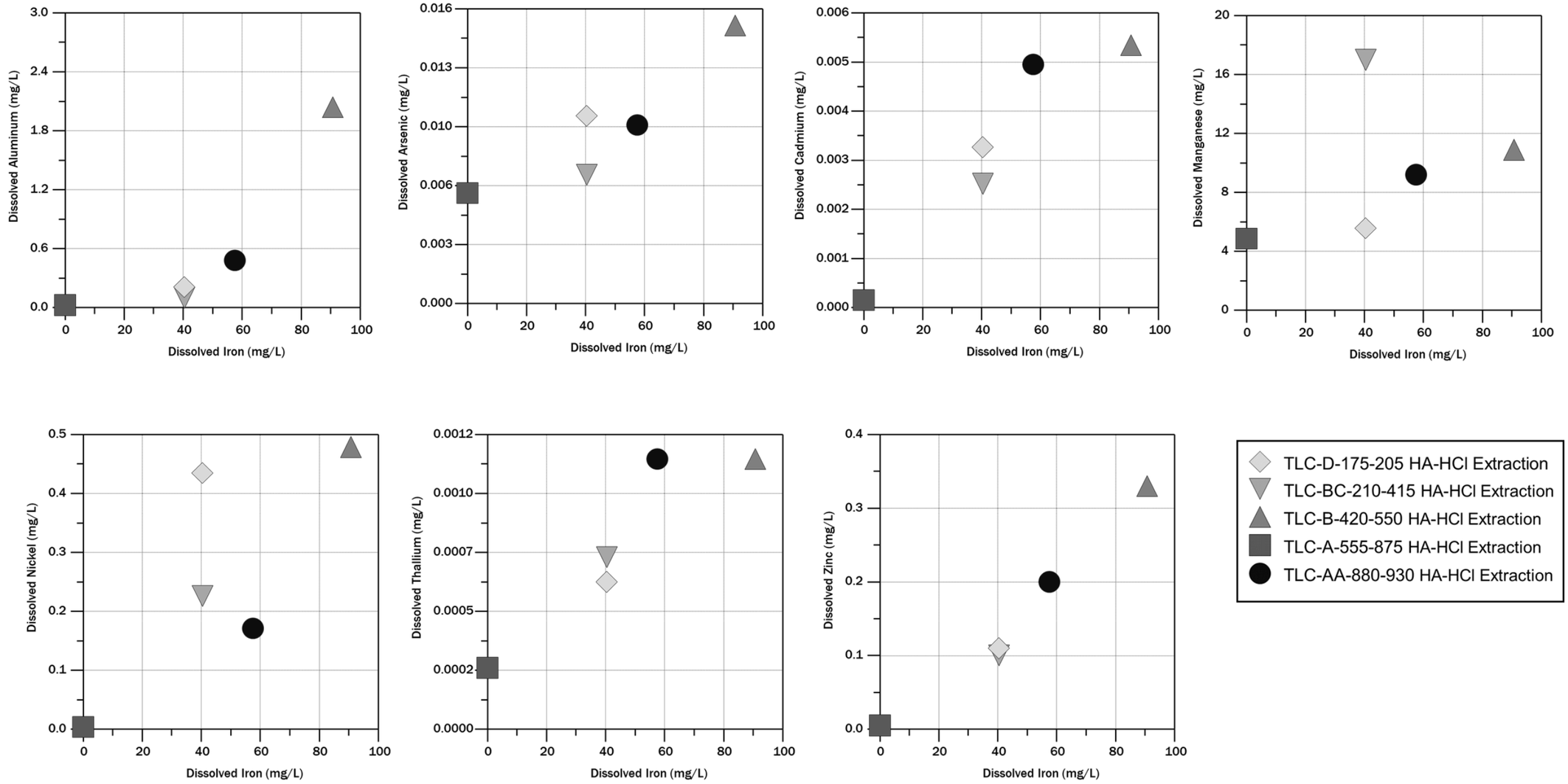

Figure 3-11. Hydroxylamine-hydrochloride extraction results

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3.5 Mineralogical Analysis

The Purisima Formation is described as a bluish-green sand consisting of basaltic and andesitic detritus with heavy mineral assemblages such as hypersthene, hornblende, and augite. (Brabb 1997, Clark 1981, Gilbert and McAndrews 1948). More detailed mineralogical descriptions of the Purisima Formation are lacking in scientific literature.

Site-specific mineralogy of the target injection units and adjacent units can provide information on potential for reactions to occur between the target injection unit and the purified water. Mineralogy data were collected from a variety of sources including visual examination of the sample cuttings during the drilling of the pilot TLC Pilot SWIP well, XRD of sample splits for each unit, and evaluation of whole rock data to provide a total chemical analysis of the samples.

3.5.1 Visual Examination

Visual examination of the drill cuttings was performed to identify mineral phases in the field (Appendix B). Individual minerals or rock types were noted on the lithological log with emphasis on identifying sulfide minerals such as pyrite (Figure 3-12). Sulfide mineral phases are of importance due to the potential for long-term metals leaching resulting from mineral oxidation by purified water.

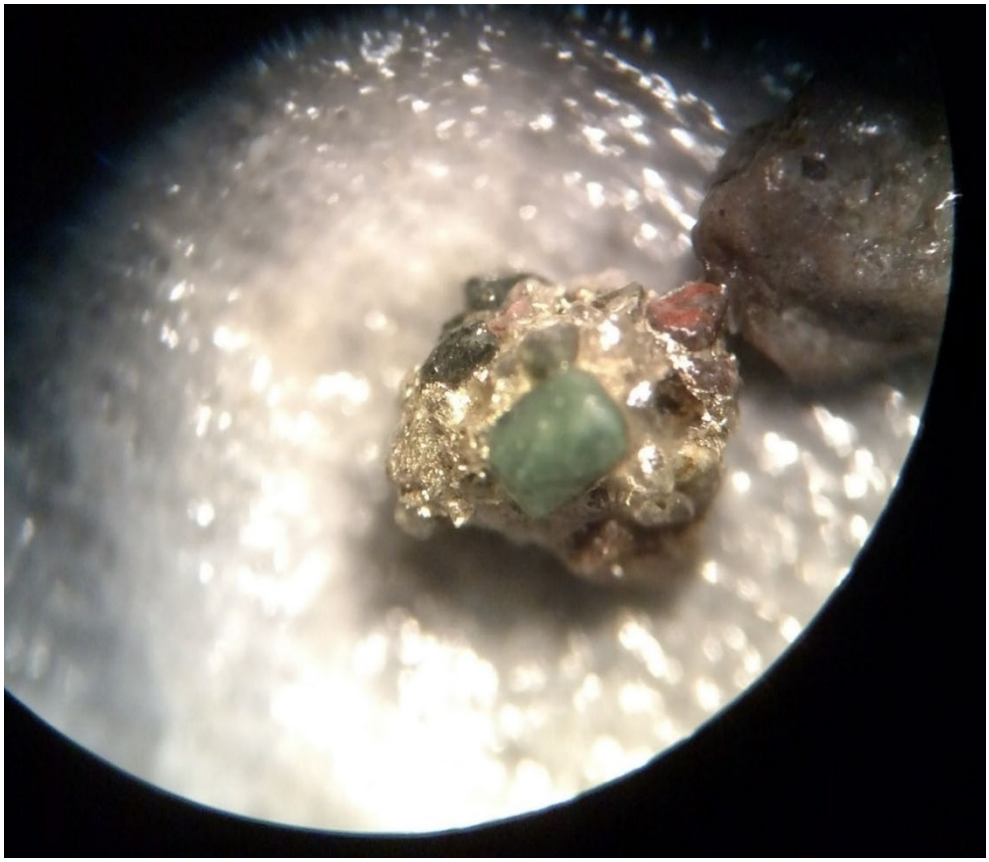

Figure 3-12. Example of sulfide mineral phases identified in samples at 735 feet bgs

Due to the fine-grained nature of the samples not all mineral phases or rock types were identifiable using only a visual evaluation even with the 30X magnification binocular scope. Mineral identification requires a combination of various characteristics including the mineral color, luster, hardness, streak, and habit. Color and luster can be evaluated through visual observation. The other identifiable traits of mineral phases typically require specimens larger than sand-size particles.

An example of the coarse-grained sand samples at 770 feet bgs, as seen through a binocular scope eyepiece at 30x magnification, is shown in Figure 3-13. The sample contained mostly sub-rounded minerals and rock clasts of various lithologies. The rounded shape of the rock and mineral fragments can obscure the mineral habit but does indicate the mineral phases are not soft or brittle. A dilute hydrochloric acid solution was used to identify the presence of carbonate cement or carbonate minerals by conducting a simple “fizz test.” Sample reactions were noted on the lithological log (Appendix B). Additionally, a magnet was used to identify mineral phases, such as magnetite, also noted on the lithological log.

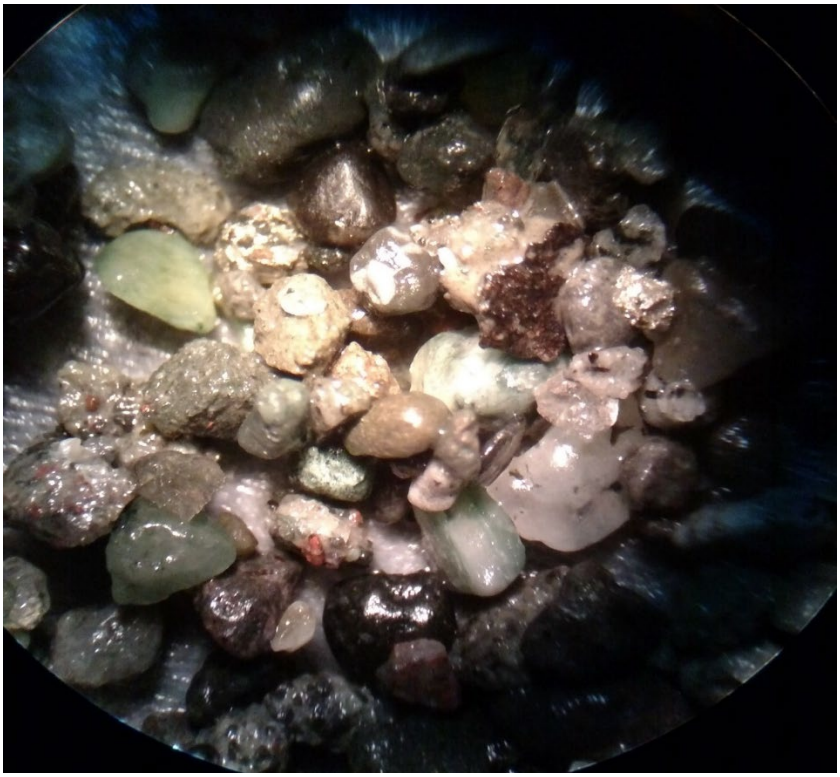

Figure 3-13. Coarse-grained sand unit from 720 feet bgs

3.5.2 XRD Analysis

XRD analysis provided mineral quantity estimations based on the relative peak height of the XRD pattern. The mineral phase quantities are semi-quantitative, with estimated percentages of greater than 2 percent of the bulk sample mineralogy. Amorphous mineral phases cannot be identified with XRD. The x-ray pattern of mineral phases in such low quantities (less than 5 percent of the bulk sample) can be difficult to distinguish and are classified as “Unidentified.” Results of the XRD analysis identified the major and minor percentages of mineral phases present within the samples (Table 3-9).

Table 3-9. Drill Cutting XRD Mineral Analysis

Mineral Name	Chemical Formula	TLC-D-175-205 weight %	TLC-BC-210-415 weight %	TLC-B-420-550 weight %	TLC-A-555-875 weight %	TLC-AA-880-930 weight %
Quartz	SiO_2	33%	27%	25%	28%	30%
Plagioclase feldspar	$(Na,Ca)Al(Si,Al)_3O_8$	30%	27%	37%	32%	39%
K-feldspar	$KAlSi_3O_8$	10%	10%	10%	13%	12%
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$	<3%	<2%	<3%	<3%	<3%
Smectite	$(Ca,Na)_x(Al,Mg,Fe)_4(Si,Al)_8O_{20}(OH,F)_4 \bullet nH_2O$	<10%	20%	13%	<5%	<10%
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH,F)_2$	<5%	5%	<3?%	–	–
Kaolinite	$Al_2Si_2O_5(OH)_4$	<5%	6%	<5%	–	–
Clinoptilolite	$(Na,K,Ca)_6(Si,Al)_{36}O_{72} \bullet 20H_2O$	<3%	–	<3%	–	–
Calcite	$CaCO_3$	<3?%	–	–	17%	7%
Pyrite	FeS_2	<2%	<3%	<2%	<2%	<3%
"Unidentified"	?	<5%	<5%	<5%	<5%	<5%

XRD mineralogy results agree with the literature descriptions of the Purisima Formation of volcanic silicate minerals, such as feldspars and quartz along with clinoamphibole mineral phases identified in the XRD analysis, include hornblende and glaucophane. Clinoptilolite is a zeolite mineral formed when volcanic glass is altered by water after deposition and was noted to be of sufficient quantities to be an economic deposit within the Santa Margarita Formation (stratigraphically below the Purisima Formation) near Branciforte Creek in Santa Cruz County (Sheppard 1971, Gilbert and McAndrews 1948). Clay mineral phases identified with XRD are consistent with the literature descriptions of the rocks. Variations in the mineral assemblages are likely due to changes in the depositional environment of the sedimentary Purisima Formation as it was deposited in the basin over geologic time.

The majority of the mineral phases identified for the Phase II samples are similar to the Phase I results (BC 2016). Small differences in the percentages of the major mineral phases between the units for the different drill holes could be related to differences in how the samples were collected or differences in the lithologies regionally. Variation in the lithological units within the basin would be expected as the units are sedimentary deposits. Gypsum, a sulfate mineral, was identified in the Phase I samples from SC-9R and chlorite, a clay mineral, was identified in the samples from CB4, SC-3R, and SC-22.

3.5.3 Whole-Rock Analysis

Samples were submitted for whole rock analysis to evaluate the total elemental constituents within each unit. Silica and aluminum being the most abundant elements in all five units corresponds with the XRD mineralogy indicating quartz and plagioclase feldspar are the most abundant mineral phases. Iron abundances are two orders of magnitude higher than manganese, although iron is not measured at significantly higher concentrations than manganese in the soil leaching data (Table 3-10). Iron bearing minerals, such as smectite, mica/illite, and pyrite, would be measured by the whole rock analysis for iron but are not readily dissolvable and would not release iron during the soil leaching modified SPLP analysis. Amorphous iron oxide minerals could also be present in the samples contributing to the whole rock iron concentrations but not leaching iron during the modified

SPLP analysis. Iron concentrations in the HA-HCl extraction results indicate the potential for iron oxide mineral phases to be present.

Table 3-10. Whole Rock Data

Analyte (mg/kg)	TLC-D-175-205	TLC-BC-210-415	TLC-B-420-550	TLC-A-555-875	TLC-AA-880-930
Aluminum	68700	61700	59700	64100	70500
Antimony	<5	<5	<5	<5	<5
Arsenic	9	8	9	8	8
Barium	530	630	540	820	730
Beryllium	<2	<2	<2	<2	<2
Boron	27	19	30	17	17
Cadmium	2.2	1.5	2.6	2.2	2.4
Calcium	35000	40000	33000	56000	45000
Chromium	100	<100	<100	<100	<100
Copper	<100	<100	<100	<100	<100
Fluoride	2.0	3.0	3.0	6	5
Iron	37300	32500	39900	32600	34400
Lead	12	11	12	12	12
Magnesium	16000	13000	8000	11000	13000
Manganese	400	700	600	700	600
Mercury	0.063	0.0229	0.0434	0.0152	0.0264
Molybdenum	<200	<200	<200	<200	<200
Nickel	120	130	90	<80	<80
Potassium	18000	17000	14000	17000	15000
Selenium	<1	<1	<1	<1	<1
Silica	649000	683000	654000	683000	670000
Silver	<100	<100	<100	<100	<100
Sodium	16000	18000	19000	19000	20000
Strontium	390	510	490	450	480
Sulfur	6670	4570	7480	6870	4980
Thallium	<1	<1	<1	<1	<1
Uranium	2	2	2	2	2
Zinc	<100	<100	<100	<100	<100

< = concentrations were not measured above the method detection limit
mg/kg = milligrams per kilogram.

Whole rock analyses measured in mg/kg represent approximately 1 part per million (ppm); soil leaching concentrations also represent approximately 1 ppm. Comparing the orders of magnitude between the whole rock and the soil leaching results can be used to indicate relative mobilization of an element from readily dissolvable mineral phases or adsorbed onto clay or oxide mineral surfaces.

Beryllium, chromium, copper, silver, thallium, and zinc were at or below the detection limit in the whole rock analysis and were either below the detection limit or very close to the detection limit for the soil leaching analyses. The results indicted these metals are not present in concentrations of concern to be leached from the units during the injection process.

Antimony and molybdenum were below the detection limit in the whole rock analysis but were detected in the soil leaching results. Antimony and molybdenum were low or non-detect in the HA-HCl results (Table 3-8), indicating these metals may not be adsorbed onto iron and manganese oxides and may be released during dissolution of other mineral phases.

Selenium is below the detection in the whole rock analyses but was measured in the soil leaching results, indicating selenium may be mobilized at low concentrations during the injection process either from mineral dissolution or desorption from clay or oxide mineral phases; however, the concentrations of selenium in the samples overall is low.

Mercury was measured above the detection limit in the whole rock analysis but was not detected in the soil leaching results, indicating mercury is not likely in a readily dissolvable phase or adsorbed onto mineral phases. Mercury is not a likely constituent of concern when purified water is introduced.

Whole rock data also provide an indication of the potential source minerals of elements such as arsenic, boron, and fluoride. Several elements measured in the soil leaching tests were below the analytical detection limit for the whole rock analysis and therefore; it is not possible to identify the potential mineral sources of these elements. Soil leaching HA-HCl test results indicate iron and arsenic have a positive correlation (Figure 3-11) indicating arsenic could be desorbing from iron oxide mineral phases. Whole rock concentrations of iron and arsenic show a similar positive correlation supporting the possibility of iron oxide minerals desorbing arsenic. (Figure 3-14). Boron and fluoride were not measured in the HA-HCl extraction due to the analytical methodology. Boron whole rock data show a positive correlation with iron, and fluoride shows a negative correlation with iron. Based on the observations of arsenic and iron soil leaching and whole rock data, boron is potentially desorbing from iron oxide minerals.

Fluoride whole rock data shows a positive correlation with calcium and a negative correlation with boron (Figure 3-14). The negative correlation with boron suggests the source of these elements is not the same. Fluoride concentrations observed in the soil leaching tests may be the result of dissolution of mineral phases, such as fluorite, or desorbing from other mineral phases, such as clays or amphiboles.

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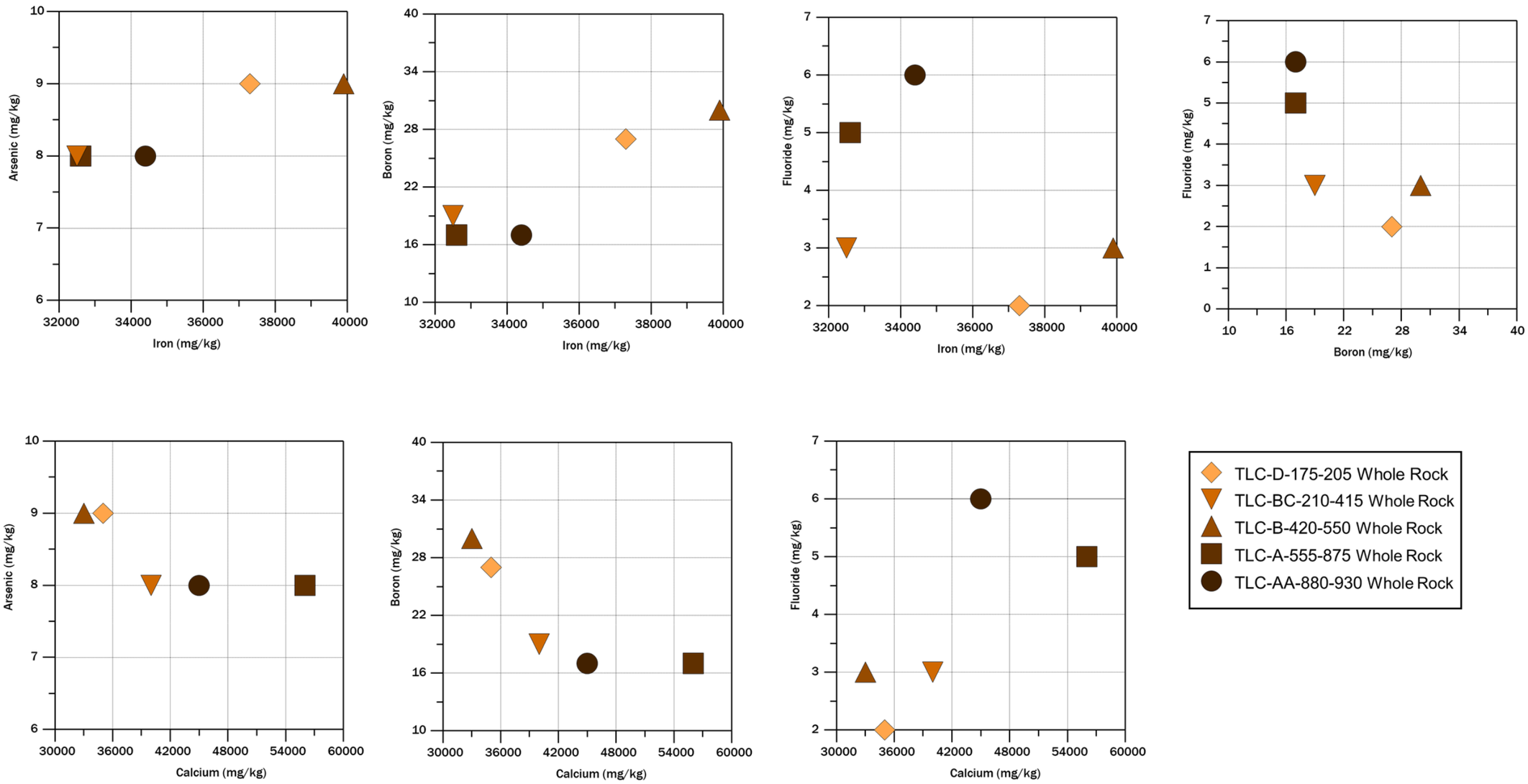

Figure 3-14. Whole rock results

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Section 4

Potential Water Quality Considerations

The potential geochemical reactions from introducing purified water into the groundwater basin and the different aquifer units can be preliminarily estimated by combining the observations and results from the field and laboratory data. All geochemical characterization data were evaluated together to assess the potential for constituents to become mobilized during the purified water injection. Data from all analyses were evaluated for each regulated constituent and categorized into one of four groups based on the observations of the geochemical results shown in Figure 4-1 and described below:

1. **Not Present.** The constituent was near or below the analytical detection limit for all geochemical analyses. Additionally, the constituent was below the detection limit in the depth-specific zone test groundwater results indicating the constituent will likely not be of concern.
2. **Readily Dissolvable.** The constituent was detected in the modified SPLP or MWMP column test data and whole rock data. The constituent was near or below the detection limit for the HA-HCl analysis indicating the constituent was not adsorbed onto clay or oxide minerals. The constituent is likely associated with a water-soluble mineral phase.
3. **Desorption.** The constituent was above the detection limit in the modified SPLP or MWMP column tests, whole rock data, and HA-HCl data. The constituent is likely to be mobilizing from the desorption from clay or iron and/or manganese oxide minerals.
4. **Immobile/Low Desorption.** The constituent was detected in the whole rock and HA-HCl analyses but was near or below the detection limit for the modified SPLP and/or MWMP column tests. The constituent is present in the sample but may not be mobilized when mixed with the purified water.

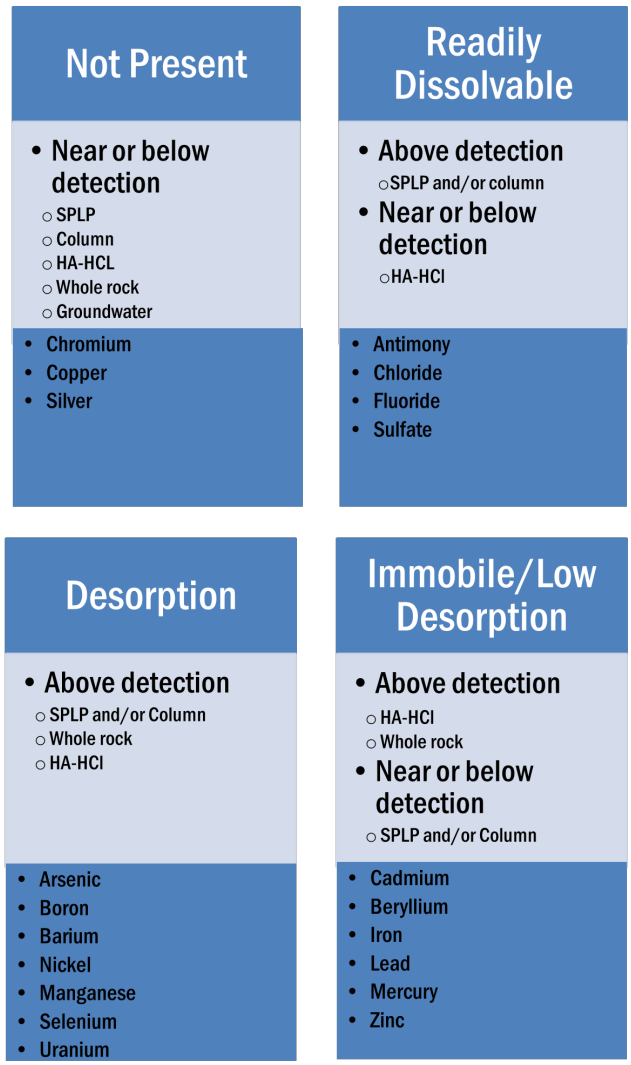

Figure 4-1. Classification of constituents and potential mobility

Several constituents did not strongly fit into one of the above classification categories and may have exhibited characteristics for more than one group. For example, the determination between a constituent being classified as immobile/low desorption and desorption considered the order of magnitude differences between the whole rock and HA-HCl data to the modified SPLP and MWMP column test data. If the whole rock and HA-HCl data were several orders of magnitude above the soil leaching results, the constituent was classified as likely to be immobile.

Regulatory MCLs were used to identify which constituents should be evaluated for mobilization potential. Classification of the constituents did not consider the concentration compared to the regulated MCL because the geochemical characterization results are from laboratory analyses and do not represent the geochemical conditions which will occur during the purified water injection program. Therefore, constituents that are classified as readily dissolvable or desorption based on the laboratory results may not reflect the future water quality with purified water injected into the groundwater basin.

Interpretations of the potential water quality from the TLC SWIP Pilot Project, and the supporting information, are listed below.

- Several regulated constituents are likely not present in the TLC SWIP pilot well samples and will potentially not be of concern for the project.
  - Chromium, copper and silver were near or below the analytical detection limit for all laboratory geochemical analyses and zone groundwater quality analyses.
- Metals are desorbing from clay or iron and/or manganese oxide minerals.
  - Concentrations of arsenic, barium, nickel, strontium, and uranium are detected in the HA-HCl soil leaching and the modified SPLP and column tests.
- All three purified waters mobilize metals and other constituents of concern.
  - Slight differences in the concentrations of the three treated waters and the deionized water may be the result of the slight mineralogical differences between the soil splits in the laboratory for the geochemical analyses.
  - All three advanced purified waters mobilize arsenic from the Purisima A and BC units; however, concentrations were below the MCL.
  - AWPF2 has the lowest concentrations of arsenic and the highest concentrations of calcium, chloride, and magnesium, indicating the soil sample splits used for the AWPF2 may be slightly different than the other samples used for the SPLP analysis.
- Constituent concentrations tend to decrease over the short-term, as multiple pore volumes of purified water are allowed to react the target units.
  - Arsenic, barium, calcium, magnesium, potassium, sodium, strontium, and uranium show decreasing trends for one or both of the Purisima A and BC units evaluated in the modified column tests.
  - Decreasing trends are likely the desorption of constituents from clay and oxide minerals and the dissolution of dissolvable mineral phases.
- Multiple rinses alter the equilibrium of the system.
  - Increasing fluoride and decreasing calcium concentrations could indicate the dissolution of fluorite with multiple rinses.
  - Increasing extracted solution pH values could indicate the removal of iron oxide mineral phases with multiple rinses.
- Site-specific data from the TLC SWIP Pilot Well provides more accurate indications of constituent mobility for the well location where the injection would be conducted.
  - Phase I soil samples were exposed to atmospheric conditions (oxygen in the air) for several years and had modified SPLP sulfate concentrations several orders of magnitude greater than the Phase II modified SPLP results.
  - Elevated sulfate concentrations are a geochemical signature of sulfide oxidation.
  - Gypsum formation is associated with sulfide oxidation.
  - Phase I results have different constituent mobilization, metals, and sulfate than the site-specific data from the TLC SWIP Pilot well.

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Section 5

Recommendations

Below are recommendations based on the results of the Phase I and II geochemical analyses and the objectives of the SWIP Pilot Project. Recommendations for additional work based on the results of the Phase I geochemical characterization include:

- **Geochemical modeling.** Evaluate the potential reactions that could occur as a result of the injection of purified water into the potential aquifer. Geochemical modeling should be conducted using mineralogy and water quality information from the Phase II analysis to simulate the geochemical reactions that could occur due to the interaction of the injection water. Modeling results can be used to confirm and refine the observed results from the geochemical characterization laboratory data.
- **Treatment Design Optimization.** Results from the geochemical modeling analysis can be used to design post treatment to address and reduce potential impacts of purified water chemistry on the mobilization of naturally occurring mineralized constituents. The optimization evaluation using geochemical modeling will be limited to evaluating parameters which can be altered within the potential design of the treatment system and comply with the water quality requirements for injection permitting. Water quality parameters that would not be achievable or cost effective for the potential water treatment plant or parameters outside of the water quality permit requirements were not be evaluated.

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Section 6

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Section 7

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Appendix A: Phase II Sampling and Analysis Plan

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Technical Memorandum

FINAL

Prepared for: Soquel Creek Water District

Project Title: Pure Water Soquel – Geochemistry of TLC Pilot Well

Project No.: 152610.001

Technical Memorandum

Subject: Twin Lakes Church Seawater Intrusion Prevention Pilot Well Geochemical Characterization Sampling and Analysis Plan

Date: January 2018

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Table of Contents

List of Figures iii
Section 1: Introduction 1
1.1 Background 1
1.2 Objectives 2
1.3 Project Scope 2
Section 2: Sample Selection and Collection 3
2.1 Approach 3
2.2 Sample Collection 3
2.2.1 Visual Examination 7
2.2.2 Sample Handling 7
Section 3: Geochemical Analysis 8
3.1 Phase II Geochemical Analysis 8
3.1.1 Soil Leaching Analysis 8
3.1.2 Modified SPLP Analysis 9
3.1.3 Modified MWMP Column Analysis 10
3.1.4 Hydroxylamine-Hydrochloride (HA-HCl) Extraction Test 11
3.1.5 Mineralogical Analysis 11
3.1.6 Whole-Rock Chemical Analysis 11
3.1.7 XRD (X-ray Diffraction) Analysis 11
3.1.8 SEM (Scanning Electron Microscopy) Analysis 12
Section 4: Data Review and Evaluations 12
4.1 Training Requirements 12
4.2 Data Management 12
4.3 Quality Control 13
4.3.1 Field QC Checks 13
4.3.2 Laboratory QC Checks 13
4.4 Data Verification 14
4.5 Data Validation 14
References 16
Attachment A: Project Standard Operating Procedures (SOP) ..... A

Use of contents on this sheet is subject to the limitations specified at the beginning of this document.
FINAL Phase II Sampling and Analysis Plan 20190305

List of Figures

Figure 1-1. Hydrogeologic conditions and TLC pilot well layout 5

List of Tables

Table 2-1. Objectives and Analytical Methods 3
Table 2-2. Mass Requirements for Geochemical Characterization 7
Table 3-1. Overview of Phase II Geochemical Characterization Analysis Work Plan 8
Table 3-2. Analytical Parameters for Soil Leaching Analysis 9

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FINAL Phase II Sampling and Analysis Plan 20190305

List of Abbreviations

ACZ	ACZ Laboratories, Inc,
AFY	acre feet per year
ASTM	American Society for Testing and Materials
BC	Brown and Caldwell
COC	chain-of-custody
CV	calibration verification
EDD	electronic data deliverable
EPA	Environmental Protection Agency
HA-HCl	Hydroxylamine-Hydrochloride Extraction
ICP-MS	Inductively Coupled Plasma with mass spectrometry
LC	Laboratory Control
MB	Method blank
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MWMP	Meteoric Water Mobility Procedure
NWRI	National Water Research Institute
Project	Twin Lakes Church Seawater Intrusion Prevention Pilot Well
PDF	Portable Document Format
PWS	Pure Water Soquel
QA	Quality Assurance
QC	Quality Control
RC	Reverse circulation
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SEM	Scanning Electron Microscopy
SPLP	Synthetic Precipitation Leachate Procedure
SOP	Standard Operating Procedure
SWIP	Seawater Intrusion Prevention
TLC	Twin Lakes Church
XRD	x-ray Diffraction

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Section 1: Introduction

This Phase II geochemical characterization sampling and analysis plan (SAP) summarizes the purpose, objectives, and methods that will be used to analyze the geochemical characteristics of soils encountered during the planned construction of the Twin Lakes Church (TLC) Seawater Intrusion Prevention Pilot (SWIP) Pilot Well Project (Project). The planned construction activities are described in the TLC Seawater Intrusion Prevention Pilot Well Basis of Design Report (Brown and Caldwell [BC], 2018). This Project is part of the Soquel Creek Water District's (District) Pure Water Soquel (PWS) project. The District is developing PWS to prevent seawater intrusion by recharging the local groundwater basin with 1,500-acre feet per year (AFY) of purified recycled water for indirect potable reuse and thereby improve its reliability as a water supply source and prevent further seawater contamination from moving inland.

This effort meets California State Water Resources Control Board's Proposition 1 Groundwater Sustainability Program guidelines aimed at preventing contamination of groundwater by seawater intrusion that serves as a source of drinking water.

Groundwater replenishment though purified water injection has been successfully implemented in California, including Orange County Water District, West Basin Municipal Water District and Water Replenishment District of Southern California groundwater replenishment projects to counterbalance the effects of seawater intrusion and replenish local groundwater aquifers. Injection of purified water into a groundwater aquifer can lead to geochemical reactions such as mineral dissolution, oxidation, or desorption (Pyne, 2005). Naturally occurring metals can be released due to mineral dissolution or desorption from iron and manganese oxide minerals. Oxidation of mineral phases such as sulfides can also occur due to the higher oxidation-reduction potential of the purified water injected into the groundwater aquifer. Changes in water quality could lead to operational difficulties and could potentially degrade the water quality of the aquifer. Therefore, the purified water post-treatment regime should be optimized for injection into the target groundwater aquifer. Geochemical characterization of target injection points in the aquifer and adjacent units can provide vital information on the design of the water finishing system to minimize the reactions between the aquifer and injected purified water.

1.1 Background

An initial geochemical characterization investigation was conducted by BC in 2016 to determine the mineralogical composition and leaching potential of aquifer units and adjacent aquitard materials within the District's service area. Sediment samples from the initial geochemical characterization were derived from archived cuttings from previously drilled wells within the vicinity of proposed recharge SWIP wells for the PWS project, and the volume of material available for analysis was limited. Samples were analyzed for mineralogical composition using x-ray diffraction (XRD) and soil leaching using Synthetic Precipitation Leachate Procedure (SPLP) methods that required very little sample volume.

Data from the initial geochemical investigation (BC, 2016) suggest there is a potential for aquifer and aquitard materials to react with the purified water in a way that could negatively impact the groundwater quality. Results from the soil leaching analysis indicate a potential for some regulated metals, such as arsenic, cadmium and nickel, to be released. The initial geochemical characterization work was conducted using simulated purified water without any post-treatment. The purpose of the initial geochemical characterization leaching study was to identify which constituents, and relative concentrations, could be released due to injection of the purified water into the aquifer.

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In 2016, Soquel Creek Water District commissioned the National Water Research Institute (NWRI) to form an Independent Advisory Panel to provide expert peer review of the technical, scientific, and regulatory aspects of the Pure Water Soquel Groundwater Replenishment Project. The Panel will review the work products (i.e., draft work plan, technical memos, reports, etc.) and answer public questions on these efforts. The Panel will also consider findings from other completed or ongoing similar efforts to develop the most informed recommendations. As part of that effort, the panel reviewed the initial geochemical investigation by BC (2016), and within the NWRI "Final Report for Panel Meeting #1", it concluded that 1.) the samples used in the initial geochemical investigation may have been oxidized during storage prior to analysis; therefore, the results may not represent the in situ geochemical conditions and 2.) the non-stabilized deionized water used in the soil leaching analysis may not be representative of the future injection water and supported bench-scale geochemical and additional mineralogical analysis (NWRI, 2016). The limited scope of the initial geochemical characterization left several data gaps which would require additional analysis to meet the objectives of the Project. For example, the initial geochemical investigation was not able to evaluate the potential effects of treated purified water on the aquifer water quality. Recommendations for additional geochemical characterization were developed including bench-scale tests and advanced geochemical or mineralogical analyses to provide supplemental data once additional aquifer material were available.

1.2 Objectives

As part of the further evaluation of the PWS Project, the District received funding assistance under Prop 1 Groundwater Planning Grant to conduct additional, site-specific geochemical characterization.

The objectives of this geochemical characterization (Phase II) are to:

- Address the data gaps from the initial geochemical characterization
- Provide information for the water treatment design
- Develop a more complete characterization data set
- Establish a methodology for future characterization studies
- Address the recommendations of the National Water Research Institute's (NWRI) Expert Panel (NWRI, 2016)) on the initial geochemical characterization

1.3 Project Scope

The project scope includes the development of planning documents, the collection and analysis of samples, laboratory analysis and testing, and data evaluation and reporting of results. Sediment samples will be collected from target layers during drilling of the TLC Seawater Intrusion Prevention Pilot well. Two categories of analyses will be conducted on select samples to evaluate the potential reactive minerals within the injection and adjacent aquifers, including:

1. Soil leachate testing, and
2. Mineralogical characterization.

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The analytical results will be tabulated and summarized in a report identifying the sediment type, mineralogy, and leaching potential of regulated metals. Results from the geochemical characterization will be used to evaluate if treated finished water quality characteristics can be optimized to reduce the potential for operational difficulties or aquifer water quality degradation.

Section 2: Sample Selection and Collection

This section describes the approach, rationale, and sample collection and analytical methods that will be used in this project.

2.1 Approach

Geochemical analyses will consist of soil leaching tests and mineralogical characterization tests. The objective of the geochemical analyses and the analytical methods to be used are shown in Table 2-1. Section 3 provides the details on the proposed analytical methods.

Table 2-1. Objectives and Analytical Methods

Objective	Determine the mineralogical composition and leaching potential of the injection aquifer and adjacent aquifer materials
Soil leach	Modified SPLP
	Modified column test leaching
	Hydroxylamine-Hydrochloride (HA-HCl) extraction test
Mineralogical characterization	Visual Description
	XRD
	Whole rock chemical analysis
	Scanning electron microscopy (SEM)

2.2 Sample Collection

The Purisima Formation, the potential injection aquifer for the District's PWS project, is a Pliocene to late Miocene sedimentary deposit of fine to medium sandstone containing siltstone and mudstone layers or lenses. Several hydrostratigraphic layer units, both aquifers and aquitards identified as Tp?/Tu (intermittently) and through F, have been defined within the Purisima Formation in the Soquel-Aptos area (Johnson et al, 2004). Sandstones of the Purisima Formation consist of plagioclase feldspar and quartz minerals with minor volcanic rock fragments of andesite, basalt and pumice (Akers and Hickey, 1967). Volcanic rock fragments can include mineral phases such as hornblende, biotite, and glaucophane (Greene, 1977). Calcite and chlorite form a secondary cement between the rock fragments. Fossil sea shells are also commonly found within the Purisima Formation.

Two aquifer units, BC and A aquifer units, within the Purisima Formation are the targeted units for the TLC Pilot well (Figure 1-1). Geochemical characterization will focus on these two aforementioned target aquifer units and the adjacent D, B, and AA units.

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Samples will be collected as grab samples according to the methodology described in the Soil and Rock Sampling and Preservation Standard Operating Procedure (SOP) (Appendix A) at approximately 10-foot intervals. The grab samples will be placed in zip-top storage bags and stored in 5-gallon buckets until the drilling operations have been completed. Splits of the individual 10-foot grab samples may be retained as archive samples if necessary.

Composite soil samples will be generated by combining the grab samples from the 10-foot intervals collected during the TLC well drilling. Geophysical log data from the TLC well will be analyzed to confirm the depths of each target units. Once the depths for each unit have been defined the discrete 10-foot grab samples within the defined depths of each target unit will be combined and homogenized following the methods described in the Soil and Rock Sampling and Preservation SOP (Appendix A) to generate one composite sample. Composite samples will be sieved to remove particles larger than 2 inches in diameter prior to splitting the necessary volume of materials for the laboratory analysis (Table 2-2).

Drilling of the TLC Pilot well will be conducted using reverse circulation (RC) methods. Drilling fluids, such as foams or muds, may be required during drilling operations to maintain circulation and retrieve boring cuttings. Samples will be rinsed using potable water (water source is from local groundwater) to remove residual drilling fluid before placing the grab samples in zip-top bags. A fine-mesh hand-held sieve will be used for overflow water to maintain as much of the sample fines as possible. Samples of the drilling fluid will be collected and analyzed to establish the water quality parameters and identify any potential transfer of constituents to the collected solid samples during drilling. Drilling mud samples will be collected from the mud tank at the surface as a grab sample of the fluid. The list of parameters for the drill fluid analysis will be dependent upon the types of drilling fluids used but will at a minimum include the list of constituents described in Section 3 Table 3-2.

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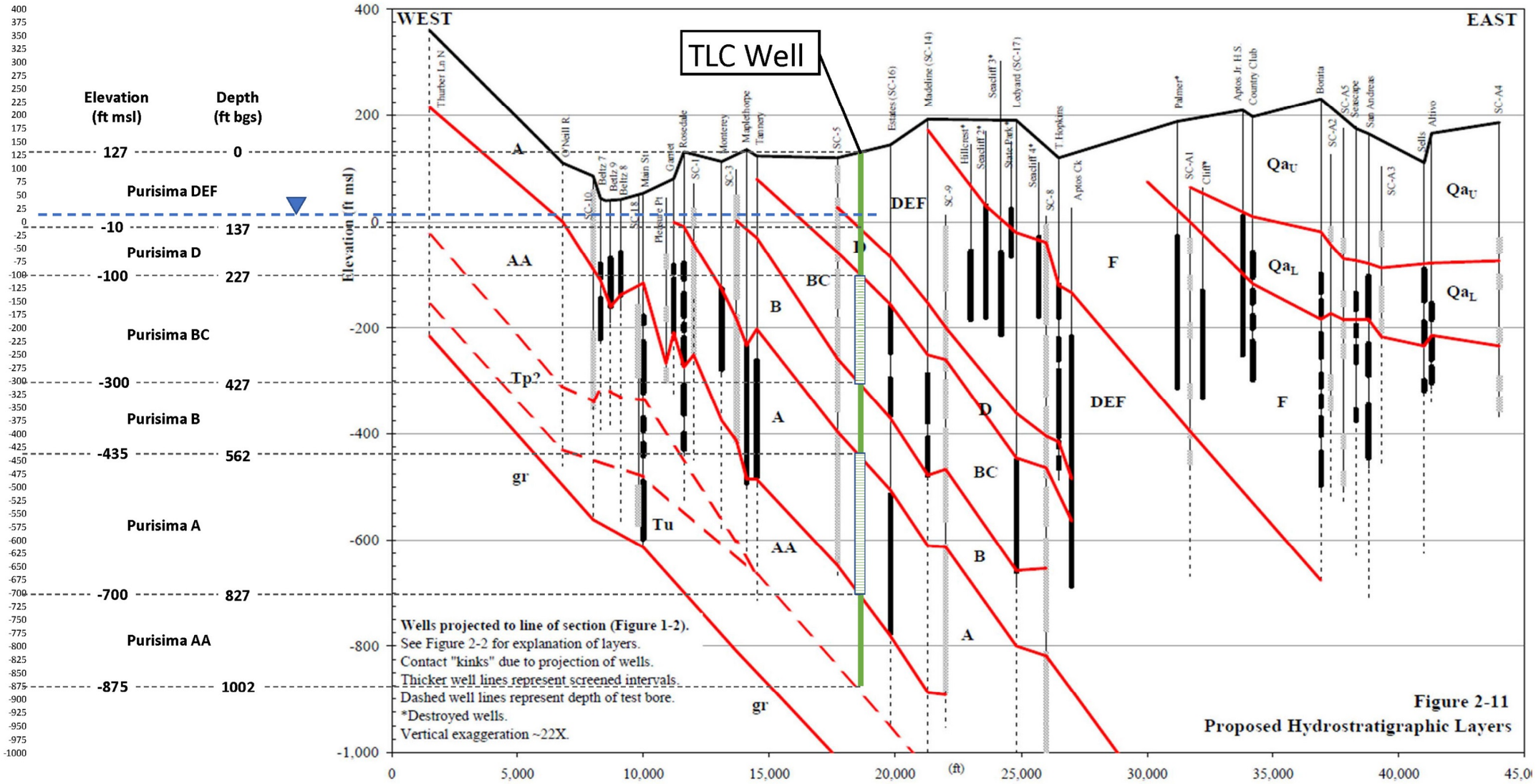
FINAL Phase II Sampling and Analysis Plan 20190305



Source:
Johnson, N.M., et al. 2004, *Groundwater Assessment of Alternative Conjunctive Use Scenarios, Technical Memorandum 2: Hydrogeologic Conceptual Model.* September

Figure 1-1. Hydrogeologic conditions and TLC pilot well layout

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FINAL Phase II Sampling and Analysis Plan 20190305

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2.2.1 Visual Examination

Field personnel will conduct a visual examination of the boring samples according to the methods described in the Soil and Rock Field Classification and Description SOP (Appendix A) to identify primary and secondary (alteration) mineral composition. The purpose of the visual examination is to preliminarily identify the predominant mineral forms throughout the sample, if possible. Visual examination will also gather information on the sample physical conditions (e.g., color, texture, relative grain-size distribution). This examination will be documented in a field log and photographs will be conducted for each sample according to the methods described in the Field Notes and Documentation SOP (Appendix A).

2.2.2 Sample Handling

After the materials have been visually inspected, photographed, and described, the sample materials will be weighed to achieve the minimum sample mass requirements for each laboratory analysis listed in Table 2-2. The sample weight will be recorded in a field log. Samples will be labeled, double bagged in gallon-sized zip top bags, and prepared for shipment. Samples will be shipped to ACZ Laboratories, Inc. (AZC) in Steamboat Springs, Colorado or The Mineral Lab, Inc. in Golden, Colorado (Table 2-2) for analyses.

Table 2-2. Mass Requirements for Geochemical Characterization

Analysis	Mass Requirement	Analytical Laboratory
HA-HCL	10 g	ACZ
SPLP	500 g	ACZ
Modified Meteoric Water Mobility Procedure (MWMP) column	5 kg	ACZ
Whole-rock chemistry	100 g	ACZ
XRD	100 g	The Mineral Lab
SEM	100 g	The Mineral Lab

Samples will be labeled with an identifier according to the corresponding well ID number, composited depths, date in year-month-day numeric format and cataloged. For example: TLC boring, depths 300 – 400 feet composited and collected on 20190115. Samples bags will be labeled with the following information:

- Sample ID
- Date and time of sample collection
- Samplers initials

Chain-of-custody (COC) procedures will be conducted in accordance with the methods described in the Soil and Rock Sampling and Preservation SOP (Appendix A). A completed COC form will accompany each box or cooler in the shipment. The sampler's name, the sample date and time, and the relinquished date and time will be recorded on the COC. All samples in each box will be listed on a corresponding COC and the requested test to be performed by the laboratory will be indicated. COCs will be signed when relinquishing sample custody to the shipping company and laboratory. Copies of the COC and shipping label, either a photocopy or photograph, will be maintained with the sampler and subsequently saved to the project file.

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FINAL Phase II Sampling and Analysis Plan 20190305

Section 3: Geochemical Analysis

This section provides details and purpose on the analytical methods that will be used in this project.

3.1 Phase II Geochemical Analysis

The Phase II geochemical characterization analyses were selected to build upon the data collected from the initial geochemical characterization by utilizing several of the same methods used in the initial investigation. Analytical methods used in the initial geochemical investigation are shown in Table 3-1 along with the proposed methods for the Phase II geochemical characterization and a brief description of the methodology details. Additional analyses will be conducted for Phase II to expand upon the previous work and attempt to fill data gaps resulting from the limited volume of material from the initial investigation. An overview of the analytical methods, the units to be analyzed and additional notes on the methodology are summarized in Table 3-1.

Table 3-1. Overview of Phase II Geochemical Characterization Analysis Work Plan

Analysis	Target Units	Number of Composite Samples	Investigation	Methodology Details
Soil Leaching				
Modified SPLP	BC, D, B, A, AA	5	Initial and Phase II	De-ionized and 3 stabilized pure water aliquots
Modified MWMP	BC, A	2	Phase II	One water type, week-long submersion, repeated 4 times
HA-HCL	BC, D, B, A, AA	5	Phase II	Metals only
Mineralogical Characterization				
Whole-rock chemistry	BC, D, B, A, AA	5	Phase II	Major, minor and trace elements
XRD	BC, D, B, A, AA	5	Initial and Phase II	Major and trace mineral phases
SEM	BC, D, B, A, AA	5	Phase II	Constituent mapping and imaging

3.1.1 Soil Leaching Analysis

Three soil leach tests will be conducted to provide an indication of the leachability of aquifer materials when exposed to injected purified and treated water chemistries (Table 3-1). The analytes selected for the soil leaching analysis are summarized in Table 3-2 and are based on California Drinking Water regulated constituents and major ions for water characterization and are the same list of parameters that was used for the initial geochemical characterization investigation (BC, 2016).

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Table 3-2. Analytical Parameters for Soil Leaching Analysis		
Major Anions		
Chloride	Fluoride	Sulfate
Nitrogen (Nitrate)	Total Nitrogen	Nitrogen (Ammonia)
Nitrogen (Nitrite)		
Major Cations		
Calcium	Magnesium	Potassium
Sodium	Total Alkalinity	Alkalinity Species
Metals		
Aluminum	Antimony	Arsenic
Barium	Beryllium	Boron
Cadmium	Chromium	Chromium (Hexavalent)
Copper	Iron	Lead
Manganese	Mercury	Molybdenum
Nickel	Orthophosphate	Selenium
Silver	Silica	Strontium
Thallium	Uranium	Zinc

3.1.2 Modified SPLP Analysis

SPLP Method 1312 uses a 20:1 solution to solids mass ratio to extract readily dissolvable solid phases (EPA, 1994). However, the high solution to solids ratio can also dilute constituents below the analytical detection limit. To achieve the characterization objective a modified SPLP with a solution to solids ratio of 4:1 was used during the initial geochemical investigation to identify potential constituents of concern while still meeting the analytical sample mass requirements. Phase II modified SPLP methodology will utilize the same 4:1 solution to solids ratio to be able to directly compare the data from the initial investigation to the Phase II results.

For the initial geochemical investigation, de-ionized laboratory reagent grade water was used in the modified SPLP analysis to dissolve constituents and simulate a “worst-case” scenario (e.g. reverse osmosis permeate that has not undergone post-treatment or stabilization) of potential mineral leaching or dissolution. Due to limited sediment sample volume, there was not enough sample to analyze multiple potential injection water chemistries. Phase II will include one analysis using the same de-ionized laboratory reagent grade water as used in the initial investigation to be able to directly compare results between both studies. Additionally, Phase II will include up to three stabilized pure-water aliquots with different post-treatment chemistries. The treated water for the modified SPLP analysis will be provided by Soquel Creek or obtained from other municipal treatment facilities.

Samples selected for SPLP analysis will be from the target injection aquifers and adjacent units that could come into contact with the injection water. Each of the target units selected for the modified SPLP analysis will be tested with the de-ionized laboratory water and the three stabilized pure-waters. The objective of testing each unit with each type of water is to determine the potential mobility of constituents from the de-ionized water results and the potential mitigation benefits of pure water stabilization.

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3.1.3 Modified MWMP Column Analysis

Soil leaching column analyses, such as the MWMP, were not conducted during the initial investigation due to limited availability of sample material. Phase II will use a modified MWMP methodology to evaluate the release of constituents from repeated interaction with the injected water. The purpose of the modified columns would be to identify changes in the water quality parameters with prolonged and repeated exposure of the target unit lithology to the potential injection fluid. Treated water will be continuously injected into and moving through the target unit over the course of the PWS project. Column leaching may provide a better estimate of constituent release over time by repeatedly exposing the aquifer material to injection water for long periods of time that may more realistically represent the PWS project.

The MWMP analysis uses a lower solution to solids ratio than SPLP and therefore, requires a 1:1 solid to solution mass ratio by adding the same mass of solids and solution to the column. The volume of solution will completely saturate the solids. The 1:1 solution to solids ratio is more likely to represent the ratio of injected fluid into the aquifer material than the SPLP ratio of 20:1. Standard MWMP analysis methodology (ASTM, 2013) is commonly used in the mining industry. The test method includes dispensing the solution at a slow flow rate over several hours to days to simulate the dissolution and mobility of constituents from mine solid materials by meteoric water. The solution percolates through the solid material, is collected and then analyzed.

To meet the objective of the Phase II geochemical characterization study, the MWMP method would be modified to extend the length of time in which the solution and solids can react, and to perform multiple, consecutive rinses to observe changes in the concentration over multiple rinses to simulate the target unit reacting to continuous injection of treated water during the PWS. Modifications to the standard MWMP test would be to fully saturate the column material at a 1:1 ratio at the beginning of the test instead of slowly percolating the solution into the column over 24-hours. Additionally, the modified method would increase the length of time the fluid can react to six days and allowing the column to drain for 24-hours on the seventh day. Leachate from the modified MWMP column analysis will be collected on the seventh day and analyzed for the parameters listed in Table 3-2. At the completion of the first week of leaching and draining of the leachate, the column will then be filled with treated water solution at a 1:1 ratio and allowed to react for another six days. The modified column tests will be repeated for a total of four cycles using the same solid materials each week. The treated water leachate that is drained from the column will not be reused in subsequent column cycles. The leachate drained from the column may have dissolved constituents which could redeposit if reused in subsequent test cycles. Instead, an aliquot of the treated water solution that has not been allowed to react with the solids will be used for each weekly leaching test cycles.

Complete saturation and longer contact time between the solids and the solution will allow for reactions, if any, to occur between the solid material and the leaching solution. Repeating the column test multiple times may define trends in the water quality of the leaching solution with repeated exposures of the target unit materials and the treated injection water. The modifications are designed to more closely simulate the injection water saturating and reacting with the aquifer materials. For example, if sulfide mineral oxidation were to occur as a result of oxygenated purified water reacting with sulfide mineral phases in the aquifer materials, then increases in sulfate or iron concentrations may be observed through successive rinses. Another possible trend would be a decrease in constituent concentrations of elements that are desorbed from clay or oxide minerals are removed. No significant trends in constituent concentrations is another possible outcome of the modified column tests.

Only the aquifer units (BC and A) would be used for the modified column analysis for the Phase II geochemical analysis. Results of the modified SPLP analysis will be evaluated to determine which of the three treated waters resulted in the lowest release of constituents to determine which solution will be

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selected for the modified MWMP column tests. If all treated waters show similar results, then the solution which represents the most likely water treatment design will be selected.

3.1.4 Hydroxylamine-Hydrochloride (HA-HCl) Extraction Test

Iron or manganese oxide mineral phases present in the target injection aquifer could contain adsorbed metals which could be released due to the changes in the in-situ chemistry because of injecting treated water. Hydroxylamine-Hydrochloride (HA-HCl) Extraction tests will be conducted to measure the amount of hydrous ferric oxide (HFO) in the samples and to determine the potential release of metals (Tessier et al., 1979). Typically, the HA-HCl extraction is one step of many to determine the partitioning of constituents in solid phase materials. Additional extraction steps are designed to evaluate the constituents bound in carbonate minerals by leaching the solids with an acidic solution or determining the constituents bound in silicate mineral through total mineral digestion. The mineral phases bound in carbonate minerals are not of concern for the Project as the injected water will have a near-neutral pH. The total elemental concentrations of the samples will be evaluated using the whole-rock chemistry described below.

Metals bound to aquifer mineral phases through adsorption could be a potential source of constituents released when treated water is injected into the aquifer. Readily dissolvable mineral phases and the metals released will be evaluated by the modified SPLP analysis described above. Results from the HA-HCL extraction analysis will be used to further estimate the potential for metals to desorb from iron and manganese oxide mineral phases. All aquifer and aquitard units will be selected for HA-HCl extraction analysis.

Leachate from the HA-HCl analysis will only be analyzed for metals due to interferences from the extraction solution for major anions and cations. Metal concentrations adsorbed onto oxide mineral phases are also of the greatest interest in meeting the objectives of the Phase II geochemical characterization study.

3.1.5 Mineralogical Analysis

Solid-phase chemistry will be evaluated using visual observations, whole-rock chemistry, XRD and SEM analysis. These data will be used to identify potential reactive mineral phases, such as sulfides or iron oxides, and mineral phases that could leach constituents.

3.1.6 Whole-Rock Chemical Analysis

Whole-rock chemical analysis will be conducted using EPA Method 3052 to determine the elemental composition of the solid materials from the target units. Solid samples are digested prior to analysis using an Inductively Coupled Plasma with mass spectrometry (ICP-MS) to quantify the concentrations of major, minor and trace elemental composition of the solid samples. Results from the whole-rock chemical analysis when combined with the visual observations and XRD analysis can provide information on the potential mineral phases present in the solid samples. Additionally, the whole-rock chemical analysis data can be compared to the soil leaching results to evaluate which constituents are mobile or immobile. All of the target units will be submitted for whole-rock chemical analysis.

3.1.7 XRD (X-ray Diffraction) Analysis

XRD identifies mineral phases and quantities from peaks created by the scattering of radiation into three dimensional arrays of atoms unique to each mineral. Mineral phases are identified by comparing locations and intensities of diffraction peaks with those of mineral reference standards. Results will be summarized as approximate mineral weight percent concentrations. Estimates of mineral concentrations will be made based on relative peak heights/areas on the XRD scans. The detection limit for an average mineral in a sample is approximately 1-3% of the sample mass and the analytical reproducibility is approximately equal to the square root of the mass of mineral present. Sample from each of the aquifer and aquitard units will be

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FINAL Phase II Sampling and Analysis Plan 20190305

submitted for XRD analysis. Samples from the initial geochemical characterization were analyzed using XRD, and the results from the Phase II analysis will be compared to the mineralogy of the initial investigation to evaluate the mineralogical changes spatially within the target units.

3.1.8 SEM (Scanning Electron Microscopy) Analysis

SEM identifies and quantifies elemental composition of samples through the bombardment of the sample by a focused electron beam. Chemical maps of individual elements can be generated to evaluate the abundance and spatial variability of elements. SEM can also be utilized to generate photomicrograph images of the sample using backscattering electron signals. The backscatter electron photomicrographs can provide image resolutions down to the micron and nanometer scale. Combining the backscatter images of the sample, along with elemental mapping, allows for an analysis of the location of particular constituents in specific mineral phases. Which units will be analyzed using SEM will be determined as the Phase II geochemical characterization data is evaluated and data gaps are identified.

Section 4: Data Review and Evaluations

To obtain characterization data that is accurate and defensible, a Quality Assurance/Quality Control (QA/QC) program will be implemented. QA is a management function and refers to the systematic planning of procedures, methods, and standards to ensure data generated by the analysis program are suitable for their intended use. QC is process-oriented and focuses on error identification and verification that data meet the established standards. Data QA/QC includes processes such as:

- Project management and communication,
- Training and documentation requirements,
- Laboratory testing and analytical methods,
- Program assessment and oversight, and
- Data validation and usability.

All data generated from the analytical laboratories will be checked and inventoried for completeness and accuracy. Data for the Groundwater Replenishment Geochemical Characterization Project will be handled according to the QA and QC procedures outlined in this section.

4.1 Training Requirements

All field personnel that participate in data collection activities for the Geochemical Characterization Project will review the SOPs and will receive instruction on proper sampling procedures. Personnel will be trained prior to their initial entry to the field. Training topics will include proper sampling and handling techniques, QA/QC procedures, field notes and documentation, and sample shipment to the analytical laboratory.

4.2 Data Management

Data from the study will be compiled in a Microsoft Access® compatible database. The analytical lab will provide all results as electronic data deliverable (EDD) files that will be directly imported into the database to prevent transcription errors. Mineralogical data received from will also be entered into the database. All data will be stored as reported by the laboratory with QC and validation qualifiers assigned. Copies of laboratory reports, complete analytical data, and images generated will be included in the final report for this assessment.

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FINAL Phase II Sampling and Analysis Plan 20190305

4.3 Quality Control

QC is a means of measuring or estimating the potential variability involved with sample collection, analysis, or measurement activities, both in the field and in the laboratory. This section discusses the various QC activities associated with this project.

4.3.1 Field QC Checks

Field QC will not be conducted because no analysis of samples will be conducted in the field. Field duplicates will not be prepared since the homogenization of boring samples is impractical without laboratory grade sample preparation equipment.

4.3.2 Laboratory QC Checks

Laboratory QC checks are routinely performed as part of the analytical process and include internal checks of sample analysis activities. The frequency and type of QC samples are often dependent on the specific analytical method. The laboratory will report any variance from laboratory-assigned QC limits impacting the quality of sample results and may report details of internal laboratory QC if requested. Laboratory QC checks include the types of samples described below.

4.3.2.1 Method Blank Samples

Method blank (MB) samples are used to assess laboratory contamination during all stages of sample preparation and analysis. MB samples will be prepared by the laboratory using reagent-grade water and are carried through the entire preparation and analytical process. The laboratory will analyze MB samples at a frequency of one sample for each batch of up to 20 samples.

4.3.2.2 Laboratory Control Samples

Laboratory control (LC) samples are multi-element matrix-specific standards with known analyte concentrations that are carried through the entire preparation and analytical process. LC samples are used to confirm the method control, accuracy, and precision of analyses for constituents that are analyzed on a total concentration or total recoverable concentration basis. The laboratory will analyze LC samples at a frequency of one sample for each batch of up to 20 samples.

4.3.2.3 Calibration Verification Samples

Calibration verification (CV) samples are method standards with known concentrations used to assess analytical precision, accuracy, and stability of the instrument calibration. The laboratory will analyze CV samples at a frequency of one sample for each batch of up to 10 samples and at the end of each workgroup.

4.3.2.4 Matrix Spike Samples

Matrix spike (MS) samples will be used to evaluate the effect of the sample matrix on the recovery of constituents. An MS sample is a split of a submitted sample that is fortified with a spiking solution containing known concentrations of the target analytes. The fortified split is carried through the entire digestion and analytical process. Analyses for the MS are compared to the non-spiked split, and recovery of the target analytes is calculated by the laboratory. Recovery data for MS samples are used to determine the accuracy of the measurement and the prevalence of matrix effects. MS samples are also used in conjunction with matrix spike duplicate (MSD) samples to evaluate analytical precision. The laboratory will analyze MS samples at a frequency of one sample for each batch of up to 20 samples.

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4.3.2.5 Matrix Spike Duplicate Samples

MSD samples are duplicate samples of MS samples that are used to assess matrix effects on analytical precision. Precision is evaluated by calculating the Relative percent difference (RPD) for the MS and MSD pair. The laboratory will analyze MSD samples at a frequency of one sample for each batch of up to 20 samples.

4.3.2.6 Additional QA/QC Requirements

The analytical laboratory will have the appropriate facilities to store, prepare, and process samples and appropriate instrumentation and staff to provide data of the required quality within the time period dictated by the project. The laboratory shall provide, upon request, information documenting their ability to conduct the analyses with the required level of data quality. Such information may include results from inter-laboratory performance evaluation studies; control charts, summary data from internal QA/QC checks, and results from analyses of certified reference materials.

4.4 Data Verification

Laboratory data packages include a PDF report and an EDD. After these are received, and the data is loaded into the Microsoft Access database, data verification process will be evaluating the following:

1. The laboratory data has merged with the correct field data.
2. All expected analyses and results are present for each sample.
3. Any duplicate analytical results are properly coded to ensure that only the correct result will be reported.
4. The data has loaded correctly and that all fields are correctly filled.
5. Numerical results and units in the database match the laboratory report (approximately 10 percent of results are checked) to ensure that the EDD and data loading processes have not compromised the data.

Any issues that arise are resolved, and the database is updated with the corrected information.

4.5 Data Validation

The analytical laboratory applies qualifiers to data based on the laboratory quality assurance plan. These laboratory-assigned qualifiers are reviewed by the data validator to determine if the laboratory-identified issue has affected data usability. Laboratory-assigned qualifiers are stored in the database and are not modified. As part of the data validation process, the data validator assigns additional qualifiers based on EPA guidance (2002). Validation qualifiers are also stored in the database. For reporting purposes, results are always reported with their associated validation qualifiers.

Data validation consists of the following steps:

- Review of sample receiving temperatures and holding times compared to sample handling requirements.
- Review of laboratory QC results (blanks, spikes, duplicates, etc.) provided in the PDF, as well as comparison of the detection limits against those requested.
- Review of laboratory equipment blanks compared to the acceptance criteria.

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FINAL Phase II Sampling and Analysis Plan 20190305

During the validation process, qualifiers are assigned, if necessary. The valid data qualifiers that the data validator adds are defined as follows:

- U - Analyte was not detected at the detection limit concentration.
- J - Reported value is an estimated concentration.
- UJ - Analyte was not detected at an estimated detection limit concentration.
- R - This data was rejected and was not used for any purposes.
- UR - The analyte was not detected. The detection limit is unreliable and may be representative of a false negative. This data was rejected and is not usable for any purpose.

If any samples are rejected (R), documentation will be provided stating the rationale for discarding the data.

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Attachment A: Project Standard Operating Procedures (SOP)

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SOP 1: Soil and Rock Sampling and Preservation

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.002.001.1011

Standard Operating Procedure Version 1.0

Subject: Soil and Rock Sampling and Preservation

Date: November 19, 2017

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Table of Contents

List of Figures ii
Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 2
Section 6: Methods 3
6.1 Sample Compositing 4
6.1 Sample Description 4
6.2 Sampling Equipment Decontamination 4
6.3 Sample Preservation 5
6.4 Sample Labels 5
6.5 Chain-of-Custody 5
6.5.1 Chain-of-Custody Forms 5
6.5.2 Chain-of-Custody Seals 6
6.6 Sample Shipment 7
Section 7: Quality Assurance/Quality Control 7
Section 8: References 8

List of Figures

Figure 6-1. Example of the cone and quarter methodology 3

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Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish a uniform method for the collection and handling of solid samples for the Soquel Creek Water District Potential Target Aquifer Geochemical Characterization Assessment. This SOP includes methods for the procurement of appropriate sample amounts, chain-of-custody procedures, and use of appropriate sample shipment methods.

Section 2: Scope and Applicability

This procedure will be used during the collection of drill core/cutting samples from drill hole locations within the Soquel Creek Water District.

Section 3: Responsibilities

The project manager (PM), or designee, will have responsibility to oversee and ensure that the handling of samples is in accordance with this SOP and any site-specific or project-specific planning documents.

Field sampling personnel will be responsible for understanding and implementation of this SOP during all field activities, and obtaining appropriate field logbooks, forms, and records necessary to complete field activities. Field personnel will ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for assuring the original documentation, or copies of the field log books, are filed at the end of project.

Section 4: Definitions

Surface soil - considered to be the top 6 inches of a soil horizon profile (i.e., soil from 0-to-6-inches below ground surface [bgs]). Depending on the program or project, however, soil to 2 feet bgs may be considered surface soil. For the purposes of this procedure, surface soil represents the soil occurring from 0- to- 6-inches bgs.

Subsurface soil - the soil occurring between surface soil and bedrock.

Composite soil samples - combinations of aliquots collected at various sample locations, or at various depths at a single location. Analysis of composite samples yields a value representing an average over the various sampled sites or depths from which individual samples were collected.

Discrete soil samples - discrete aliquots from distinct sampling intervals, of a specific size, that are representative of one specific sample location at a specific point in time.

Continuous samplers - devices that allow a soil specimen to enter a split barrel during drilling. Both plastic and steel liners can be used inside the sample tube to retain the sample. In some formations, the soil sample may be considered “undisturbed.”

Split-barrel samplers - collect samples by driving a 1.5-inch nominal inner diameter (typical), split barrel into a soil formation with a 140-pound hammer dropped 30 inches. For environmental applications, 2-, 2.5- and 3-inch inner diameter split barrels are not uncommon. If a standard 1.5-inch split barrel is used, the number of blows to drive the last 1 foot of the sample are referred to as the standard penetration resistance or N-value. See ASTM D-1586 for the specification for this type of sampler. Another type of split barrel sampler is

the core barrel. A core barrel is longer and usually wider in diameter than the typical split barrel samplers and used on hollow stem auger drill rigs. Core barrels are usually 5 feet long and approximately 4-inch outside diameter, which sit into the leading auger and collect soil while drilling. Core barrels are typically unlined.

Ring-lined samplers - split barrels lined with removable rings. The rings are thin-walled and arranged in 1-, 2- or 6-inch increments to section the recovered soil sample. This device is used to collect soil samples for environmental applications and to collect relatively undisturbed soils in stiff and hard cohesive soils where it is not possible to push a sampler. See ASTM D3550 for the specification for this type of additional sampler.

Thin-walled tubes - used to recover relatively undisturbed soil samples by pressing the tubes into soil either hydraulically, or with a Denison or Pitcher sampler.

Section 5: Required Materials

The materials required for this SOP include the following:

- Bound field log books
- Field description visual aids
- Black waterproof and/or indelible ink pens
- Digital camera
- Hand lens
- Blank paper/white board
- Spray bottle
- Distilled water
- Paper towels
- Zip top bags
- Metal spoon/trowel
- Stainless steel bowl
- Measuring scoops
- Scale
- Paper towels
- Field logs, Sieve
- Clean 5-gallon buckets (to collect sieved material and to store collected samples)
- Plastic sheet (or similar) for sample quartering
- Sample coolers for shipping
- Sample labels
- Chain-of-custody forms
- Packing materials

Section 6: Methods

The following methods outline general considerations for sample collection, sample handling, and maintaining sample custody after collection.

Subsurface soil samples to be collected from depths greater than 6 inches bgs can be obtained manually using a hand-auger, a drilling rig, or excavating device (e.g., backhoe). A split-barrel sampler can be employed to depths in excess of 100 feet bgs with the assistance of a drilling rig. An excavating device can provide bulk soil samples from the ground surface to the limits of the excavator (typically 15 to 25 feet bgs. Bulk soil sampling at greater depths in unsaturated soils can be done using a bucket auger rig.

Composite soil samples are combinations of aliquots collected at various sample locations, or at various depths at a single location. Analysis of composite samples yields a value representing an average over the various sampled sites or depths from which individual samples were collected. Composite soil sampling is typically used in sampling soil for the characterization of investigation derived waste for disposal purposes. Other uses of composite sampling is in characterization of large surface area where a material may have been distributed.

Composite samples may require homogenization or other processing methods to ensure the sample is representative of all sample aliquots. Removal of large particles using a sieve reduces the potential for the nugget effect to occur in the composite sample. The nugget effect occurs when a large particle is over-represented in a small aliquot of material used for laboratory analysis. A large gauge sieve placed over the on top of 5-gallon bucket can be used to screen out larger particles prior to sample homogenization. Unconsolidated material which is stuck together should be separated by hand prior to sieving. The coning and quartering method can be used to first divide the sample into four segments. The sample is first divided into four quarters as shown in Figure 6-1. The diagonally opposite samples are mixed together into two equal halves. The two mixed halves of the sample are then combined, and the process is repeated until the sample appears to be visually homogenized. The final quartering step is used to split the sample into the desired quantity for laboratory analysis. Quartering is continued until a suitable sample volume is achieved.

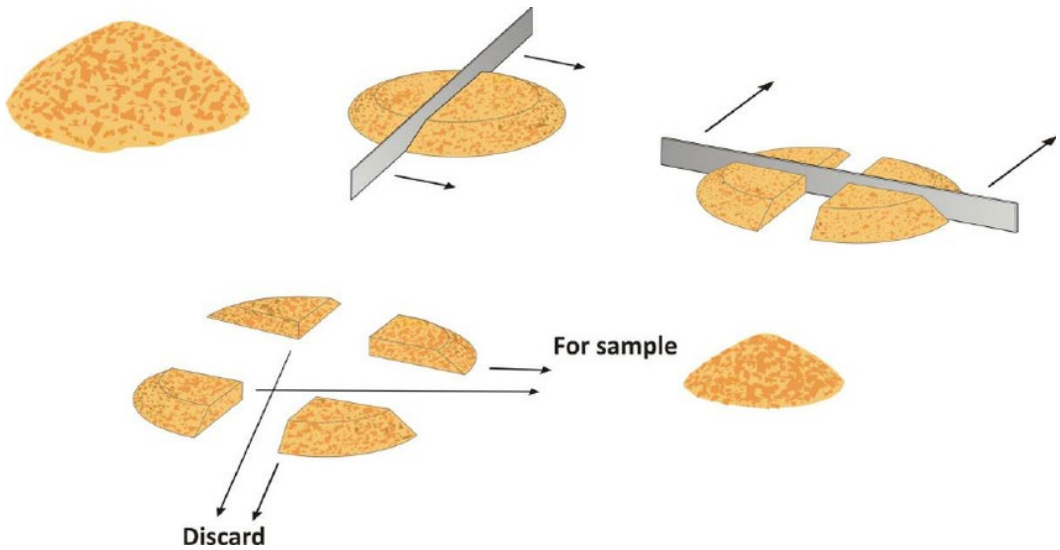

Figure 6-1. Example of the cone and quarter methodology

Core samples are to be collected in order to evaluate the geochemical characteristics, including acid generation potential and metals leaching, of mine lithologies to be excavated from the pit and exposed to atmospheric conditions. These samples should be handled with care so that analytical data will represent the geochemical nature of the mine lithologies. In addition, sample chain-of-custody is important for establishing sample integrity was maintained between field crew and the laboratory.

General considerations for handling during sampling are:

- Always wear latex gloves when handling samples
- Sample receptacles or containers should be wrapped in a way that is protective of both surrounding containers and the container the sample is in
- Always check and thoroughly document procedures in field logbooks or sampling forms. There is never "too much information"

Soil/rock samples typically do not require chemical preservation methods of any kind, see Section 6.3 for additional details. Samples must be transported from the field to the laboratory through the use of the proper sample containers and packing material.

6.1 Sample Compositing

Samples may have to be combined from several depth interval sub-samples to generate enough material to meet the analytical lab mass requirements. The purpose of compositing is to gather the required amount of mass from the target aquifer interval from several smaller individual samples.

To avoid over-representing individual sample interval the goal for sample collection will be to collect the same amount of sample from each individual sample to generate the composites. The following methods describe the methods to be used for generating a composite sample. Each individual sample will be collected using a volumetric scoop (measuring cup) to obtain consistent mass from each sample. Individual sample volumes will be combined in a stainless steel bowl and mixed using a spoon or towel until the color and grain-size are consistent.

The composite sample then will be photographed. Photographs of the composite sample will show the sample ID number in the photograph. The composite sample will be split into sub samples for shipment to different laboratories, if necessary. Samples will be labeled and placed in ziplock bags, packed in boxes, and shipped to the analytical laboratory.

6.1 Sample Description

Visual examination of the drill cutting is to be conducted to identify the primary and secondary (alteration) mineral composition. Visual examination will identify mineralogical changes (secondary alteration), mineral coatings, physical conditions (e.g., relative grain size distribution), and unaltered rock vs. unconsolidated conglomerates/soils. The visual examination will be documented in a field log notebook. Field descriptions should follow the procedures described in the Soil and Rock Descriptions SOP.

6.2 Sampling Equipment Decontamination

All sampling equipment must be cleaned according to the Equipment Decontamination SOP prior to collecting the next samples.

6.3 Sample Preservation

Solid samples, including rock, soils, and sediments, shall be preserved by cooling to 4°, ± 2° C. Most soil and solid samples require no other preservatives. Samples should be contained in glass jars or air-tight plastic bags then kept in a cooler to prevent the loss of soil moisture. Solid samples, whether in metal sleeves, wide-mouth glass jars, or other containers, will be labeled and secured appropriately, then placed immediately in an ice chest containing sufficient ice to maintain a temperature range of 4° ± 2° C through delivery to the laboratory. Sufficient ice chests and quantities of ice to manage all samples collected during the day (or shift) shall be maintained at the sampling site. Samples are maintained in ice or, if available, in refrigerators, within a range of 4° ± 2° C, from the time the sample control manager assumes custody until the samples are packed for shipment and relinquished to the shipper or other transport agent.

6.4 Sample Labels

Sample labels are required on all sample containers as the primary source of sample identification. Sample identification numbers will also be written using indelible markers on the sample bag. Specific field data do not need to be recorded on the labels. Sample labels should contain the following information:

- Sample identification number
- Project name and number
- Date of sample collection
- Details of samplers (initials, etc.)

All samples will be double bagged in zip top bags with the sample ID, date and samplers initials written on both bags. Place the sample label in between the inner and outer sample bags.

6.5 Chain-of-Custody

The goal of implementing chain-of-custody (COC) procedures is to ensure that the sample is traceable from the time that it is collected until it, or its derived data, are used. Samples would be considered to be "in custody" under the following conditions:

- It is in personal possession
- It is in personal view after being in personal possession
- It was in personal possession when it was properly secured
- It is in a designated secure area

6.5.1 Chain-of-Custody Forms

A chain-of-custody form may be initiated at the time the sample containers are filled or, at the latest, when sample containers leave the site at which they are prepared. Additionally, chain-of-custody forms may be pre-populated with initial information for the project and specific analytical methods listed prior to field work to decrease the amount of time spent documenting in the field. Actual sample collection information should be recorded in the field immediately after the sample has been collected.

Samples submitted to the laboratory must use a COC form. The following information should be included on the COC:

- Sample name
- Date/time of collection, sampler
- Number of containers
- Analysis requested
- Data package requested
- Contact information

It is important that field personnel completely fill out all applicable sections of the form.

The COC form should be completed in advance of field work where possible. Sample names, dates, and times should be completed by field personnel at the time of sample collection. The original COC form should be copied prior to sample shipping and the original included in the shipping container. If a triplicate COC form is used, the top page original shall be included with the samples and the remainder preserved for project files. Revisions to COCs should be single-line crossed out, initialed, and dated. Chain-of-custody forms should be numerically sequenced with a number clearly indicated on the form. The chain-of-custody forms should be placed in shipping containers, protected from moisture using plastic bags (e.g., ziplock bags), and the original should accompany the containers during shipment to the laboratory. Chain-of-custody forms included in any shipping container should only reflect those samples that are in that container. Field personnel collecting samples will be responsible for custody of the samples until transport to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date, and note the time of transfer on the COC forms. The COC is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the COC record should be maintained by field personnel along with other field records.

Common carriers (i.e., FedEx) are not expected to sign the chain-of-custody form. However, the bill of lading or airbill becomes part of the chain-of-custody record in the event that a common carrier is used to transport the samples. Airbill or bill of lading numbers should be recorded on the chain-of-custody forms.

6.5.2 Chain-of-Custody Seals

Chain-of-custody seals shall be affixed to the outside of each shipping container or cooler. One seal is required and should be placed along the front of the cooler at the point where the lid meets the body of the cooler. The seals do not necessarily need to be custody tape, but any type of tape that can be used that cannot be easily removed without showing signs of damage. The custody seals or tape shall include the date and initials of the packager.

Chain-of-custody seals or evidence tape may be used, but are not required, on sample containers in order to demonstrate the sample containers have not been opened or otherwise tampered with during transit. Chain-of-custody seals, or evidence tape if used, should be affixed to each sample package as soon after sample collection as is possible.

6.6 Sample Shipment

Shipment of samples to an analytical laboratory is usually required upon completion of sample collection. Proper packaging is necessary in order to protect the sample containers and to comply with all applicable transportation regulations. Core samples do not require any sample preservation (e.g., cooling), and no ice or cooler packs are required.

In general, samples are shipped using packaging that is supplied by the analytical laboratory. Care should be taken to ensure that the samples are adequately protected from breakage or cross-contamination during shipment. Sample bags should be secured tightly with bubble wrap or other suitable packing media. Once packed, the cooler should be secured shut by wrapping packaging tape completely around the cooler.

A custody seal shall be placed on the outside of the cooler, and clear tape shall be wrapped around the cooler to cover each seal without obscuring or damaging signatures or other significant data. The shipping label shall be secured to the outside of the shipping container and, if it is attached to the top of a cooler by adhesive, clear tape shall be used to secure it to the packaging. A valid return address must appear on the shipping label in the event the shipper is unable to deliver to the designated address.

Samples will be delivered to the analytical laboratory within the analytical parameter hold times. If samples are sent on Friday, Saturday delivery will be requested, and arrangements must be made with the laboratory to receive the shipment.

Section 7: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

Section 8: References

U.S. Environmental Protection Agency, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, December 1987.

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SOP 2: Soil and Rock Field Classification and Description

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FINAL Phase II Sampling and Analysis Plan 20190110.docx

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

Standard Operating Procedure Version 1.0

Subject: Soil and Rock Field Classification and Description

Date: November 19, 2017

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 1
Section 6: Methods 2
6.1 Description of Soils 2
6.1.1 General Considerations 2
6.1.2 Soil Description Procedures 2
6.2 Description of Rock 6
6.2.1 General Considerations 6
6.2.2 Rock Description Procedures 6
Section 7: Quality Assurance/Quality Control 11
Attachment A: Field Description Visual Aids ..... A
Attachment B: Field Log Form ..... B

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SOP_2_Soil_and Rock Descriptions

Section 1: Objective

This objective of this Standard Operating Procedure (SOP) is to establish a consistent method for Brown and Caldwell staff to follow when completing the description of soil and rock samples obtained from field sampling efforts and entry into borehole logs. Consistency with description is important because during many projects multiple employees may be involved at different times. Hence, being able to compare between logs that were created by different geologists is essential for creating subsurface interpretations.

Section 2: Scope and Applicability

This procedure will be used during all field activities when bore hole subsurface drilling, surface soil or rock sampling, reconnaissance geological mapping is occurring. These activities should be documented as described herein and following the SOP for Field Notes and Documentation.

Section 3: Responsibilities

The Project Manager (PM) shall ensure that the soil or rock classification and description procedures used in the field conform to the guidelines in this SOP. The PM shall ensure that all field personnel providing descriptions are properly trained to conduct this task and are providing descriptions under the oversight of a Senior Geologist registered in the state in which the logging is occurring. If the state does not have requirements for registration, then the Senior Geologist should meet the standards for a professional geologist under that states law or be registered in another state. The Field Supervisor is responsible for reviewing lithologic logs for accuracy and completeness prior to releasing them to the project manager for review. The Field Geologist is responsible for following the soil classification and description procedures in this SOP, and for accurately and completely representing the lithology encountered in the field.

Section 4: Definitions

American Society for Testing Materials (ASTM).

Feldpathoids. Alkali (potassium) or basic (plagioclase) feldspar.

International Union of Geological Sciences (IUSG).

Unified Soil Classification System (USCS).

Section 5: Required Materials

The materials required for completing the procedures outlined in this SOP, at a minimum, include the following:

- Hand lens
- Field notebook and borehole log forms
- Protractor
- Pencils

- Pocket knife
- Dilute hydrochloric acid in small dispenser
- Field charts of grain size examples (e.g., American Geological Institute [AGI] data sheets)
- Squirt bottle with water
- Compass with altimeter

Section 6: Methods

The following sections provide guidance for how proper field visual descriptions of soils and rock samples should be conducted. These methods may not be applicable to every soil or rock sample found, but should provide enough guidance to allow accurate and defensible descriptions by a variety of field geologists.

6.1 Description of Soils

The following section provides a description of the procedures that should be used when describing soils.

6.1.1 General Considerations

The most popular soil classification method that is based on grain size and other properties, is the Unified Soil Classification System (USCS). This system was initially developed by A. Casagrande in 1948 and was then called the Airfield Classification System. It was adopted with minor modifications by the U.S. Bureau of Reclamation and the U.S. Corps of Engineers in 1952. In 1969, the American Society for Testing and Materials (ASTM) adopted the system. This system is designated currently by ASTM as D-2488-90 and will be used as a guideline for classifying and describing lithology. It requires certain information (e.g. liquid limit, plastic limit moisture content and plasticity index) about the soil which can only be obtained in a laboratory.

The USCS is based on grain size and response to physical manipulation at various water contents. This system is often used for classifying soils encountered in boreholes, test pits, and surface sampling. The following properties form the basis of USCS soil classification:

- Percentage of gravel, sand, and fines;
- Shape of the grain size distribution curve; and
- Plasticity and compressibility characteristics.

Four soil fractions are recognized. They are cobbles, gravel, sand, and fines (silt or clay). The soils are divided as coarse-grained soils, fine grained soils, and highly organic soils. The coarse grained soils contain 50 percent of grains coarser than a number 200 sieve (approximately 0.08 mm). Fine grained soils contain more than 50 percent of material smaller than the number 200 sieve. Organic soils contain particles of leaves, roots, peat, etc.

6.1.2 Soil Description Procedures

The following will be used as a guideline for logging lithology from subsurface activities (i.e. borehole drilling, trenching, etc.).

The USCS recognizes 15 soil groups and uses names and letter symbols to distinguish between these groups. The coarse-grained soils are subdivided into gravels (G) and sands (S). Both the gravel and sand groups are divided into four secondary groups. Fine grained soils are subdivided into silts (M) and clays (C).

Soils are also classified according to their plasticity and grading. Plastic soils are able to change shape under the influence of applied stress and to retain the shape once the stress is removed. Soils are referred to either low (L) or high (H) plasticity. The grading of a soil sample refers to the particle size distribution of the sample. A well graded (W) sand or gravel has a wide range of particle sizes and substantial amounts of particles sized between the coarsest and finest grains. A poorly graded (P) sand or gravel consists predominately of one size or has a wide range of sizes with some intermediate sizes missing.

Soils which have characteristics of two groups are given boundary classifications using the names that most nearly describe the soil. The two groups are separated by a slash. The same is true when a soil could be well or poorly graded. Again, the two groups are separated by a slash.

Soil description should be concise and stress major constituents and characteristics for fine-grained, organic, or coarse-grained soils. Tables 1 and 2 are checklists for descriptions of fine-grained, organic soils, and coarse-grained soils, respectively. Field descriptions should include as a minimum:

Soil name. The basic name of the predominant constituent and a single-word modifier indicating the major subordinate constituent;

Particle Size Distribution. An estimate of the percentage and grain-size range of each of the soil's subordinate constituents with emphasis on clay-particle constituents. This description may also include a description of angularity. This parameter is critical for assessing hydrogeology of the site and should be carefully and fully documented;

Gradation or Plasticity. For granular soil (sands or gravels) that should be described as well-graded, poorly graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soil (silts or clays) should be described as non-plastic, low plastic, medium plastic, or highly plastic. The table below summarizes how to grade plasticity based on simple field tests.

Criteria for Describing Plasticity	
Descriptive item	**Criteria**
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any moisture content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times close to the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Dry Strength. Dry strength describes the crushing characteristics of a dry soil crumb about 1/4 inch (5 mm) in diameter. If a crumb of dry soil is not available, after removing particles larger than No. 40 sieve size, mold at least three balls of soil about 1/4 inch (5 mm) in diameter to the consistency of putty, adding water if necessary. Allow the balls to dry completely by oven, sun, or air drying, and then test their strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity. The table below includes criteria for determining dry strength descriptions in the field.

Criteria for Describing Dry Strength	
Descriptive item	**Criteria**
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure.
Medium	The dry specimen breaks into pieces and crumbles with considerable finger pressure.
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very high	The dry specimen cannot be broken between the thumb and a hard surface.

Dilatancy. Dilatancy describes the soils reaction to shaking. After removing particles larger than No. 40 sieve size, prepare a ball of moist soil about ½ inch (15 mm) in diameter. Add enough water, if necessary, to make the soil soft but not sticky.

Place the ball in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the ball which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the ball stiffens, and finally cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil. The table below outlines the criteria for determining dilatancy in the field.

Criteria for Describing Dilatancy	
Descriptive item	**Criteria**
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear, or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

Toughness. Toughness is the consistency of the soil near the plastic limit. After removing particles larger than the No. 40 sieve size, mold a ball of soil about ½ inch (15 mm) in diameter to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. The specimen is then rolled out by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. The thread is folded and rerolled repeatedly. During this manipulation, the moisture content is gradually reduced and the specimen stiffens, finally loses it plasticity, and crumbles when the plastic limit is reached. The table below outlines criteria for determining toughness in the field.

Criteria for Describing Toughness	
Descriptive item	**Criteria**
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The lump and thread have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

Moisture Content. The amount of soil moisture described as dry, moist, or wet/saturated;

Criteria for Describing Moisture	
Descriptive item	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet/saturated	Visible free water, usually soil is below water table.

Color. The basic color of the soil. (Refer to Munsell soil color charts.);

Odor. Odor is described from a warm, moist sample. The odor should only be described if it is organic or unusual. An organic odor will have distinctive decaying vegetation smell. Unusual odors, petroleum product, chemical, and the like should be described.

Soil Texture and Structure. Description of particle size distribution, arrangement of particles into aggregates, and their structure. This description includes joints, fissures, slicked sides, bedding, veins, root holes, debris, organic content, and residual or relict structure, as well as other characteristics that may influence the movement or retention of water or contaminants;

Structure (for description of soils only)	
Descriptive item	**Criteria**
Stratified	Alternating layers of varying material or color with layers at least 6 mm (1/4 inch) thick; note thickness
Laminated	Alternating layers of varying material or color with layers less than 6 mm (1/4 inch) thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated (parallel grooves or scratches)
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout.

Relative Density or Consistency. An estimate of density of a fine-grained soil or consistency of a cohesive soil, usually based on standard penetration tests;

Criteria for Describing Consistency	
Descriptive item	**Criteria**
Very soft	Thumb penetrates soil more than 1 inch
Soft	Thumb penetrates about 1 inch
Firm	Thumb indentation up to ¼ inch
Hard	No indentation with thumb, readily indented with thumbnail
Very Hard	Not indented with thumbnail

Cementation. An estimate of cementation of a coarse-grained soil.

Criteria for Describing Cementation	
Descriptive item	**Criteria**
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Relative Permeability. An estimate of the permeability based on visual examination of materials (e.g., high permeability for course sand and gravel verses low permeability for silty clay). The estimate should address presence and condition of fractures (open, iron-stand, calcite-filled, open but claylined, etc.), as well as fracture density and orientation;

Local Geologic Name. Any specific local name or generic name (i.e., alluvium, loess); and

Group Symbol. USCS of symbols.

The soil logs should also include a complete description of any tests run in the borehole; placement and construction details of piezometers, wells, and other monitoring equipment; abandonment records; geophysical logging techniques used; and notes on readings obtained by air monitoring instruments.

6.2 Description of Rock

The following section provides a description of the procedures that should be used when describing rock samples.

6.2.1 General Considerations

Rock identification is based on minerals and textures. Drilling in rock will be slow and core recovery may consist of pulverized chips. The proper drilling technique is necessary for adequate recovery and accurate rock identification.

6.2.2 Rock Description Procedures

Rocks can be categorized into three types: sedimentary, igneous, and metamorphic. Descriptions for these three types of rocks are different. The following procedures are organized following the three categories.

Sedimentary Rock Classification. Sedimentary rocks result from two processes (and combinations thereof):

- Consolidation of loose sediments that have accumulated in layers, forming clastic rocks.
- Precipitation from solution to form a chemical rock. Included in this category are rocks directly or indirectly formed by biological processes.

The following text summarizes how to characterize these two types of sedimentary rock.

Clastic Rocks. Clastic rocks have been classified different ways. They may be classified according to the size of particles, sorting, and distribution of particles, or chemical content of silica, feldspar, and calcite.

Grain Size. In the most commonly used classification system, the size of the particles determines the general rock name. For example, sand-sized particles for sandstones; pebbles form conglomerates, and so on. The rack names are shown in the table below along with their component particle sizes. The divisions in the classification are based upon the Modified Wentworth scale used to measure grain size.

Grain Size Scale (Modified Wentworth Scale)			
Diameter (in)	Particle	Sediment	Rock
< 0.0002	Clay	Mud	Claystone, mudstone, shale
0.0002 to 0.002	Silt		Siltstone
0.002 to 0.08	Sand	Sand	Sandstone
0.08 to 2.5	Pebble	Gravel	Conglomerate (rounded) Breccia (angular)
2.5 to 11.8	Cobble		
> 11.8	Boulder		

Conglomerates and breccias have adjectives such as *clast-supported and matrix supported*. *Clast-supported* means that he clasts are sorted well enough so that the large clasts touch, and *matrix-supported* is not.

A well-sorted sandstone is called an arenite. A poorly sorted sandstone with a matrix of silt and clay is called a wacke. A sandstone with more than 25% feldspar is an arkose. And, if lithic fragments or iron and magnesium minerals and feldspar are present along with quartz sand and silt, the rock is called a graywacke.

Sorting. Sedimentary rock names are further characterized by the sorting the particles have undergone. The distribution of grain sizes reflects the type of transport a sediment has experienced and the depositional environment. A well-sorted (or poorly graded) sediment has two or three sizes present. A poorly sorted (or well-graded) sediment has a wide range of grain sizes present.

Cementation. Cementing substances have usually been referred to by adjectives such as calcareous, dolomitic, and siliceous; however, these terms might also imply accessory detrital materials, so that the unambiguous terms calcite-cemented, dolomite-cemented, and quartz-cemented are recommended.

Chemical Rocks. Chemical rocks have been classified according to chemical composition, depositional texture, and depositional environment.

Common chemical rocks are limestone, dolomite, evaporites (gypsum, anhydrite, halite, etc.) phosphate rocks (apatite), manganese nodules, ironstones (limonite, siderite, and chlorite silicates), coal, pyrite, chert, and diatomite, and some cherts have a biogenic component to their formation.

Igneous Rock Classification. Classification of igneous rocks is based upon the mineral content of the rock. Minerals upon which the classification is based are feldspar, quartz (or feldspathoids), and mafic minerals such as biotite, hornblende, pyroxene, and olivine. Of these minerals, identifying feldspar is the key to classification.

The International Union of Geological Sciences (IUGS), Sub commission on the Systematics of Igneous Rocks attempted to create a universal classification of igneous rocks. The committee's recommendations for plutonic and volcanic rocks are shown in the following two tables, respectively. A rock is classified by determining it composition relative to the percentage of alkali feldspar, plagioclase, and quartz (or feldspathoid.

Modal Classification of Plutonic Igneous Rocks	
Modal Values	**Classification**
Q > 60	Not igneous
Q = 20-60, P <10	Alkali feldspar granite
Q = 20-60, P = 10-65	Granite
Q = 20-60, P = 65-90	Granodiorite
Q = 20-60, P >90	Tonalite
Q = 5-20, P <10	Alkali feldspar quartz syenite
Q = 5-20, P = 10-35	Quartz syenite
Q = 5-20, P = 35-65	Quartz monzonite
Q = 5-20, P = 65-90	Quartz monzodiorite (An < 50), Quartz monzogabbro (An > 50), Quartz anorthosite (M < 10)
Q = 5-20, P >90	Quartz diorite (An < 50), Quartz gabbro (An > 50), Quartz anorthosite (M < 10)
Q = 0-5, P <10	Alkali feldspar syenite
Q = 0-5, P = 10-35	Syenite
Q = 0-5, P = 35-65	Monzonite
Q = 0-5, P = 65-90	Monzodiorite (An < 50), Monzogabbro (An > 50), Anorthosite (M < 10)
Q = 0-5, P >90	Diorite (An < 50), Gabbro (An > 50), Anorthosite (M < 10)
F = 0-10, P <10	Foid-bearing alkali feldspar quartz syenite
F = 0-10, P = 10-35	Foid-bearing syenite
F = 0-10, P = 35-65	Foid-bearing monzonite
F = 0-10, P = 65-90	Foid-bearing monzodiorite (An < 50), Foid-bearing monzogabbro (An > 50)
F = 0-10, P >90	Foid-bearing diorite (An < 50), Foid-bearing gabbro (An > 50)
F = 10-60, P <10	Foid syenite
F = 10-60, P = 10-50	Foid monzosyenite
F = 10-60, P = 50-90	Foid monzodiorite (An < 50) Foid monzogabbro (An > 50)
F = 10-60, P >90	Foid diorite (An < 50), Foid gabbro (An > 50)
F > 60	Foidolites

Q = quartz/(quartz = alkali feldspar = plagioclase)

F = feldspathoids/(feldspathoids = alkali feldspar)

P = feldspathoids/(feldspathoids = plagioclase feldspar)

M = color index

An = % anorthite inplagioclase

Modal Classification of Volcanic Igneous Rocks	
Modal Values	**Classification**
Q > 60	Not igneous
Q = 20-60, P <10	Alkali feldspar rhyolite
Q = 20-60, P = 10-65	Rhyolite
Q = 20-60, P = 65-90	Dacite
Q = 20-60, P >90	Dacite
Q = 5-20, P <10	Alkali feldspar quartz trachyte
Q = 5-20, P = 10-35	Quartz trachyte
Q = 5-20, P = 35-65	Quartz latite
Q = 5-20, P = 65-90	In all six fields, the names andesite and basalt are applied; basalt is used if SiO_2 < 52wt % after H_2O and CO_2 are deleted and the analysis recalculated to sum 100%
Q = 5-20, P >90	
Q = 0-5, P = 65-90	
Q = 0-5, P >90	
F = 0-10, P = 65-90	
F = 0-10, P >90	
Q = 0-5, P <10	Alkali feldspar trachyte
Q = 0-5, P = 10-35	Trachyte
Q = 0-5, P = 35-65	Latite
F = 0-10, P <10	Foid-bearing alkali feldspar quartz trachyte
F = 0-10, P = 10-35	Foid-bearing trachyte
F = 0-10, P = 35-65	Foid-bearing latite
F = 10-60, P <10	Phonolite
F = 10-60, P = 10-50	Tephritic phonolite
F = 10-60, P = 50-90	Phonolitic tephrite
F = 10-60, P > 90	Tephrite (olivine < 10%) Basanite (olivine > 10%)
F > 60	Foidite

Q = quartz

P = feldspathoids/(feldspathoids = plagioclase feldspar)

F = feldspathoids/(feldspathoids = alkali feldspar)

Metamorphic Rock Classification. In this binomial system for naming metamorphic rocks, the main rock name is based on the texture of the rock, and the principal or more significant minerals are added as modifying nouns, as in biotite-quartz schist or andalusite-cordierite hornfels. The names are meant to be applied on a descriptive basis; a schistose rock, for example, should not be called a hornfels just because it is found in a contact aureole.

Textures.

- Schistose – grains platy or elongate and oriented parallel or subparallel. Foliated (lepidoblasitc) of fabric is planar, lineated (nematoblastic) if linear.
- Granobalstic – grains approximately equidimensional; platy and linear grains oriented randomly or so subordinate that foliation is not developed.
- Hornfelsic – grains irregular and interincluded but generally microscopic; recognized in field by unusual toughness, ring to hammer blow, and hackly fracture at all angles. Under hand lens, freshly broken surfaces show a sugary coating that will not rub off (formed by rending of interlocking grains).
- Semischistose (gneissic) – platy or linear grains subparallel but so subordinate or so unevenly distributed that rock has only a crude folliation; especially common in metamorphosed granular rocks, such as sandstones and igneous rocks.
- Cataclastic – clastic textures resulting from breaking and grinding with little if any recrystallization; characterized by angular, lensoid, or rounded fragments (porphyroclasts) in a fine-grained and commonly streaked or layered
- Groundmass. Mortar structure applies to nonorientated arrangements, and phacoidal, flaser, and augen structure apply to lenticular arrangements.

Rock Names.

Schistose Rocks:

- Schist – grains can be seen without using a microscope.
- Phyllite – all (or almost all) grains of groundmass are microscopic, but cleavage have sheen caused by reflections from platy or linear minerals; commonly corrugated.
- Slate – grains are microscopic; very cleavable; surface dull; tougher than shale and cleavage commonly oblique to bedding.
- Phyllonite – appearance like phyllite but formed by cataclasis (see mylonite) and recrystallization commonly of coarser-grained rocks, as indicated by relict rock slices, slip folds, and prophyroclasts.

Granoblastic Rocks:

- Granulite or Granofels – granoblastic rocks, irrespective of mineral composition; because granulite can connote special compositions and conditions or origin, granofels may be preferred.
- Quartzite, marble, and amphibolite – compositional names that generally connote granoblastic texture; exceptions should be modified for clarity, as schistose quartzite or plagioclase hornblende schist.
- Tactite (skarn) – heterogeneous calc-sillicate granulites and related metasomatic rocks of typically uneven grain.

Hornfelsic Rocks. All called hornfels, or, if relict features are clear, hornfelsic may be used with the original rock name (as hornfelsic andesite)

Semi-schistose (Gneissic) Rocks:

- Semi-schist – fine-grained (typically less than 1.4 mm) so that individual platy or lineate grains are indistinct; relict features often common.
- Gneiss – generally coarser than ½ mm with small aggregates of platy or lineate grains forming separate lenses, bladed, or streaks in otherwise granoblastic rock. Platy or lineate structures may be distributed evenly through the rock or may be concentrated locally so that some layers or lenses are granoblastic or schistose (banded gneiss).

Cataclastic Rocks. Where original nature of rock is still apparent, rock name can be modified by suitable adjectives (as cataclastic granite, flaser gabbro, phacoidal rhyollite):

- Mylonite – crushing so thorough that rock is largely aphanitic and commonly dark-colored; may be layered and crudely folliated but not schistose like phyllonite; porphyroclasts commonly rounded or lenticular.
- Ultrmylonite, pseudotachyylyte – aphanitic to nearly vitreous-appearing dark rock commonly injected as dikes into adjoining rocks.

Relict and Special Textures and Structures. If textures of low-grade metamorphic rocks are dominantly relict, original rock names may be modified (as massive metabasalt, semischistose met-andesite). If hydrothermal alteration has produces prominent new minerals, names such as chloritized diorite and sercitized granite can be used:

- Strongly metasomatized rocks with coarse or unusual textures may require special names such as gneissen, quartz-schorl rock, and corundum-mica rock.
- Magmatite – a composite rock composed of igneous or igneous-appearing and/or metamorphic materials that are generally distinguishable megascopically.

Section 7: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

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Attachment A: Field Description Visual Aids

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Attachment B: Field Log Form

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SOP 3: Field Notes and Documentation

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

Standard Operating Procedure Version 1.0

Subject: Field Notes and Documentation

Date: November 19, 2017

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Required Materials 1
Section 5: Methods 2
5.1 Field Logbooks 2
5.2 Photographs 3
5.3 Additional Field Forms/Records 4
Section 6: Corrections 4
Section 7: Documentation Reviews 4
Section 8: Field Record Backup 4
Section 9: Documentation Archive 5

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Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish a consistent method and format for the use and control of documentation generated during daily field activities. Field notes and records are intended to provide sufficient information that can be used to recreate the field activities, as well as, the collection of environmental data. Information placed in these documents and/or records shall be factual, detailed and objective.

Section 2: Scope and Applicability

This procedure will be used during all field activities, regardless of the purpose by all project team personnel and subcontractors who conduct field investigations. These activities may include, but are not limited to, all types of media sampling (soil vapor, soil, groundwater, wastewater, etc), utility clearance, well installation, sample point locating and surveys, site reconnaissance, free product removal, remediation, and waste handling.

Section 3: Responsibilities

The Project Manager (PM), or designee, will have the responsibility to oversee and ensure that field documentation is collected in accordance with this SOP and any site-specific or project specific planning documents. The field sampling personnel will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities. Field personnel shall ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for tracking the location of all field documentation, including field logbooks. Field personnel are responsible for assuring that the original documentation (or copies of the field log book, if needed for another project at the same site), are filed at the end of the field project or during a long project (greater than month) every couple of weeks.

Section 4: Required Materials

The materials required for this SOP include the following:

- Bound field logbooks, and
- Black waterproof and/or indelible ink pens
- Field Forms

Section 5: Methods

This SOP primarily includes the documentation procedures for the field logbooks. However, procedures discussed in this SOP are applicable to all other types of field documentation collected and should be universal in application. Details of other field records and forms (e.g., boring logs, sample labels, chain of custody records, and waste containment labels) are discussed in the specific SOP associated with that particular field activity (e.g., borehole drilling, sample handling, investigative derived waste), and not covered in detail in this SOP. Attachment A has example field sheets for groundwater sampling.

5.1 Field Logbooks

Field personnel will keep accurate written records of their daily activities in a bound logbook, or project specific work sheets that will later be bound, that will be sufficient to recreate the project field activities without reliance on memory. This information will be recorded in chronological order. All entries will be legible, written in black waterproof or indelible ink, and contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. Each page of the field logbook will be consecutively numbered, signed and dated by the field author(s). Pages should not be removed for any reason.

There should be no blank lines or partial pages. Any blank part of a page should be lined to the end of the page at the end of the day.

In addition to documenting field activities, field logbooks will include, but are not limited to, the following:

- Date and time of activities,
- Site location
- Purpose of site visit,
- Site and weather conditions,
- Personnel present, including sampling crew, facility/site personnel and representatives (including site arrival and departure times),
- Subcontractors present,
- Regulatory agencies and their representatives (including phone numbers, site arrival and departure times),
- Level of health and safety protection,
- Sampling methodology and information,
- Sample numbers or descriptions,
- Sample Locations (sketches are very helpful),
- Source of sample(s), sample identifications, sample container types and preservatives used, and lot numbers for bottles and preservatives (if applicable and if not recorded on other forms or in a sample control logbook),
- A chronological description of the field observations and events,
- Specific considerations associated with sample acquisition (e.g., field parameter measurements, field screening data, HASP monitoring data, etc.) (if not recorded on another form),
- Wastes generated, containment units (including volumes, matrix, etc), and storage location (if not recorded on another form),
- Field quality assurance/quality control samples collection, preparation, and origin (if not recorded on other forms or in a sample control logbook),
- Physical or quantitative measurements.

The manufacturer, model and serial number of field instruments (e.g., OVM, water quality, etc.) shall be recorded, if not using a calibration form. Also, source, lot number and expiration date of standard shall be recorded if calibrated in the field.

- Well construction materials, water source(s), and other materials used on-site (if not recorded on another form).
- Sample conditions that could potentially affect the sample results,
- If deviating from plan, clearly state the reason(s) for deviation,
- Persons contacted and topics discussed,
- Documentation of exclusion zone set-up and location,
- Documentation of decontamination procedures, and
- Daily Summary.

Field situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the field activity without relying on the collector's memory. Language used shall be objective, factual, and free of personal opinions. Hypothesis for observed phenomena may be recorded, however, they must be clearly indicated as such and only relate to the subject observation.

Logbooks will be assigned to a specific sampling team. If it is necessary to transfer the log book or sheets to alternative team member during the course of field work, the person relinquishing the log book will sign and date the log book at the time of transfer.

Field logbooks should consist of a bound book, in which the insertion or removal of pages will be visibly noticeable after the logbook has been assembled. Logbooks can be prepared by gluing or laminating pages together either at the left side or top of the page. If inclement weather is expected, logbooks may have plastic laminated front and back covers to protect the interior pages, and should not be broken apart for copying. Loose-leaf binding, such as comb binding is not considered hard binding. To maintain the integrity of the logbook, pages should be consecutively numbered prior to use. Logbook pages can be of any format, and may include blank pages for recording or field forms that are used for specific tasks. As an alternative, commercially bound and consecutive page numbered field logbooks may also be used.

5.2 Photographs

Photographs provide the most accurate demonstration of the field worker’s observations. They can be significant to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. Telephoto or wide-angle shots cannot be used in enforcement proceedings. Some industrial clients do not permit photographs on their sites. In industrial and military settings, confirm with the project manager that photographs are allowed.

A photograph must be documented if it is to be a valid representation of an existing situation. Therefore, for each photograph taken, several items shall be recorded in the field logbooks:

- Date and time photograph taken;
- Name of photographer;
- Site name, location, and field task;
- Brief description of the subject and the direction taken;
- Sequential number of the photograph and the roll number; and
- For digital photographs, ensure that the date and time settings in the camera are accurately set before taking pictures.

5.3 Additional Field Forms/Records

Additional field records may be required for each specific field event. The use of these records and examples are described in other SOPs specific for the activity (e.g. Borehole Logging SOP, Groundwater Sampling and Purging SOP, etc.). These other records may include:

- Borehole Logs during drilling
- Well Construction and Development records (groundwater, soil vapor, extraction, etc.),
- Groundwater Purge and Sample Collection Records,
- Soil Vapor Purge and Sample Collection Records,
- Water Level Monitoring and Product Removal Records,
- NAPL Removal Records,
- Investigation Derived Waste (IDW) Tracking Records,
- Instrument Calibration Records, and
- Health and Safety Monitoring Records and sign-off sheets.

Prior to field activities, the field sampling personnel will coordinate with the Project Manager, or designee, to determine which additional records will be required for the specific field task. These additional records will be maintained in a field file or a three-ring notebook throughout the duration of the field activities or included in a specially prepared site-specific notebook. If the field notebook is being created, the forms may be part of the laminated book.

Section 6: Corrections

If an error is made in the field, logbook corrections will be made by drawing a single line through the error, entering the correct information, and initialing and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes, are prohibited. All corrections will be initialed and dated. Some projects require that a brief reason for the change must also be added where the correction was made. Ask the Project Manager, if this requirement is necessary.

Section 7: Documentation Reviews

Periodically, the Project Manager, or designee, will review the field logbooks pertaining to the activities under their supervision. The elements of this review will include technical content, consistency, and compliance with the project plans and SOPs. Discrepancies and errors identified during the review should be resolved between reviewer and author of the field documentation. Corrections and/or additions of information shall be initialed and dated by the field author or reviewer.

Section 8: Field Record Backup

Periodically, the Project Manager, or designee, will determine if and when field logbooks and records need to be photocopied. Photocopies will be maintained in the project files and can be used as backup in the event that the original field logbook or records are lost or damaged. In addition, the field logbook can be scanned and an electronic copy in .pdf format will be stored in the electronic file for the project.

Section 9: Documentation Archive

At the completion of the project, all original field logbooks and records will be stored in the project files in accordance with Brown and Caldwell procedures. Typically project files lifetimes are controlled and spelled out in contractual agreements with clients. Typically, project files are archived after project finalization and kept indefinitely in archive.

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SOP 4: Equipment Decontamination

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

Standard Operating Procedure Version 1.0

Subject: Equipment Decontamination

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 2
Section 6: Methods 2
6.1 Decontamination Station Set-up 3
6.2 Remove Gross Contamination 3
6.3 Remove Residual Contamination 4
6.3.1 Removal of residual contamination consists of the following steps: 4
6.4 Prevent Recontamination After Decontamination 4
Section 7: Record Keeping 4
Section 8: Quality Assurance/Quality Control 5

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SOP_4_Equipment Decontamination

Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish consistent methods to reduce or eliminate:

- Contamination and cross-contamination of environmental samples by sample equipment, other samples, or personnel.
- Health and environmental risk caused by the spread of contaminants.

Section 2: Scope and Applicability

Decontamination should occur any time a sampling tool or instrument used in field investigations may contact sampled media or personnel using the equipment. This procedure will be used in conjunction with use of reusable equipment during field activities associated with handling, sampling, or measuring environmental media such as soil, groundwater, soil gas, or air. These procedures are to be implemented primarily on-site such as at the point of use or at a designated equipment decontamination station at the project site. Equipment decontamination should be completed before each use and prior to transporting off-site.

Examples of soil and groundwater sample collection equipment usually requiring decontamination includes pumps, bailers, water/interface level indicators, tubing, hand augers, split spoon samplers, and other related equipment used for the collection of samples or the measurement of field parameters.

These procedures are general minimum standards. They may be modified or supplemented for a specific project by site-specific workplans or health and safety plans.

Section 3: Responsibilities

The Project Manager, or designee, will have the responsibility to oversee and ensure that equipment decontamination procedures are implemented in accordance this SOP and any site-specific workplan, field sampling plan (FSP), quality assurance project plan (QAPP), and site health and safety plan (HASP). The field personnel will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

Section 4: Definitions

SDS. Safety Data Sheets. - These documents need to be kept on site and discuss the physical and toxicological aspects for a particular substance used during decontamination or encountered during contamination.

Decontamination area. - An area that is not expected to be contaminated and is upwind of the exclusion zone

Exclusion zone. - The area in which contaminants are known or suspected to be present.

Measurement/monitoring equipment. - Any equipment used to check or evaluate site conditions.

Potable. - Drinkable.

Sampling equipment. - Any equipment used during the process of sample collection.

HASP. Site Health and Safety Plan. - Plan written to coordinate and outline precautions that will be taken to initiate and monitor worker safety.

Section 5: Required Materials

- The equipment and supplies required for this SOP include the following (not every project will require all of these materials):
- Clean buckets or tubs to hold wash and rinse solutions of a size appropriate to the equipment to be decontaminated.
- Tap water.
- Deionized or distilled water
- Long-handled brushes for scrubbing. Flat-bladed scrapers, garden type spray bottles (no oil lubricated parts).
- Non-phosphate detergent such as Alconox or Liqui-Nox.
- Plastic sheeting for the decontamination area.
- Plastic bags and/or aluminum foil to keep decontaminated equipment clean until the next use.
- Gloves, aprons, safety glasses, and any other PPE required in the HASP.
- Towels and wipes.
- Dispensing bottles.

Section 6: Methods

Decontamination consists of physically removing contaminants from personnel or equipment. To prevent the transfer of harmful materials, procedures have been developed and are implemented before anyone enters a site and continue throughout site operations.

A decontamination plan should be based on the worst-case scenario (if information about the site is limited). The plan can be modified, if justified, by supplemental information. Initially, the decontamination plan assumes all protective clothing and equipment which leave the exclusion zone are contaminated. Based on this assumption, a system is established to wash and rinse all non-disposable and non-dedicated equipment. Decontamination plans will be site-specific and presented in the HASP and/or the work plan's SAP/QAPP for each site.

The decontamination area should be located, if possible, where decontamination fluids and soil wastes can be easily discarded or discharged after receipt of analytical results which determine if discharge parameters have been met. Decontamination wastewater should be managed in accordance with the Investigation Derived Waste Plan or as directed in the SAP or QAPP.

6.1 Decontamination Station Set-up

A decontamination pad should be established for cleaning of heavy equipment or large sampling tools. This pad can be a prefabricated area that already exists on site for washing large equipment or can be constructed. If a prefabricated area exists, it needs to have characteristics that allow for collecting fluids and solids that will fall off the large equipment. Decontamination pads can be constructed in a variety of ways, but things to consider during construction are the following:

- The pad will need to be constructed so it provides complete secondary containment. Hence all sides will require berms to prevent off pad migration of fluids. The berms need to be constructed by considering the balance between sump pump removal rates and the amount of fluid that will be generated.
- Fluids from decontamination processes cannot escape and be directly discharged vertically into the ground; hence if plastic sheeting is used it should be minimally double layered and thick (greater than 8 mil).
- The pad will have to drain in one general direction where a sump pump can collect fluids. The pad will need to be located near power and water, if possible. However, a generator can supply power and water can be trucked in.

For small equipment decontamination and PPE decontamination a smaller station is established, usually in the contaminant reduction zone, between the exclusion zone and buffer zone. For this station, clean buckets or tubs (5 gallon buckets are most common) should be used. There should be enough room within this area for storing used and unused drums. Buckets should be placed on plastic sheeting to prevent spillage to the ground, and to help keep the decontamination area and equipment as clean as possible. The buckets should be filled half to three-quarters full as follows:

- Bucket 1 - Tap water with non-phosphate detergent such as Liqui-Nox made up as directed by the manufacturer.
- Bucket 2 - Tap water or deionized water for rinsing
- Bucket 3 - Deionized or distilled water for the second rinsing

If additional rinses using wash or dispensing bottles are called for in the project-specific documents, an additional bucket to catch the discharge from the final rinse will be necessary.

A clean area, generally covered with plastic sheeting or large clean plastic bags, is also needed to set down decontaminated equipment prior to reuse or air drying and packaging for later use. A stainless steel rack (e.g., grill for barbecue) can often help drying activities.

After the decontamination area is set up, equipment decontamination is comprised of four general steps:

- Removal of gross (visible) contamination
- Removal of residual contamination
- Prevention of recontamination, and
- Disposal of wastes associated with the decontamination

6.2 Remove Gross Contamination

Gross contamination generally applies to soil sampling equipment, which may have significant residue clinging to the piece of equipment. This can be removed by dry brushing or scraping or by a high-pressure steam or water rinse often, in areas not grossly contaminated, steam washes may be all that is applied to larger equipment, such as drill casings. If utilizing high-pressure steam or water, the rinse water should be containerized as investigation derived waste. Since a significant amount of wastes may be generated, this operation is often best conducted on a decon pad, which has been designed as a secondary containment

area to collect wastes. Materials used and generated during gross contamination removal should be treated in a similar fashion to the waste stream that is being utilized at the Site. For example, if groundwater is treated as hazardous waste at the site then decontamination water and/or drill cutting should be treated as hazardous waste and be properly disposed. Disposal of investigative derived waste should follow procedures outlined in the project specific documents.

6.3 Remove Residual Contamination

All sampling equipment used at the site must be cleaned prior to any sampling effort, after each sample is collected, and after the sampling effort is accomplished.

Removal of residual contamination consists of the following steps:

- Place the item in the first bucket (detergent wash) and scrub the entire surface area of each piece of equipment to be decontaminated. Utilize scrub brushes to remove all visible contamination. For submersible pumps, connect a length of tubing (dedicated to the cleaning process) to the pump and place the other end in the bucket and circulate the detergent wash water through the pump until the water runs clean or at least 1 minute. Change the water periodically to minimize the amount of residue carried over into the second rinse.
- Place the item in the second bucket (clear water rinse – tap or deionized water) and rinse. Change the water periodically to minimize the amount of residue carried over into the third rinse. Recirculate rinse water through the submersible pump for at least 1 minute.
- Place the item in the third bucket (deionized or distilled water) and repeat the rinsing procedure. Change water as necessary.

Unless the Work Plan or FSP directs additional rinses, place the item on a clean surface such as plastic sheeting to await reuse or packaging for storage (e.g., wrapping foil).

Wash water and materials from residual decontamination should be treated in a similar fashion to the waste stream that is being utilized at the Site. For example, if groundwater is treated as hazardous waste at the site then decontamination water and/or drill cutting should be treated as hazardous waste and be properly disposed. Disposal of investigative derived waste should follow procedures outline in the project specific documents.

6.4 Prevent Recontamination After Decontamination

After the decontamination process, equipment should be stored to preserve its clean state to the extent practical. The method will vary by the nature of the equipment. Protection measures include covering or wrapping in plastic or sealable plastic bags or wrapping with oil-free aluminum foil.

Section 7: Record Keeping

The decontamination method should be documented within the field documentation designated for the project. Entries documenting the procedure used, fluids used, lot numbers for fluids, and any changes and approval for changes should be entered into a bound field notebook or on project-specific forms (see Field Notes and Documentation SOP for field forms). Upon completion of the field activity, it is the responsibility of the field personnel to ensure the project/task manager receives copies of all of the field documentation.

Section 8: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

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Attachment A: Project Standard Operating Procedures (SOP)

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SOP 1: Soil and Rock Sampling and Preservation

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.002.001.1011

Standard Operating Procedure Version 1.0

Subject: Soil and Rock Sampling and Preservation

Date: November 19, 2017

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Table of Contents

List of Figures ii
Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 2
Section 6: Methods 3
6.1 Sample Compositing 4
6.1 Sample Description 4
6.2 Sampling Equipment Decontamination 4
6.3 Sample Preservation 5
6.4 Sample Labels 5
6.5 Chain-of-Custody 5
6.5.1 Chain-of-Custody Forms 5
6.5.2 Chain-of-Custody Seals 6
6.6 Sample Shipment 7
Section 7: Quality Assurance/Quality Control 7
Section 8: References 8

List of Figures

Figure 6-1. Example of the cone and quarter methodology 3

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Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish a uniform method for the collection and handling of solid samples for the Soquel Creek Water District Potential Target Aquifer Geochemical Characterization Assessment. This SOP includes methods for the procurement of appropriate sample amounts, chain-of-custody procedures, and use of appropriate sample shipment methods.

Section 2: Scope and Applicability

This procedure will be used during the collection of drill core/cutting samples from drill hole locations within the Soquel Creek Water District.

Section 3: Responsibilities

The project manager (PM), or designee, will have responsibility to oversee and ensure that the handling of samples is in accordance with this SOP and any site-specific or project-specific planning documents.

Field sampling personnel will be responsible for understanding and implementation of this SOP during all field activities, and obtaining appropriate field logbooks, forms, and records necessary to complete field activities. Field personnel will ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for assuring the original documentation, or copies of the field log books, are filed at the end of project.

Section 4: Definitions

Surface soil - considered to be the top 6 inches of a soil horizon profile (i.e., soil from 0-to-6-inches below ground surface [bgs]). Depending on the program or project, however, soil to 2 feet bgs may be considered surface soil. For the purposes of this procedure, surface soil represents the soil occurring from 0- to- 6-inches bgs.

Subsurface soil - the soil occurring between surface soil and bedrock.

Composite soil samples - combinations of aliquots collected at various sample locations, or at various depths at a single location. Analysis of composite samples yields a value representing an average over the various sampled sites or depths from which individual samples were collected.

Discrete soil samples - discrete aliquots from distinct sampling intervals, of a specific size, that are representative of one specific sample location at a specific point in time.

Continuous samplers - devices that allow a soil specimen to enter a split barrel during drilling. Both plastic and steel liners can be used inside the sample tube to retain the sample. In some formations, the soil sample may be considered “undisturbed.”

Split-barrel samplers - collect samples by driving a 1.5-inch nominal inner diameter (typical), split barrel into a soil formation with a 140-pound hammer dropped 30 inches. For environmental applications, 2-, 2.5- and 3-inch inner diameter split barrels are not uncommon. If a standard 1.5-inch split barrel is used, the number of blows to drive the last 1 foot of the sample are referred to as the standard penetration resistance or N-value. See ASTM D-1586 for the specification for this type of sampler. Another type of split barrel sampler is

the core barrel. A core barrel is longer and usually wider in diameter than the typical split barrel samplers and used on hollow stem auger drill rigs. Core barrels are usually 5 feet long and approximately 4-inch outside diameter, which sit into the leading auger and collect soil while drilling. Core barrels are typically unlined.

Ring-lined samplers - split barrels lined with removable rings. The rings are thin-walled and arranged in 1-, 2- or 6-inch increments to section the recovered soil sample. This device is used to collect soil samples for environmental applications and to collect relatively undisturbed soils in stiff and hard cohesive soils where it is not possible to push a sampler. See ASTM D3550 for the specification for this type of additional sampler.

Thin-walled tubes - used to recover relatively undisturbed soil samples by pressing the tubes into soil either hydraulically, or with a Denison or Pitcher sampler.

Section 5: Required Materials

The materials required for this SOP include the following:

- Bound field log books
- Field description visual aids
- Black waterproof and/or indelible ink pens
- Digital camera
- Hand lens
- Blank paper/white board
- Spray bottle
- Distilled water
- Paper towels
- Zip top bags
- Metal spoon/trowel
- Stainless steel bowl
- Measuring scoops
- Scale
- Paper towels
- Field logs, Sieve
- Clean 5-gallon buckets (to collect sieved material and to store collected samples)
- Plastic sheet (or similar) for sample quartering
- Sample coolers for shipping
- Sample labels
- Chain-of-custody forms
- Packing materials

Section 6: Methods

The following methods outline general considerations for sample collection, sample handling, and maintaining sample custody after collection.

Subsurface soil samples to be collected from depths greater than 6 inches bgs can be obtained manually using a hand-auger, a drilling rig, or excavating device (e.g., backhoe). A split-barrel sampler can be employed to depths in excess of 100 feet bgs with the assistance of a drilling rig. An excavating device can provide bulk soil samples from the ground surface to the limits of the excavator (typically 15 to 25 feet bgs. Bulk soil sampling at greater depths in unsaturated soils can be done using a bucket auger rig.

Composite soil samples are combinations of aliquots collected at various sample locations, or at various depths at a single location. Analysis of composite samples yields a value representing an average over the various sampled sites or depths from which individual samples were collected. Composite soil sampling is typically used in sampling soil for the characterization of investigation derived waste for disposal purposes. Other uses of composite sampling is in characterization of large surface area where a material may have been distributed.

Composite samples may require homogenization or other processing methods to ensure the sample is representative of all sample aliquots. Removal of large particles using a sieve reduces the potential for the nugget effect to occur in the composite sample. The nugget effect occurs when a large particle is over-represented in a small aliquot of material used for laboratory analysis. A large gauge sieve placed over the on top of 5-gallon bucket can be used to screen out larger particles prior to sample homogenization. Unconsolidated material which is stuck together should be separated by hand prior to sieving. The coning and quartering method can be used to first divide the sample into four segments. The sample is first divided into four quarters as shown in Figure 6-1. The diagonally opposite samples are mixed together into two equal halves. The two mixed halves of the sample are then combined, and the process is repeated until the sample appears to be visually homogenized. The final quartering step is used to split the sample into the desired quantity for laboratory analysis. Quartering is continued until a suitable sample volume is achieved.

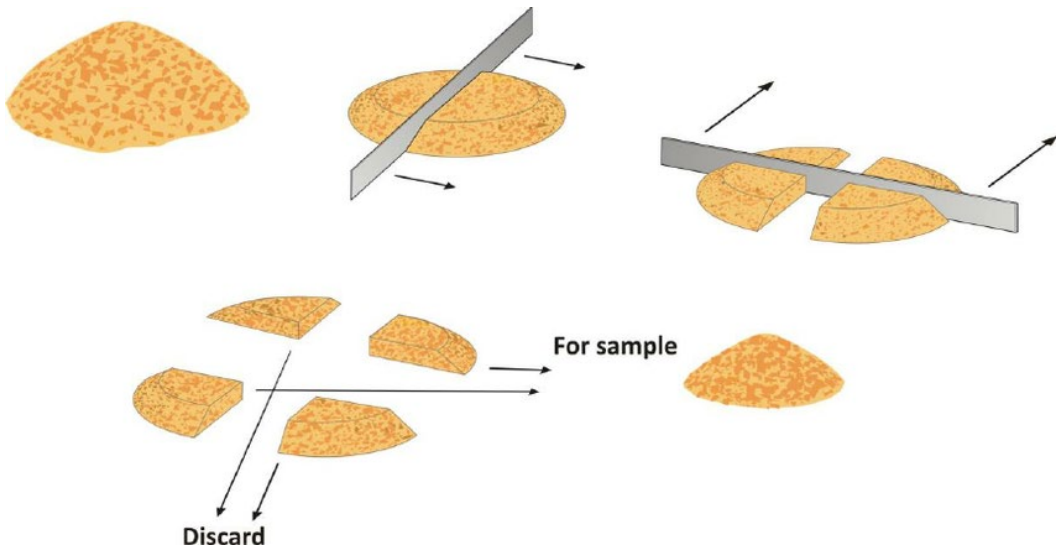

Figure 6-1. Example of the cone and quarter methodology

Core samples are to be collected in order to evaluate the geochemical characteristics, including acid generation potential and metals leaching, of mine lithologies to be excavated from the pit and exposed to atmospheric conditions. These samples should be handled with care so that analytical data will represent the geochemical nature of the mine lithologies. In addition, sample chain-of-custody is important for establishing sample integrity was maintained between field crew and the laboratory.

General considerations for handling during sampling are:

- Always wear latex gloves when handling samples
- Sample receptacles or containers should be wrapped in a way that is protective of both surrounding containers and the container the sample is in
- Always check and thoroughly document procedures in field logbooks or sampling forms. There is never "too much information"

Soil/rock samples typically do not require chemical preservation methods of any kind, see Section 6.3 for additional details. Samples must be transported from the field to the laboratory through the use of the proper sample containers and packing material.

6.1 Sample Compositing

Samples may have to be combined from several depth interval sub-samples to generate enough material to meet the analytical lab mass requirements. The purpose of compositing is to gather the required amount of mass from the target aquifer interval from several smaller individual samples.

To avoid over-representing individual sample interval the goal for sample collection will be to collect the same amount of sample from each individual sample to generate the composites. The following methods describe the methods to be used for generating a composite sample. Each individual sample will be collected using a volumetric scoop (measuring cup) to obtain consistent mass from each sample. Individual sample volumes will be combined in a stainless steel bowl and mixed using a spoon or towel until the color and grain-size are consistent.

The composite sample then will be photographed. Photographs of the composite sample will show the sample ID number in the photograph. The composite sample will be split into sub samples for shipment to different laboratories, if necessary. Samples will be labeled and placed in ziplock bags, packed in boxes, and shipped to the analytical laboratory.

6.1 Sample Description

Visual examination of the drill cutting is to be conducted to identify the primary and secondary (alteration) mineral composition. Visual examination will identify mineralogical changes (secondary alteration), mineral coatings, physical conditions (e.g., relative grain size distribution), and unaltered rock vs. unconsolidated conglomerates/soils. The visual examination will be documented in a field log notebook. Field descriptions should follow the procedures described in the Soil and Rock Descriptions SOP.

6.2 Sampling Equipment Decontamination

All sampling equipment must be cleaned according to the Equipment Decontamination SOP prior to collecting the next samples.

6.3 Sample Preservation

Solid samples, including rock, soils, and sediments, shall be preserved by cooling to 4°, ± 2° C. Most soil and solid samples require no other preservatives. Samples should be contained in glass jars or air-tight plastic bags then kept in a cooler to prevent the loss of soil moisture. Solid samples, whether in metal sleeves, wide-mouth glass jars, or other containers, will be labeled and secured appropriately, then placed immediately in an ice chest containing sufficient ice to maintain a temperature range of 4° ± 2° C through delivery to the laboratory. Sufficient ice chests and quantities of ice to manage all samples collected during the day (or shift) shall be maintained at the sampling site. Samples are maintained in ice or, if available, in refrigerators, within a range of 4° ± 2° C, from the time the sample control manager assumes custody until the samples are packed for shipment and relinquished to the shipper or other transport agent.

6.4 Sample Labels

Sample labels are required on all sample containers as the primary source of sample identification. Sample identification numbers will also be written using indelible markers on the sample bag. Specific field data do not need to be recorded on the labels. Sample labels should contain the following information:

- Sample identification number
- Project name and number
- Date of sample collection
- Details of samplers (initials, etc.)

All samples will be double bagged in zip top bags with the sample ID, date and samplers initials written on both bags. Place the sample label in between the inner and outer sample bags.

6.5 Chain-of-Custody

The goal of implementing chain-of-custody (COC) procedures is to ensure that the sample is traceable from the time that it is collected until it, or its derived data, are used. Samples would be considered to be "in custody" under the following conditions:

- It is in personal possession
- It is in personal view after being in personal possession
- It was in personal possession when it was properly secured
- It is in a designated secure area

6.5.1 Chain-of-Custody Forms

A chain-of-custody form may be initiated at the time the sample containers are filled or, at the latest, when sample containers leave the site at which they are prepared. Additionally, chain-of-custody forms may be pre-populated with initial information for the project and specific analytical methods listed prior to field work to decrease the amount of time spent documenting in the field. Actual sample collection information should be recorded in the field immediately after the sample has been collected.

Samples submitted to the laboratory must use a COC form. The following information should be included on the COC:

- Sample name
- Date/time of collection, sampler
- Number of containers
- Analysis requested
- Data package requested
- Contact information

It is important that field personnel completely fill out all applicable sections of the form.

The COC form should be completed in advance of field work where possible. Sample names, dates, and times should be completed by field personnel at the time of sample collection. The original COC form should be copied prior to sample shipping and the original included in the shipping container. If a triplicate COC form is used, the top page original shall be included with the samples and the remainder preserved for project files. Revisions to COCs should be single-line crossed out, initialed, and dated. Chain-of-custody forms should be numerically sequenced with a number clearly indicated on the form. The chain-of-custody forms should be placed in shipping containers, protected from moisture using plastic bags (e.g., ziplock bags), and the original should accompany the containers during shipment to the laboratory. Chain-of-custody forms included in any shipping container should only reflect those samples that are in that container. Field personnel collecting samples will be responsible for custody of the samples until transport to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date, and note the time of transfer on the COC forms. The COC is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the COC record should be maintained by field personnel along with other field records.

Common carriers (i.e., FedEx) are not expected to sign the chain-of-custody form. However, the bill of lading or airbill becomes part of the chain-of-custody record in the event that a common carrier is used to transport the samples. Airbill or bill of lading numbers should be recorded on the chain-of-custody forms.

6.5.2 Chain-of-Custody Seals

Chain-of-custody seals shall be affixed to the outside of each shipping container or cooler. One seal is required and should be placed along the front of the cooler at the point where the lid meets the body of the cooler. The seals do not necessarily need to be custody tape, but any type of tape that can be used that cannot be easily removed without showing signs of damage. The custody seals or tape shall include the date and initials of the packager.

Chain-of-custody seals or evidence tape may be used, but are not required, on sample containers in order to demonstrate the sample containers have not been opened or otherwise tampered with during transit. Chain-of-custody seals, or evidence tape if used, should be affixed to each sample package as soon after sample collection as is possible.

6.6 Sample Shipment

Shipment of samples to an analytical laboratory is usually required upon completion of sample collection. Proper packaging is necessary in order to protect the sample containers and to comply with all applicable transportation regulations. Core samples do not require any sample preservation (e.g., cooling), and no ice or cooler packs are required.

In general, samples are shipped using packaging that is supplied by the analytical laboratory. Care should be taken to ensure that the samples are adequately protected from breakage or cross-contamination during shipment. Sample bags should be secured tightly with bubble wrap or other suitable packing media. Once packed, the cooler should be secured shut by wrapping packaging tape completely around the cooler.

A custody seal shall be placed on the outside of the cooler, and clear tape shall be wrapped around the cooler to cover each seal without obscuring or damaging signatures or other significant data. The shipping label shall be secured to the outside of the shipping container and, if it is attached to the top of a cooler by adhesive, clear tape shall be used to secure it to the packaging. A valid return address must appear on the shipping label in the event the shipper is unable to deliver to the designated address.

Samples will be delivered to the analytical laboratory within the analytical parameter hold times. If samples are sent on Friday, Saturday delivery will be requested, and arrangements must be made with the laboratory to receive the shipment.

Section 7: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

Section 8: References

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SOP 2: Soil and Rock Field Classification and Description

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

Standard Operating Procedure Version 1.0

Subject: Soil and Rock Field Classification and Description

Date: November 19, 2017

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 1
Section 6: Methods 2
6.1 Description of Soils 2
6.1.1 General Considerations 2
6.1.2 Soil Description Procedures 2
6.2 Description of Rock 6
6.2.1 General Considerations 6
6.2.2 Rock Description Procedures 6
Section 7: Quality Assurance/Quality Control 11
Attachment A: Field Description Visual Aids ..... A
Attachment B: Field Log Form ..... B

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SOP_2_Soil_and Rock Descriptions

Section 1: Objective

This objective of this Standard Operating Procedure (SOP) is to establish a consistent method for Brown and Caldwell staff to follow when completing the description of soil and rock samples obtained from field sampling efforts and entry into borehole logs. Consistency with description is important because during many projects multiple employees may be involved at different times. Hence, being able to compare between logs that were created by different geologists is essential for creating subsurface interpretations.

Section 2: Scope and Applicability

This procedure will be used during all field activities when bore hole subsurface drilling, surface soil or rock sampling, reconnaissance geological mapping is occurring. These activities should be documented as described herein and following the SOP for Field Notes and Documentation.

Section 3: Responsibilities

The Project Manager (PM) shall ensure that the soil or rock classification and description procedures used in the field conform to the guidelines in this SOP. The PM shall ensure that all field personnel providing descriptions are properly trained to conduct this task and are providing descriptions under the oversight of a Senior Geologist registered in the state in which the logging is occurring. If the state does not have requirements for registration, then the Senior Geologist should meet the standards for a professional geologist under that states law or be registered in another state. The Field Supervisor is responsible for reviewing lithologic logs for accuracy and completeness prior to releasing them to the project manager for review. The Field Geologist is responsible for following the soil classification and description procedures in this SOP, and for accurately and completely representing the lithology encountered in the field.

Section 4: Definitions

American Society for Testing Materials (ASTM).

Feldpathoids. Alkali (potassium) or basic (plagioclase) feldspar.

International Union of Geological Sciences (IUSG).

Unified Soil Classification System (USCS).

Section 5: Required Materials

The materials required for completing the procedures outlined in this SOP, at a minimum, include the following:

- Hand lens
- Field notebook and borehole log forms
- Protractor
- Pencils

- Pocket knife
- Dilute hydrochloric acid in small dispenser
- Field charts of grain size examples (e.g., American Geological Institute [AGI] data sheets)
- Squirt bottle with water
- Compass with altimeter

Section 6: Methods

The following sections provide guidance for how proper field visual descriptions of soils and rock samples should be conducted. These methods may not be applicable to every soil or rock sample found, but should provide enough guidance to allow accurate and defensible descriptions by a variety of field geologists.

6.1 Description of Soils

The following section provides a description of the procedures that should be used when describing soils.

6.1.1 General Considerations

The most popular soil classification method that is based on grain size and other properties, is the Unified Soil Classification System (USCS). This system was initially developed by A. Casagrande in 1948 and was then called the Airfield Classification System. It was adopted with minor modifications by the U.S. Bureau of Reclamation and the U.S. Corps of Engineers in 1952. In 1969, the American Society for Testing and Materials (ASTM) adopted the system. This system is designated currently by ASTM as D-2488-90 and will be used as a guideline for classifying and describing lithology. It requires certain information (e.g. liquid limit, plastic limit moisture content and plasticity index) about the soil which can only be obtained in a laboratory.

The USCS is based on grain size and response to physical manipulation at various water contents. This system is often used for classifying soils encountered in boreholes, test pits, and surface sampling. The following properties form the basis of USCS soil classification:

- Percentage of gravel, sand, and fines;
- Shape of the grain size distribution curve; and
- Plasticity and compressibility characteristics.

Four soil fractions are recognized. They are cobbles, gravel, sand, and fines (silt or clay). The soils are divided as coarse-grained soils, fine grained soils, and highly organic soils. The coarse grained soils contain 50 percent of grains coarser than a number 200 sieve (approximately 0.08 mm). Fine grained soils contain more than 50 percent of material smaller than the number 200 sieve. Organic soils contain particles of leaves, roots, peat, etc.

6.1.2 Soil Description Procedures

The following will be used as a guideline for logging lithology from subsurface activities (i.e. borehole drilling, trenching, etc.).

The USCS recognizes 15 soil groups and uses names and letter symbols to distinguish between these groups. The coarse-grained soils are subdivided into gravels (G) and sands (S). Both the gravel and sand groups are divided into four secondary groups. Fine grained soils are subdivided into silts (M) and clays (C).

Soils are also classified according to their plasticity and grading. Plastic soils are able to change shape under the influence of applied stress and to retain the shape once the stress is removed. Soils are referred to either low (L) or high (H) plasticity. The grading of a soil sample refers to the particle size distribution of the sample. A well graded (W) sand or gravel has a wide range of particle sizes and substantial amounts of particles sized between the coarsest and finest grains. A poorly graded (P) sand or gravel consists predominately of one size or has a wide range of sizes with some intermediate sizes missing.

Soils which have characteristics of two groups are given boundary classifications using the names that most nearly describe the soil. The two groups are separated by a slash. The same is true when a soil could be well or poorly graded. Again, the two groups are separated by a slash.

Soil description should be concise and stress major constituents and characteristics for fine-grained, organic, or coarse-grained soils. Tables 1 and 2 are checklists for descriptions of fine-grained, organic soils, and coarse-grained soils, respectively. Field descriptions should include as a minimum:

Soil name. The basic name of the predominant constituent and a single-word modifier indicating the major subordinate constituent;

Particle Size Distribution. An estimate of the percentage and grain-size range of each of the soil's subordinate constituents with emphasis on clay-particle constituents. This description may also include a description of angularity. This parameter is critical for assessing hydrogeology of the site and should be carefully and fully documented;

Gradation or Plasticity. For granular soil (sands or gravels) that should be described as well-graded, poorly graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soil (silts or clays) should be described as non-plastic, low plastic, medium plastic, or highly plastic. The table below summarizes how to grade plasticity based on simple field tests.

Criteria for Describing Plasticity	
Descriptive item	**Criteria**
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any moisture content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times close to the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Dry Strength. Dry strength describes the crushing characteristics of a dry soil crumb about 1/4 inch (5 mm) in diameter. If a crumb of dry soil is not available, after removing particles larger than No. 40 sieve size, mold at least three balls of soil about 1/4 inch (5 mm) in diameter to the consistency of putty, adding water if necessary. Allow the balls to dry completely by oven, sun, or air drying, and then test their strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity. The table below includes criteria for determining dry strength descriptions in the field.

Criteria for Describing Dry Strength	
Descriptive item	**Criteria**
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure.
Medium	The dry specimen breaks into pieces and crumbles with considerable finger pressure.
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very high	The dry specimen cannot be broken between the thumb and a hard surface.

Dilatancy. Dilatancy describes the soils reaction to shaking. After removing particles larger than No. 40 sieve size, prepare a ball of moist soil about ½ inch (15 mm) in diameter. Add enough water, if necessary, to make the soil soft but not sticky.

Place the ball in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the ball which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the ball stiffens, and finally cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil. The table below outlines the criteria for determining dilatancy in the field.

Criteria for Describing Dilatancy	
Descriptive item	**Criteria**
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear, or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

Toughness. Toughness is the consistency of the soil near the plastic limit. After removing particles larger than the No. 40 sieve size, mold a ball of soil about ½ inch (15 mm) in diameter to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. The specimen is then rolled out by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. The thread is folded and rerolled repeatedly. During this manipulation, the moisture content is gradually reduced and the specimen stiffens, finally loses it plasticity, and crumbles when the plastic limit is reached. The table below outlines criteria for determining toughness in the field.

Criteria for Describing Toughness	
Descriptive item	**Criteria**
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The lump and thread have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

Moisture Content. The amount of soil moisture described as dry, moist, or wet/saturated;

Criteria for Describing Moisture	
Descriptive item	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet/saturated	Visible free water, usually soil is below water table.

Color. The basic color of the soil. (Refer to Munsell soil color charts.);

Odor. Odor is described from a warm, moist sample. The odor should only be described if it is organic or unusual. An organic odor will have distinctive decaying vegetation smell. Unusual odors, petroleum product, chemical, and the like should be described.

Soil Texture and Structure. Description of particle size distribution, arrangement of particles into aggregates, and their structure. This description includes joints, fissures, slicked sides, bedding, veins, root holes, debris, organic content, and residual or relict structure, as well as other characteristics that may influence the movement or retention of water or contaminants;

Structure (for description of soils only)	
Descriptive item	**Criteria**
Stratified	Alternating layers of varying material or color with layers at least 6 mm (1/4 inch) thick; note thickness
Laminated	Alternating layers of varying material or color with layers less than 6 mm (1/4 inch) thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated (parallel grooves or scratches)
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout.

Relative Density or Consistency. An estimate of density of a fine-grained soil or consistency of a cohesive soil, usually based on standard penetration tests;

Criteria for Describing Consistency	
Descriptive item	**Criteria**
Very soft	Thumb penetrates soil more than 1 inch
Soft	Thumb penetrates about 1 inch
Firm	Thumb indentation up to ¼ inch
Hard	No indentation with thumb, readily indented with thumbnail
Very Hard	Not indented with thumbnail

Cementation. An estimate of cementation of a coarse-grained soil.

Criteria for Describing Cementation	
Descriptive item	**Criteria**
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Relative Permeability. An estimate of the permeability based on visual examination of materials (e.g., high permeability for course sand and gravel verses low permeability for silty clay). The estimate should address presence and condition of fractures (open, iron-stand, calcite-filled, open but claylined, etc.), as well as fracture density and orientation;

Local Geologic Name. Any specific local name or generic name (i.e., alluvium, loess); and

Group Symbol. USCS of symbols.

The soil logs should also include a complete description of any tests run in the borehole; placement and construction details of piezometers, wells, and other monitoring equipment; abandonment records; geophysical logging techniques used; and notes on readings obtained by air monitoring instruments.

6.2 Description of Rock

The following section provides a description of the procedures that should be used when describing rock samples.

6.2.1 General Considerations

Rock identification is based on minerals and textures. Drilling in rock will be slow and core recovery may consist of pulverized chips. The proper drilling technique is necessary for adequate recovery and accurate rock identification.

6.2.2 Rock Description Procedures

Rocks can be categorized into three types: sedimentary, igneous, and metamorphic. Descriptions for these three types of rocks are different. The following procedures are organized following the three categories.

Sedimentary Rock Classification. Sedimentary rocks result from two processes (and combinations thereof):

- Consolidation of loose sediments that have accumulated in layers, forming clastic rocks.
- Precipitation from solution to form a chemical rock. Included in this category are rocks directly or indirectly formed by biological processes.

The following text summarizes how to characterize these two types of sedimentary rock.

Clastic Rocks. Clastic rocks have been classified different ways. They may be classified according to the size of particles, sorting, and distribution of particles, or chemical content of silica, feldspar, and calcite.

Grain Size. In the most commonly used classification system, the size of the particles determines the general rock name. For example, sand-sized particles for sandstones; pebbles form conglomerates, and so on. The rack names are shown in the table below along with their component particle sizes. The divisions in the classification are based upon the Modified Wentworth scale used to measure grain size.

Grain Size Scale (Modified Wentworth Scale)			
Diameter (in)	Particle	Sediment	Rock
< 0.0002	Clay	Mud	Claystone, mudstone, shale
0.0002 to 0.002	Silt		Siltstone
0.002 to 0.08	Sand	Sand	Sandstone
0.08 to 2.5	Pebble	Gravel	Conglomerate (rounded) Breccia (angular)
2.5 to 11.8	Cobble		
> 11.8	Boulder		

Conglomerates and breccias have adjectives such as *clast-supported and matrix supported*. *Clast-supported* means that he clasts are sorted well enough so that the large clasts touch, and *matrix-supported* is not.

A well-sorted sandstone is called an arenite. A poorly sorted sandstone with a matrix of silt and clay is called a wacke. A sandstone with more than 25% feldspar is an arkose. And, if lithic fragments or iron and magnesium minerals and feldspar are present along with quartz sand and silt, the rock is called a graywacke.

Sorting. Sedimentary rock names are further characterized by the sorting the particles have undergone. The distribution of grain sizes reflects the type of transport a sediment has experienced and the depositional environment. A well-sorted (or poorly graded) sediment has two or three sizes present. A poorly sorted (or well-graded) sediment has a wide range of grain sizes present.

Cementation. Cementing substances have usually been referred to by adjectives such as calcareous, dolomitic, and siliceous; however, these terms might also imply accessory detrital materials, so that the unambiguous terms calcite-cemented, dolomite-cemented, and quartz-cemented are recommended.

Chemical Rocks. Chemical rocks have been classified according to chemical composition, depositional texture, and depositional environment.

Common chemical rocks are limestone, dolomite, evaporites (gypsum, anhydrite, halite, etc.) phosphate rocks (apatite), manganese nodules, ironstones (limonite, siderite, and chlorite silicates), coal, pyrite, chert, and diatomite, and some cherts have a biogenic component to their formation.

Igneous Rock Classification. Classification of igneous rocks is based upon the mineral content of the rock. Minerals upon which the classification is based are feldspar, quartz (or feldspathoids), and mafic minerals such as biotite, hornblende, pyroxene, and olivine. Of these minerals, identifying feldspar is the key to classification.

The International Union of Geological Sciences (IUGS), Sub commission on the Systematics of Igneous Rocks attempted to create a universal classification of igneous rocks. The committee's recommendations for plutonic and volcanic rocks are shown in the following two tables, respectively. A rock is classified by determining it composition relative to the percentage of alkali feldspar, plagioclase, and quartz (or feldspathoid.

Modal Classification of Plutonic Igneous Rocks	
Modal Values	**Classification**
Q > 60	Not igneous
Q = 20-60, P <10	Alkali feldspar granite
Q = 20-60, P = 10-65	Granite
Q = 20-60, P = 65-90	Granodiorite
Q = 20-60, P >90	Tonalite
Q = 5-20, P <10	Alkali feldspar quartz syenite
Q = 5-20, P = 10-35	Quartz syenite
Q = 5-20, P = 35-65	Quartz monzonite
Q = 5-20, P = 65-90	Quartz monzodiorite (An < 50), Quartz monzogabbro (An > 50), Quartz anorthosite (M < 10)
Q = 5-20, P >90	Quartz diorite (An < 50), Quartz gabbro (An > 50), Quartz anorthosite (M < 10)
Q = 0-5, P <10	Alkali feldspar syenite
Q = 0-5, P = 10-35	Syenite
Q = 0-5, P = 35-65	Monzonite
Q = 0-5, P = 65-90	Monzodiorite (An < 50), Monzogabbro (An > 50), Anorthosite (M < 10)
Q = 0-5, P >90	Diorite (An < 50), Gabbro (An > 50), Anorthosite (M < 10)
F = 0-10, P <10	Foid-bearing alkali feldspar quartz syenite
F = 0-10, P = 10-35	Foid-bearing syenite
F = 0-10, P = 35-65	Foid-bearing monzonite
F = 0-10, P = 65-90	Foid-bearing monzodiorite (An < 50), Foid-bearing monzogabbro (An > 50)
F = 0-10, P >90	Foid-bearing diorite (An < 50), Foid-bearing gabbro (An > 50)
F = 10-60, P <10	Foid syenite
F = 10-60, P = 10-50	Foid monzosyenite
F = 10-60, P = 50-90	Foid monzodiorite (An < 50) Foid monzogabbro (An > 50)
F = 10-60, P >90	Foid diorite (An < 50), Foid gabbro (An > 50)
F > 60	Foidolites

Q = quartz/(quartz = alkali feldspar = plagioclase)

F = feldspathoids/(feldspathoids = alkali feldspar)

P = feldspathoids/(feldspathoids = plagioclase feldspar)

M = color index

An = % anorthite inplagioclase

Modal Classification of Volcanic Igneous Rocks	
Modal Values	**Classification**
Q > 60	Not igneous
Q = 20-60, P <10	Alkali feldspar rhyolite
Q = 20-60, P = 10-65	Rhyolite
Q = 20-60, P = 65-90	Dacite
Q = 20-60, P >90	Dacite
Q = 5-20, P <10	Alkali feldspar quartz trachyte
Q = 5-20, P = 10-35	Quartz trachyte
Q = 5-20, P = 35-65	Quartz latite
Q = 5-20, P = 65-90	In all six fields, the names andesite and basalt are applied; basalt is used if SiO_2 < 52wt % after H_2O and CO_2 are deleted and the analysis recalculated to sum 100%
Q = 5-20, P >90	
Q = 0-5, P = 65-90	
Q = 0-5, P >90	
F = 0-10, P = 65-90	
F = 0-10, P >90	
Q = 0-5, P <10	Alkali feldspar trachyte
Q = 0-5, P = 10-35	Trachyte
Q = 0-5, P = 35-65	Latite
F = 0-10, P <10	Foid-bearing alkali feldspar quartz trachyte
F = 0-10, P = 10-35	Foid-bearing trachyte
F = 0-10, P = 35-65	Foid-bearing latite
F = 10-60, P <10	Phonolite
F = 10-60, P = 10-50	Tephritic phonolite
F = 10-60, P = 50-90	Phonolitic tephrite
F = 10-60, P > 90	Tephrite (olivine < 10%) Basanite (olivine > 10%)
F > 60	Foidite

Q = quartz

P = feldspathoids/(feldspathoids = plagioclase feldspar)

F = feldspathoids/(feldspathoids = alkali feldspar)

Metamorphic Rock Classification. In this binomial system for naming metamorphic rocks, the main rock name is based on the texture of the rock, and the principal or more significant minerals are added as modifying nouns, as in biotite-quartz schist or andalusite-cordierite hornfels. The names are meant to be applied on a descriptive basis; a schistose rock, for example, should not be called a hornfels just because it is found in a contact aureole.

Textures.

- Schistose – grains platy or elongate and oriented parallel or subparallel. Foliated (lepidoblasitc) of fabric is planar, lineated (nematoblastic) if linear.
- Granobalstic – grains approximately equidimensional; platy and linear grains oriented randomly or so subordinate that foliation is not developed.
- Hornfelsic – grains irregular and interincluded but generally microscopic; recognized in field by unusual toughness, ring to hammer blow, and hackly fracture at all angles. Under hand lens, freshly broken surfaces show a sugary coating that will not rub off (formed by rending of interlocking grains).
- Semischistose (gneissic) – platy or linear grains subparallel but so subordinate or so unevenly distributed that rock has only a crude folliation; especially common in metamorphosed granular rocks, such as sandstones and igneous rocks.
- Cataclastic – clastic textures resulting from breaking and grinding with little if any recrystallization; characterized by angular, lensoid, or rounded fragments (porphyroclasts) in a fine-grained and commonly streaked or layered
- Groundmass. Mortar structure applies to nonorientated arrangements, and phacoidal, flaser, and augen structure apply to lenticular arrangements.

Rock Names.

Schistose Rocks:

- Schist – grains can be seen without using a microscope.
- Phyllite – all (or almost all) grains of groundmass are microscopic, but cleavage have sheen caused by reflections from platy or linear minerals; commonly corrugated.
- Slate – grains are microscopic; very cleavable; surface dull; tougher than shale and cleavage commonly oblique to bedding.
- Phyllonite – appearance like phyllite but formed by cataclasis (see mylonite) and recrystallization commonly of coarser-grained rocks, as indicated by relict rock slices, slip folds, and prophyroclasts.

Granoblastic Rocks:

- Granulite or Granofels – granoblastic rocks, irrespective of mineral composition; because granulite can connote special compositions and conditions or origin, granofels may be preferred.
- Quartzite, marble, and amphibolite – compositional names that generally connote granoblastic texture; exceptions should be modified for clarity, as schistose quartzite or plagioclase hornblende schist.
- Tactite (skarn) – heterogeneous calc-sillicate granulites and related metasomatic rocks of typically uneven grain.

Hornfelsic Rocks. All called hornfels, or, if relict features are clear, hornfelsic may be used with the original rock name (as hornfelsic andesite)

Semi-schistose (Gneissic) Rocks:

- Semi-schist – fine-grained (typically less than 1.4 mm) so that individual platy or lineate grains are indistinct; relict features often common.
- Gneiss – generally coarser than ½ mm with small aggregates of platy or lineate grains forming separate lenses, bladed, or streaks in otherwise granoblastic rock. Platy or lineate structures may be distributed evenly through the rock or may be concentrated locally so that some layers or lenses are granoblastic or schistose (banded gneiss).

Cataclastic Rocks. Where original nature of rock is still apparent, rock name can be modified by suitable adjectives (as cataclastic granite, flaser gabbro, phacoidal rhyollite):

- Mylonite – crushing so thorough that rock is largely aphanitic and commonly dark-colored; may be layered and crudely folliated but not schistose like phyllonite; porphyroclasts commonly rounded or lenticular.
- Ultrmylonite, pseudotachyylyte – aphanitic to nearly vitreous-appearing dark rock commonly injected as dikes into adjoining rocks.

Relict and Special Textures and Structures. If textures of low-grade metamorphic rocks are dominantly relict, original rock names may be modified (as massive metabasalt, semischistose met-andesite). If hydrothermal alteration has produces prominent new minerals, names such as chloritized diorite and sercitized granite can be used:

- Strongly metasomatized rocks with coarse or unusual textures may require special names such as gneissen, quartz-schorl rock, and corundum-mica rock.
- Magmatite – a composite rock composed of igneous or igneous-appearing and/or metamorphic materials that are generally distinguishable megascopically.

Section 7: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

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Attachment A: Field Description Visual Aids

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Attachment B: Field Log Form

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SOP 3: Field Notes and Documentation

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

Standard Operating Procedure Version 1.0

Subject: Field Notes and Documentation

Date: November 19, 2017

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Required Materials 1
Section 5: Methods 2
5.1 Field Logbooks 2
5.2 Photographs 3
5.3 Additional Field Forms/Records 4
Section 6: Corrections 4
Section 7: Documentation Reviews 4
Section 8: Field Record Backup 4
Section 9: Documentation Archive 5

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Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish a consistent method and format for the use and control of documentation generated during daily field activities. Field notes and records are intended to provide sufficient information that can be used to recreate the field activities, as well as, the collection of environmental data. Information placed in these documents and/or records shall be factual, detailed and objective.

Section 2: Scope and Applicability

This procedure will be used during all field activities, regardless of the purpose by all project team personnel and subcontractors who conduct field investigations. These activities may include, but are not limited to, all types of media sampling (soil vapor, soil, groundwater, wastewater, etc), utility clearance, well installation, sample point locating and surveys, site reconnaissance, free product removal, remediation, and waste handling.

Section 3: Responsibilities

The Project Manager (PM), or designee, will have the responsibility to oversee and ensure that field documentation is collected in accordance with this SOP and any site-specific or project specific planning documents. The field sampling personnel will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities. Field personnel shall ensure all field activities are documented completely at the end of each field day. Field personnel are responsible for tracking the location of all field documentation, including field logbooks. Field personnel are responsible for assuring that the original documentation (or copies of the field log book, if needed for another project at the same site), are filed at the end of the field project or during a long project (greater than month) every couple of weeks.

Section 4: Required Materials

The materials required for this SOP include the following:

- Bound field logbooks, and
- Black waterproof and/or indelible ink pens
- Field Forms

Section 5: Methods

This SOP primarily includes the documentation procedures for the field logbooks. However, procedures discussed in this SOP are applicable to all other types of field documentation collected and should be universal in application. Details of other field records and forms (e.g., boring logs, sample labels, chain of custody records, and waste containment labels) are discussed in the specific SOP associated with that particular field activity (e.g., borehole drilling, sample handling, investigative derived waste), and not covered in detail in this SOP. Attachment A has example field sheets for groundwater sampling.

5.1 Field Logbooks

Field personnel will keep accurate written records of their daily activities in a bound logbook, or project specific work sheets that will later be bound, that will be sufficient to recreate the project field activities without reliance on memory. This information will be recorded in chronological order. All entries will be legible, written in black waterproof or indelible ink, and contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. Each page of the field logbook will be consecutively numbered, signed and dated by the field author(s). Pages should not be removed for any reason.

There should be no blank lines or partial pages. Any blank part of a page should be lined to the end of the page at the end of the day.

In addition to documenting field activities, field logbooks will include, but are not limited to, the following:

- Date and time of activities,
- Site location
- Purpose of site visit,
- Site and weather conditions,
- Personnel present, including sampling crew, facility/site personnel and representatives (including site arrival and departure times),
- Subcontractors present,
- Regulatory agencies and their representatives (including phone numbers, site arrival and departure times),
- Level of health and safety protection,
- Sampling methodology and information,
- Sample numbers or descriptions,
- Sample Locations (sketches are very helpful),
- Source of sample(s), sample identifications, sample container types and preservatives used, and lot numbers for bottles and preservatives (if applicable and if not recorded on other forms or in a sample control logbook),
- A chronological description of the field observations and events,
- Specific considerations associated with sample acquisition (e.g., field parameter measurements, field screening data, HASP monitoring data, etc.) (if not recorded on another form),
- Wastes generated, containment units (including volumes, matrix, etc), and storage location (if not recorded on another form),
- Field quality assurance/quality control samples collection, preparation, and origin (if not recorded on other forms or in a sample control logbook),
- Physical or quantitative measurements.

The manufacturer, model and serial number of field instruments (e.g., OVM, water quality, etc.) shall be recorded, if not using a calibration form. Also, source, lot number and expiration date of standard shall be recorded if calibrated in the field.

- Well construction materials, water source(s), and other materials used on-site (if not recorded on another form).
- Sample conditions that could potentially affect the sample results,
- If deviating from plan, clearly state the reason(s) for deviation,
- Persons contacted and topics discussed,
- Documentation of exclusion zone set-up and location,
- Documentation of decontamination procedures, and
- Daily Summary.

Field situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the field activity without relying on the collector's memory. Language used shall be objective, factual, and free of personal opinions. Hypothesis for observed phenomena may be recorded, however, they must be clearly indicated as such and only relate to the subject observation.

Logbooks will be assigned to a specific sampling team. If it is necessary to transfer the log book or sheets to alternative team member during the course of field work, the person relinquishing the log book will sign and date the log book at the time of transfer.

Field logbooks should consist of a bound book, in which the insertion or removal of pages will be visibly noticeable after the logbook has been assembled. Logbooks can be prepared by gluing or laminating pages together either at the left side or top of the page. If inclement weather is expected, logbooks may have plastic laminated front and back covers to protect the interior pages, and should not be broken apart for copying. Loose-leaf binding, such as comb binding is not considered hard binding. To maintain the integrity of the logbook, pages should be consecutively numbered prior to use. Logbook pages can be of any format, and may include blank pages for recording or field forms that are used for specific tasks. As an alternative, commercially bound and consecutive page numbered field logbooks may also be used.

5.2 Photographs

Photographs provide the most accurate demonstration of the field worker’s observations. They can be significant to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. Telephoto or wide-angle shots cannot be used in enforcement proceedings. Some industrial clients do not permit photographs on their sites. In industrial and military settings, confirm with the project manager that photographs are allowed.

A photograph must be documented if it is to be a valid representation of an existing situation. Therefore, for each photograph taken, several items shall be recorded in the field logbooks:

- Date and time photograph taken;
- Name of photographer;
- Site name, location, and field task;
- Brief description of the subject and the direction taken;
- Sequential number of the photograph and the roll number; and
- For digital photographs, ensure that the date and time settings in the camera are accurately set before taking pictures.

5.3 Additional Field Forms/Records

Additional field records may be required for each specific field event. The use of these records and examples are described in other SOPs specific for the activity (e.g. Borehole Logging SOP, Groundwater Sampling and Purging SOP, etc.). These other records may include:

- Borehole Logs during drilling
- Well Construction and Development records (groundwater, soil vapor, extraction, etc.),
- Groundwater Purge and Sample Collection Records,
- Soil Vapor Purge and Sample Collection Records,
- Water Level Monitoring and Product Removal Records,
- NAPL Removal Records,
- Investigation Derived Waste (IDW) Tracking Records,
- Instrument Calibration Records, and
- Health and Safety Monitoring Records and sign-off sheets.

Prior to field activities, the field sampling personnel will coordinate with the Project Manager, or designee, to determine which additional records will be required for the specific field task. These additional records will be maintained in a field file or a three-ring notebook throughout the duration of the field activities or included in a specially prepared site-specific notebook. If the field notebook is being created, the forms may be part of the laminated book.

Section 6: Corrections

If an error is made in the field, logbook corrections will be made by drawing a single line through the error, entering the correct information, and initialing and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes, are prohibited. All corrections will be initialed and dated. Some projects require that a brief reason for the change must also be added where the correction was made. Ask the Project Manager, if this requirement is necessary.

Section 7: Documentation Reviews

Periodically, the Project Manager, or designee, will review the field logbooks pertaining to the activities under their supervision. The elements of this review will include technical content, consistency, and compliance with the project plans and SOPs. Discrepancies and errors identified during the review should be resolved between reviewer and author of the field documentation. Corrections and/or additions of information shall be initialed and dated by the field author or reviewer.

Section 8: Field Record Backup

Periodically, the Project Manager, or designee, will determine if and when field logbooks and records need to be photocopied. Photocopies will be maintained in the project files and can be used as backup in the event that the original field logbook or records are lost or damaged. In addition, the field logbook can be scanned and an electronic copy in .pdf format will be stored in the electronic file for the project.

Section 9: Documentation Archive

At the completion of the project, all original field logbooks and records will be stored in the project files in accordance with Brown and Caldwell procedures. Typically project files lifetimes are controlled and spelled out in contractual agreements with clients. Typically, project files are archived after project finalization and kept indefinitely in archive.

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SOP 4: Equipment Decontamination

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Standard Operating Procedure

Prepared for: Soquel Creek Water District

Project Title: Geochemical Characterization of Twin Lakes Pilot Well

Project No.: 152610.

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Subject: Equipment Decontamination

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Table of Contents

Section 1: Objective 1
Section 2: Scope and Applicability 1
Section 3: Responsibilities 1
Section 4: Definitions 1
Section 5: Required Materials 2
Section 6: Methods 2
6.1 Decontamination Station Set-up 3
6.2 Remove Gross Contamination 3
6.3 Remove Residual Contamination 4
6.3.1 Removal of residual contamination consists of the following steps: 4
6.4 Prevent Recontamination After Decontamination 4
Section 7: Record Keeping 4
Section 8: Quality Assurance/Quality Control 5

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SOP_4_Equipment Decontamination

Section 1: Objective

The objective of this standard operating procedure (SOP) is to establish consistent methods to reduce or eliminate:

- Contamination and cross-contamination of environmental samples by sample equipment, other samples, or personnel.
- Health and environmental risk caused by the spread of contaminants.

Section 2: Scope and Applicability

Decontamination should occur any time a sampling tool or instrument used in field investigations may contact sampled media or personnel using the equipment. This procedure will be used in conjunction with use of reusable equipment during field activities associated with handling, sampling, or measuring environmental media such as soil, groundwater, soil gas, or air. These procedures are to be implemented primarily on-site such as at the point of use or at a designated equipment decontamination station at the project site. Equipment decontamination should be completed before each use and prior to transporting off-site.

Examples of soil and groundwater sample collection equipment usually requiring decontamination includes pumps, bailers, water/interface level indicators, tubing, hand augers, split spoon samplers, and other related equipment used for the collection of samples or the measurement of field parameters.

These procedures are general minimum standards. They may be modified or supplemented for a specific project by site-specific workplans or health and safety plans.

Section 3: Responsibilities

The Project Manager, or designee, will have the responsibility to oversee and ensure that equipment decontamination procedures are implemented in accordance this SOP and any site-specific workplan, field sampling plan (FSP), quality assurance project plan (QAPP), and site health and safety plan (HASP). The field personnel will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

Section 4: Definitions

SDS. Safety Data Sheets. - These documents need to be kept on site and discuss the physical and toxicological aspects for a particular substance used during decontamination or encountered during contamination.

Decontamination area. - An area that is not expected to be contaminated and is upwind of the exclusion zone

Exclusion zone. - The area in which contaminants are known or suspected to be present.

Measurement/monitoring equipment. - Any equipment used to check or evaluate site conditions.

Potable. - Drinkable.

Sampling equipment. - Any equipment used during the process of sample collection.

HASP. Site Health and Safety Plan. - Plan written to coordinate and outline precautions that will be taken to initiate and monitor worker safety.

Section 5: Required Materials

- The equipment and supplies required for this SOP include the following (not every project will require all of these materials):
- Clean buckets or tubs to hold wash and rinse solutions of a size appropriate to the equipment to be decontaminated.
- Tap water.
- Deionized or distilled water
- Long-handled brushes for scrubbing. Flat-bladed scrapers, garden type spray bottles (no oil lubricated parts).
- Non-phosphate detergent such as Alconox or Liqui-Nox.
- Plastic sheeting for the decontamination area.
- Plastic bags and/or aluminum foil to keep decontaminated equipment clean until the next use.
- Gloves, aprons, safety glasses, and any other PPE required in the HASP.
- Towels and wipes.
- Dispensing bottles.

Section 6: Methods

Decontamination consists of physically removing contaminants from personnel or equipment. To prevent the transfer of harmful materials, procedures have been developed and are implemented before anyone enters a site and continue throughout site operations.

A decontamination plan should be based on the worst-case scenario (if information about the site is limited). The plan can be modified, if justified, by supplemental information. Initially, the decontamination plan assumes all protective clothing and equipment which leave the exclusion zone are contaminated. Based on this assumption, a system is established to wash and rinse all non-disposable and non-dedicated equipment. Decontamination plans will be site-specific and presented in the HASP and/or the work plan's SAP/QAPP for each site.

The decontamination area should be located, if possible, where decontamination fluids and soil wastes can be easily discarded or discharged after receipt of analytical results which determine if discharge parameters have been met. Decontamination wastewater should be managed in accordance with the Investigation Derived Waste Plan or as directed in the SAP or QAPP.

6.1 Decontamination Station Set-up

A decontamination pad should be established for cleaning of heavy equipment or large sampling tools. This pad can be a prefabricated area that already exists on site for washing large equipment or can be constructed. If a prefabricated area exists, it needs to have characteristics that allow for collecting fluids and solids that will fall off the large equipment. Decontamination pads can be constructed in a variety of ways, but things to consider during construction are the following:

- The pad will need to be constructed so it provides complete secondary containment. Hence all sides will require berms to prevent off pad migration of fluids. The berms need to be constructed by considering the balance between sump pump removal rates and the amount of fluid that will be generated.
- Fluids from decontamination processes cannot escape and be directly discharged vertically into the ground; hence if plastic sheeting is used it should be minimally double layered and thick (greater than 8 mil).
- The pad will have to drain in one general direction where a sump pump can collect fluids. The pad will need to be located near power and water, if possible. However, a generator can supply power and water can be trucked in.

For small equipment decontamination and PPE decontamination a smaller station is established, usually in the contaminant reduction zone, between the exclusion zone and buffer zone. For this station, clean buckets or tubs (5 gallon buckets are most common) should be used. There should be enough room within this area for storing used and unused drums. Buckets should be placed on plastic sheeting to prevent spillage to the ground, and to help keep the decontamination area and equipment as clean as possible. The buckets should be filled half to three-quarters full as follows:

- Bucket 1 - Tap water with non-phosphate detergent such as Liqui-Nox made up as directed by the manufacturer.
- Bucket 2 - Tap water or deionized water for rinsing
- Bucket 3 - Deionized or distilled water for the second rinsing

If additional rinses using wash or dispensing bottles are called for in the project-specific documents, an additional bucket to catch the discharge from the final rinse will be necessary.

A clean area, generally covered with plastic sheeting or large clean plastic bags, is also needed to set down decontaminated equipment prior to reuse or air drying and packaging for later use. A stainless steel rack (e.g., grill for barbecue) can often help drying activities.

After the decontamination area is set up, equipment decontamination is comprised of four general steps:

- Removal of gross (visible) contamination
- Removal of residual contamination
- Prevention of recontamination, and
- Disposal of wastes associated with the decontamination

6.2 Remove Gross Contamination

Gross contamination generally applies to soil sampling equipment, which may have significant residue clinging to the piece of equipment. This can be removed by dry brushing or scraping or by a high-pressure steam or water rinse often, in areas not grossly contaminated, steam washes may be all that is applied to larger equipment, such as drill casings. If utilizing high-pressure steam or water, the rinse water should be containerized as investigation derived waste. Since a significant amount of wastes may be generated, this operation is often best conducted on a decon pad, which has been designed as a secondary containment

area to collect wastes. Materials used and generated during gross contamination removal should be treated in a similar fashion to the waste stream that is being utilized at the Site. For example, if groundwater is treated as hazardous waste at the site then decontamination water and/or drill cutting should be treated as hazardous waste and be properly disposed. Disposal of investigative derived waste should follow procedures outlined in the project specific documents.

6.3 Remove Residual Contamination

All sampling equipment used at the site must be cleaned prior to any sampling effort, after each sample is collected, and after the sampling effort is accomplished.

Removal of residual contamination consists of the following steps:

- Place the item in the first bucket (detergent wash) and scrub the entire surface area of each piece of equipment to be decontaminated. Utilize scrub brushes to remove all visible contamination. For submersible pumps, connect a length of tubing (dedicated to the cleaning process) to the pump and place the other end in the bucket and circulate the detergent wash water through the pump until the water runs clean or at least 1 minute. Change the water periodically to minimize the amount of residue carried over into the second rinse.
- Place the item in the second bucket (clear water rinse – tap or deionized water) and rinse. Change the water periodically to minimize the amount of residue carried over into the third rinse. Recirculate rinse water through the submersible pump for at least 1 minute.
- Place the item in the third bucket (deionized or distilled water) and repeat the rinsing procedure. Change water as necessary.

Unless the Work Plan or FSP directs additional rinses, place the item on a clean surface such as plastic sheeting to await reuse or packaging for storage (e.g., wrapping foil).

Wash water and materials from residual decontamination should be treated in a similar fashion to the waste stream that is being utilized at the Site. For example, if groundwater is treated as hazardous waste at the site then decontamination water and/or drill cutting should be treated as hazardous waste and be properly disposed. Disposal of investigative derived waste should follow procedures outline in the project specific documents.

6.4 Prevent Recontamination After Decontamination

After the decontamination process, equipment should be stored to preserve its clean state to the extent practical. The method will vary by the nature of the equipment. Protection measures include covering or wrapping in plastic or sealable plastic bags or wrapping with oil-free aluminum foil.

Section 7: Record Keeping

The decontamination method should be documented within the field documentation designated for the project. Entries documenting the procedure used, fluids used, lot numbers for fluids, and any changes and approval for changes should be entered into a bound field notebook or on project-specific forms (see Field Notes and Documentation SOP for field forms). Upon completion of the field activity, it is the responsibility of the field personnel to ensure the project/task manager receives copies of all of the field documentation.

Section 8: Quality Assurance/Quality Control

Quality assurances for sample handling centers upon following procedures outlined above and double checking as samples are collected. Checks should be performed either by field personnel, or preferably, by a project chemist or other personnel that constantly checks field COC forms versus laboratory receipt acknowledgment forms, discusses condition of samples as received by laboratory personnel, and communicates constantly with the laboratory project manager to prevent quality assurance issues from starting or becoming significant problems should they occur.

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Appendix B: Field Logs

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DAILY FIELD REPORT

TLC pilot well

Brown AND Caldwell

COMMENTS

Client/Project: Conductor casing lithologic log

0 - 3 ft bgs: Fill: light tan brown, fg - mg sand mixed with pebble sized angular granitic gravel and some cobble sized clasts

3 - 9 ft bgs: Clayey sand: dark ~~tan~~ brown, fg with some clay and traces tree roots

9 - 13 ft bgs: Sandy clay: reddish brown, firm minor fg sand and gravel, increasing sand with depth

13 - 20 ft bgs: Fluvial deposits: large rounded cobbles of well indurated fg S.S. with heavy FeOx, with some sand and clay

20 - 34 ft bgs: Sand: light tan brown, vfg - fg with minor silt and clay

34 - 36 ft bgs Sand(stone): fg - mg, dark brown to grey, poorly indurated

36 - 39 ft bgs: Sand: fg, dark tan brown, with interbeds of brownish black poorly indurated sandstone and minor silt

39 - 43 ft bgs: sand(stone): bluish grey, fg, very well indurated with seashells

Staff Initials:_____

Page ___ of ___

OVER

43-45 ft bgs: Sand: vfg, bluish grey
semi-well indurated portions
water encountered @ 43 ft bgs

45-50 ft bgs: clayey sand: bluish grey, vfg
with some clay and
minor gravels (chert & lithics)
to rounded cobbles, with
interbedded fg sandstone
and shell hash.

Brown AND Caldwell

Boring Log

Project Name: Soquel Pure Water TLC
Project No.: 152444 | 152610
Boring No.: TLP Pilot
Location: Soquel Creek
Coordinates:
Well No.:
Weather Cond.:
Water Table Depth:
Date Started: 2-11-2019
Drilling Contractor: Maggoria
Screen Length/Type:
Date Completed:
BC Inspector: K. Donahue
Sand Pack Amount/Type:
Total Depth:
Drilling Equip.: reverse rotary
Screen Slot Size:
Permit No:
Sample Method: Grab
Sump Installed/Length:
Ref. Elevation: ~131 ft amsl
Size/Type of Bit: 18" tricone
Riser Stickup:
Notes:
Hammer Weight/Fall:
Riser length/Type:
Completion type:
Soil Class System: Burmister
Development Method:
Monitoring Well Perm. ☐ Temp. ☐ Soil Boring Only ☐
FID/PID (model): —
Well Yield:
Soil Vapor Point ☐ ☐ Other: injection

Depth (ft bgs)	Sample No.	Recovery					Sample Description	Well Construction	Remarks
							1)Burmister Description 2) Munsell Color 3) Moisture content 4) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 5) Various (sed. structure, weathering, fracture intensity, etc.) 0-50 ft bgs logges on seperate sheets from 1/30-31/2019		
60							5GY 4/1 dark olive gray, hard, fine grain sand to silt, pyrite grains <1/8", feldspars, qtz, chlorite (?), vigorous fizz from matrix minor clay >> slightly sticky, mostly rock fragments >1/8 in fine sandstone		
65							same as above		
70							same as above w/ interbedded/mixed tan 5Y 7/2 siltstone(?) reacts to HCl moderate fizz, frags (shells?) platy in shape ~1/8" thick, subangular shape hard, samples slightly plastic-sticky fine sand stone to siltstone		
75							same as above increase in shells(?)		
80							same as above, decrease in shells, mod. fizz slightly plastick-sticky, fine sand to siltstone		
							85 ft same as above		
85							90ft Same as above, Medium plastic, friable break rock chips w/ fingernail, less shells Pyrite (?) in veinlette, siltstone		
90									

Brown and Caldwell

Boring Log

Project Name: FLC Pilot well | Project No. 152010 | Boring No.:

BC Inspector: K Donahue | Date Started: 2/11/19 | Date Completed:

Depth (ft bgs)	Sample No.	Recovery	1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.) Sample Description	Well Construction	Remarks
90					
95			5GY 3/1 dark olive gray, shells 50% of sample, fizz strongly, breaks w/ finger nail mineral comp. same as above fine sandstone to silt stone		
100			5GY 4/1 dark olive gray silty clay, medium plastic not sticky, soft, 5-7% shells, very little fizz Qtz, chlorite, micas, felds - silt stone		
105			same as above Slight fizz, Softy, Slightly stick 1-3% shells - silt stone		
110			Same as above, high plasticity → good ribbon sticky, Stiffer, clay content higher, no shells silt stone – claystone		
115			Same as above		P DEF unit ? Diagenesis ↓
120			dark olive claystone, very slight fizz Soft, mark w/ finger nail, no shells, high plastic sticky, stiff, no shells		
125			Same as above		
130			Same as above		
135			Same as above		
140			Same as above		

Brown AND Caldwell

Boring Log

Project Name: TLC Pilot well | Project No. 152610 | Boring No.:

BC Inspector: KDonahue | Date Started: 2/11/19 | Date Completed:

1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description (below kelly bushing (ft bkb))	Well Construction	Remarks (→ ~5 ft above to pot)
140					conductor casing.
145			5GY 4/1 dark olive gray, high plastic sticky, stiff, no shells, slight fizz, claystone, friable, mark w/ finger nail		
150			silty/clay: dark olive grey, stiff		
155			same as above		
160			sandy clay: dark olive gray, stiff w/ minor fg sands & traces shells		CO
165			silty clay, dark olive gray, w/ shells soft, very little fizz		
170			silty clay: dark olive grey, soft with shell fragments		0900 WT = 9.4 lbs VIS = 31 s Sand = 4.5%
175			same as above, minerals observed Qtz chlorite minor mica (?)		
180			clayey sand: olive grey, fg-mg w/ shell fragments and some silt		CO & Clean shaker table
185			same as above, sticky clay, copper colored viscous material on sample → pipe dope (?)		1100 WT = 9.4 VIS = 32 Sand = 3%
190			silty clay: dark olive grey, stiff ~~4~~ some silts and minor vfg sands		

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152444 | Boring No.:
BC Inspector: N. Byler | Date Started: 2-11-2019 | Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery					Sample Description ft bkb	Well Construction	Remarks
190						195	dark olive gray, shells, felds, Qtz, chlorite 5GY 4/1 micas, slight fizz, siltstone fine to med sand + silt		1300 WT=9.4 VIS=31 Sand=4% API filter cake NA
195									
200							Silty sand: olive grey, fg-mg w/ shell fragments some silt, traces clay		1500 WT=9.3 VIS=30 Sand=4%
							same as above		
210							silty sand: olive grey, fg-mg w/ some silts and well indurated sandstone stringers		↑ D aquitard?
							215 ft bkb: sand (stone): olive grey fg-mg, w/ shell frags well indurated, calcareous		BC unit? ↓ CO
220							220 ft bkb: sandy clay, soft w/ some fg sand & shell frags, olive grey		
225							225 same as above		
230							230 ft bkb: silty sand, olive grey vfg-fg, w/ some silts, traces s.s. stringers		
235							235 same as above		
240							240 bkb: silty sand, olive grey fg, w/ traces silt and s.s. stringers		CO

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152 444 | Boring No.:

BC Inspector: N. Byler | Date Started: 2-11-2019 | Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
240			ft bkb 245 same as above		1700 WT = 9.4 lb/ft Vis = 31 s sand = 3.5%
245			250 5GY 4/1 dark olive gray, sticky, slightly stiff, min - Qtz, felds, micas, slight fizz very few shells >5% silty sandstone		
250			255 rock fragments of hard medium sandstone dark olive gray, fizz strongly, qtz, felds micas		1900 wt 9.4 Vis 31 Sand 4%
255					
260			260 medium to coarse grained sandstone dark olive gray, Qtz, chlorite, micas, folds hard rock frags, some fines => silty sand		
265			Medium sandstone, silt increase, slightly sticky, no fizz		2100 Wt 9.6 V 30.0 Sand 9.6
270			fine sandstone, no fizz, same mineralogy as above		
275			same as above - fine sandstone, no shells		
280			stiffer, low plasticity, clay sand fine sand, same mineralogy >10% shells no fizz		
285			dark olive gray silty, fine sand med plasticity, no fizz, no shells		
290			Clayey sand, stiff sticky, fine sand		

Brown AND Caldwell

Boring Log

Project Name: TLE Pilot well
Project No. 152610
Boring No.:
BC Inspector: KDonahue
Date Started: 2/4/19
Date Completed:

Depth (ft bgs)	Sample No.	Recovery					1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.) Sample Description	Well Construction	Remarks
290									2300
295							dark olive clayey sand, stiff, med plastic fine sand, low fizz 1-3% shells		Vis -30.0 wt - 9.6 Sand 9.5
300							fine grained sand, clayey, sticky 5-10% shells, no fizz, same mineralogy clayey fine sand		
305							same as above - <3% shells		
310							same as above		
315							hard fine sandstone, shells ~50%, strong fizz, Qtz, felds, micas, chlorite		
320							Silty clay, stiff, low plasticity dark olive gray, same mineralogy as above no fizz Silty clay stone		
325							same as above ~3% shells		
330							clayey fine sand, some harder rock fragments, no fizz 35% shells		0100 vis - 33 wt - 9.6 Sand - 5%
335							same as above, less shells 10% stiff, clayey fine sand		
340									

Brown AND Caldwell

Boring Log

Project Name: TLC Pilot Well
Project No. 152610
Boring No.:
BC Inspector: K Donahue
Date Started: 2/11/19
Date Completed:

Depth (ft bgs)	Sample No.	Recovery					Sample Description (1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.)	Well Construction	Remarks
340							Silty fine sand, dark olive gray, soft, Slightly Sticky, Qtz, chlorite, micas, felds, no fizz		0300 vis - 32 wt - 9.6 Sand - 5%
							Silty sandstone		
345							harder medium grained sandstone, Qtz, chlorite, micas, clayey fine to Med sandstone vigorous fizz, color same		
350							fine sand w/clay, sticky, plastic no fizz, color same		
355							Coarse sand, Qtz, felds, hematite (?) fine grained shells 10%, no fizz, color same		
360							clayey fine sand, stiff, gritty, Sticky Medium plasticity, same mineralogy no fizz, color same		
365							clayey coarse sand, same mineralogy minor fizz from clay, color same 10% shells		
370							clayey medium sand, stiff, sticky no fizz, low plasticity, mineralogy and color same, no shells		
375							same as above		
380							Silty-clay Medium sand, softer, sticky color & mineralogy same, no shells, no fizz		
385							Same as above		
390							same w/ slight increase in clay, Stiff		

Brown AND Caldwell

Boring Log

Project Name: TLC Pilot well
BC Inspector: K Donahue
Project No. 152610
Date Started: 2/11/19
Boring No.:
Date Completed:

1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery					Sample Description ft bkb	Well Construction	Remarks
390									
395							5GY 4/1 dark olive gray, silty-clayey medium sand, stiff, no fizz, low plasticity mineralogy, Qtz, felds, chlorite, no shells		0500 VIS - 30 wt - 9.5 Sand - 5%
400							400': silty clay: olive grey, soft w/ poorly indurated sandstone stringers		0800 WT = 9.2 lb/gal VIS = 32 s Sand = 3%
							405': silty clay: olive grey firm, traces shell frags		
410							410': silty clay, olive grey firm, w/ well indurated sandstone stringers		
							415': silty clay: olive grey firm, w/ shell frags & SS stringers		
420							420': silty clay: olive grey firm, w/ shell frags and well indurated S.S. stringers		1100 WT = 9.4 lb/gal VIS = 31 s sand = 3.5%
							425': silty clay, firm olive grey, moderate amount of S.S. stringers		
430							430': silty clay, firm, sticky olive grey, ~~[illegible]~~		CO
							435': sand(stone): olive grey fg-mg, well indurated w/ shell frags		↑ BC unit?
440							440': silty clay, olive grey firm, sticky		B aquitard? ↓

Brown AND Caldwell

Boring Log

Project Name: TLC Pilot well
Project No. 152610
Boring No.:
BC Inspector: N. Byler
Date Started: 2/11/2019
Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
			ft bkb		
			445: silty clay, olive grey firm, sticky		
450			450: silty clay, olive grey firm, sticky		
			455: silty clay, olive gray firm, sticky		
460			460: silty clay, olive gray soft		1300 WT = 9.3 VIS = 35 Sand = 2%
			465: silty clay, olive gray soft, w/ fg sandstone stringers		
470			470: silty clay, olive gray soft, w/ fg sand stone stringers		
			475: silty clay, olive grey soft, w/ traces s.s. stringers		
480			480: silty clay, olive gray soft w/ traces fg sand		
			485: silty sand, olive gray mg-cg, w/ shell frags		1600 WT = 9.3 VIS = 32 Sand = 0.7%
490			490: sand: olive gray, mg-cg w/ shell frags, qtz, ksper, lithics		

Brown AND Caldwell

Boring Log

Project Name: TCC injection well
Project No. 152610
Boring No.:
BC Inspector: K. Donahue
Date Started: 2-11-2019
Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery					Sample Description ft bkb	Well Construction	Remarks
							495: silty clay, olive grey, soft, w/ minor vfg sand		
500							500: sandy clay, olive grey stiff, w/ vfg sands		
							505: silty clay, olive grey firm, w/ traces s.s. stringers		
510							510: silty clay, olive grey, soft, w/ minor vfg sands, and s.s. stringers		1800 WT - 94 lb/gal VIS - 31 s Sand - 1%
							515: silty clay, olive grey firm.		
520							520: silty clay, olive grey firm.		CO
							525: No sample		
530							530: 5GY 4/1 dark olive gray stiff clay, firm, no fizz.		
							535: same as above		
540							540: same as above		

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152610 | Boring No.:

BC Inspector: K. Donahue | Date Started: 2-11-2019 | Date Completed:

Depth (ft bgs)	Sample No.	Recovery	1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.) Sample Description ft bgs	Well Construction	Remarks
540					2000 Vis-30 wt-9.4 Sand-1.5%
545			545: Same as above, hard claystone dark olive gray, no fizz		
550			550: clayey fine sand, med plasticity no fizz same color as above		↑ B aquifer?
555			555: dark olive gray fine grained sandstone - hard, minor shells, shells fizz		A unit?
560			560: clayey medium grained sand soft, slightly stick, same color, no fizz		↓
565			565: same as above w fragments of hard sandstone		
570			570: same, increase in hard sandstone fragments, and fragment size		
575			575: Clayey fine sand, soft, ~~med~~ med plasticity no fizz, visable Qtz grains		
580			580: Same as above		
585			585: Same as above		
590			590: dark olive gray, clayey fine sand, soft - med plasticity, no fizz		0400 Vis 30 wt 9.5 Sand 10%

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152610 | Boring No.:

BC Inspector: K. Denhve | Date Started: 2-11-2019 | Date Completed:

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
590			1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.) ft bgs		
595			595 : dark olive gray, soft a clayey fine sand, Med plasticit no fizz, nos hells		
600			600 : same as above		
605			605 : less clay, stiffer + grittier : dark olive gray clayey sand no fizz, med plasticity,		
610			610 : less clay, lower plasticity, stiff, no fizz, no shells fine sand w/ minimal clay		
615			615 : same firm fine sand w/ clay as above		
620			620 : clayey sand : olive gay vfg-fg, traces s.s. stringers & shells N625 drilling slower, rig chatter		600 Vis 31 w 9.7 Sand 1%
625			625 : Clayey Sand : olive gay vfg-fg, traces ss stringers & shells		
630			630 : Sandy Clay : olive gay soft, traces shell fragg		
635			635 : Sandy clay : olive gay soft, traces shell fragg		
640			640 : Sandy clay : olive gray soft, w/ traces shell fragg		

Brown AND Caldwell

Boring Log

Project Name: SLC injection well
BC Inspector: K. Donahue
Project No. 152610
Date Started: 2-11-2019
Boring No.:
Date Completed:

Depth (ft bgs)	Sample No.	Recovery	Sample Description (1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.) ft bkb	Well Construction	Remarks
			0 clayey sand: olive grey, vfg-fg w/ moderate soft clays		
			645: [redacted]		
650			650: sand [redacted]: dark olive grey mg-cg [redacted], w/ minor shell frags		0800 WT 9.7 lb/gal VIS 31 s Sand 4%
			655: Sand (stone): dark olive grey, fg-mg, well sorted		
660			660: sand (stone): dark olive grey, fg-mg, w/ minor shell frags		bit chatter
			665: sand(stone): dark olive grey, fg-mg, well sorted		1000 WT - 10.0 lb/gal VIS - 31 s Sand - 5%
670			670: sand: dark olive grey, mg-cg, w/ sandstone stringers, qtz & chert		
			675: Sand (stone): dark olive grey, fg-mg w/ mg-cg sand		
680			680: sand: dark olive grey, mg-cg, chert, qtz and lithics		1200 WT - 9.2 lb/gal VIS - 30 Sand - 1%
			685: Sand(stone): bluish grey to dark olive grey, fg-mg, calcareous		
690			690: chert, andesite? glaucophane? (as above)		CO

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152610 | Boring No.:

BC Inspector: K. Donahue | Date Started: 2-11-2019 | Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
690			ft bls		1400 WT-9.3 lb/gal VIS-32 s Sand-1%
695			695: Sand(stone): bluish to dark olive grey, fg-mg, calcareous		
700			700: Sand: mg-cg, olive grey with fg s.s. stringers		
705			705: sand(stone): olive grey, fg-mg, sub-angular to angular		
710			710: clayey sand: dark olive grey, vfg-fg with moderate amounts of clay. minor ss stringers		CO 1600 WT-9.3 lb/gal VIS-30 s Sand-1.5%
715			715: clayey sand: olive grey, cg w/ moderate clay & some s.s. stringers qtz & chert		
720			720: dark olive gray, coarse to medium sandstone, possible sulfides vigour fizz from matrix, Qtz, mica, chert lithics, magnetite		1800 WT-9.2 lb/gal VIS-30 s Sand-1%
725			725: Same as above increase in clayey matrix, fizz vigously clayey sandstone		
730			730: same as above. calcareous white matrix clayey sand, color darker still dark olive grey		
735			735: same as above clayey coarse sand clasts of clay-fine silty unit visible sulfides in lithics		2000 Vis 30 wt 9.3 Sand 1.5%
740			740: Same as above clayey coarse sand		

Sample for XRD + SEM

Brown AND Caldwell

Boring Log

Project Name: TLC injection well | Project No. 152 610 | Boring No.:

BC Inspector: K. Donahue | Date Started: 2-11-2019 | Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description ft bgs	Well Construction	Remarks
740					2200 Vis 30 wt 9.4 sand 1.5
745			745: Clayey sand, coarse grained, white-ltgray calcareous matrix visible Qtz, lithics, flourite(?), sulfides v.fine grained pyr. disseminated + veins		
750			750: Medium sand, little clay Qtz lithics, micas, sulfides on rock fross low fizz in clay		
755			755: Same as above		
760			760: Same sand as above, carbonate Matrix visable holding sand grains together, fizz weakly, sulfides noted Purple flourite (?)		2400 Vis 30 wt 9.5 sand 1.5
760			765: same as above		
770			770: Same as above		
775			775: Same as above		
780			780: Same as above		
785			785: Same as above		
790			790: Same as above		

Brown AND Caldwell

Boring Log

Project Name: The Indian Well
Project No. 152 610
Boring No.:
BC Inspector: K. Donahue
Date Started: 2-11-2019
Date Completed:

1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
			795: Medium grained Sand, White matrix mostly absent from sample, lithics mix → Qtz, sulfides, flourite, micas Matrix fizzes		0200 Vi 30 wt 9.5 Sand 2
800			800: Same Sand unit as above w/ a lense of clayey fine sand clayey sand no fizz		0400 Vis 31 wt 9.6 Sand 2.5
			805: Medium sand, mixed lithics and minerals,		POOH clean bit
810			810: silty sand: grey, cg, w/ qtz, chert & lithics		0700 VIS - 30 s WT - 9.4 lb/gal Sand - 1.5 %
			815: silty sand: olive grey, cg w/ qtz, chert, lithics & moderate silts		started to use PAC-L at ~810 collected sample of mud for analysis 2/15/19 2400
820			820: sand: olive grey, cg, w/ qtz, chert, & lithics		
			825: sand: olive grey, cg w/ qtz, chert, Kspar, lithics		
830			830: sand: olive grey, mg-cg, qtz, chert, Kspar, lithics		0600 Vis - 30 wt - 9.5 Sand - 2
			835: silty sand: olive grey, mg-cg w/ qtz, chert, Kspar & lithics		
840			840: sand (stone): bluish grey, mg w/ minor cg sand (qtz, chert) and traces yellowish grey silt stone		

Brown AND Caldwell

Boring Log

Project Name: TLC injection well
Project No. 152610
Boring No.:
BC Inspector: K. Donahue
Date Started: 2-11-2019
Date Completed:

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
			1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.)		
			ft bkb		bit chatter
			845: clayey sand: olive grey fg-mg w/ some cg sand & sandstone stringers		
850			850: clayey sand: dark olive grey fg-mg, w/ cg sand (qtz & clay) & s.s. stringers, traces yellowish grey siltstone		
			855: clayey sand: dark olive grey, fg-mg w/ mg s.s. stringers & moderate clay		
860			860: clayey sand: dark olive grey, fg-mg w/ s.s. stringers & clay	A ? A	0800 WT - 9.2 lb/gal VIS - 31 s Sand - 1.5%
			865: sand (stone): olive grey, mg w/ some clay & yellowish grey siltstone	AA ? ↓	
870			870: sandy clay: dark olive grey, soft, w/ fg sand & traces sandstone stringers		CO
			875: sand: dark olive grey, mg-fg, with clay & traces mg s.s. stringers		
880			880: silty sand: dark olive grey fg-mg, w/ s.s. stringers, cg qtz & clay & yellowish grey siltstone		1000 WT - 9.2 lb/gal VIS - 29 s SAND - 1.5%
			885: clayey sand: olive grey, fg-mg, w/ minor mg s.s. & yellow grey siltstone		
890			890: clayey sand: olive grey, fg-mg, w/ minor mg grey ss & yellowish-grey siltstone		CO

Brown AND Caldwell

Boring Log

Project Name: TLC injection well
Project No. 152610
Boring No.:
BC Inspector: K. Donahue
Date Started: 2-11-2019
Date Completed:

1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery	Sample Description	Well Construction	Remarks
			ft bls		
			895: clayey sand; dark olive grey fg-mg, with clay and traces s.s. stringers & yellowish gray siltstone		
900			900: sandy clay; dark olive grey, soft, sticky, w/ fg sand & traces S.S. stringers		1200 WT 9.1 VIS 30 s sand - 1.5%
			905: sandy clay; dark olive grey, firm, sticky, w/ s.s. stringers & yellowish gray siltstone		bit chatter
910			910: sand(stone); dark olive grey, fg-mg, well lithified w/ fg sand & clay		
			915: sandy clay; dark olive grey soft, w/ fg sand, & s.s. stringers		
920			920: clayey sand; dark olive grey vfg-fg, with clay and minor sandstone stringers		1400 WT 9.3 lb/gal VIS - 30 s sand = 2%
			925: clayey sand; dark olive grey vfg-fg, with clay & yellowish gray fg s.s.		CO
930			930: sand; dark olive grey, mg-cg with fg s.s. stringers & yellowish gray siltstone		
			935: silty sand; olive grey, vfg, w/ traces fg sandstone		bit chatter
940			940: sand(stone); olive grey, fg-mg, w/ clay and vfg-fg sand		

Brown AND Caldwell

Boring Log

Project Name: TLC injection well
BC Inspector: K. Donahue
Project No. 152610
Date Started: 2-11-2019
Boring No.:
Date Completed:

1)Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content
5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info.
6) Various (sed structure, weathering, fracture intensity, etc.)

Depth (ft bgs)	Sample No.	Recovery					Sample Description ft bkb	Well Construction	Remarks
							945: Clayey Sand: dark olive grey, vfg-fg, w/ clay & ss. stringers		
950							950: clayey sand: dark olive grey, vfg-fg, w/ clay & minor sandstone stringers		1600 WT - 9.2 lb/gal VIS - 30s Sand - 2%
							955: clayey sand, dark olive grey, vfg-fg, w/ clay & minor ss. stringers		
960							960: Sand(stone): olive grey, fg very well indurated, with clay and vfg sand		bit chatter
							965: clayey sand: dark olive grey vfg-fg, with poorly indurated ss. stringers		
970							970: clayey sand: dark olive grey vfg-fg, with clay & poorly indurated s.s. stringers		
							975: Clayey sand: dark olive grey, vfg-fg, with clay & s.s. stringers		
980							980: Clayey sand: dark olive grey, vfg-fg, with clay & sand stone stringers		1800 WT - 9.4 lb/gal VIS - 30s Sand - 2.5%
							985: clayey sand: dark olive grey, vfg-fg, with clay & s.s. stringers		
990							990: clayey sand: dark olive grey vfg-fg with clay & traces s.s.		

Brown AND Caldwell

Boring Log

Project Name: TL injection well
Project No. 152610
Boring No.:
BC Inspector: K. Dorrance
Date Started: 2-11-2019
Date Completed:

Depth (ft bgs)	Sample No.	Recovery	Sample Description (1) Burmister Description 2) USCS Sym. 3) Munsell Color 4) Moisture content 5) Fine (plasticity, toughness, dilatancy) and/or Coarse (grading, angularity) Info. 6) Various (sed structure, weathering, fracture intensity, etc.)	Well Construction	Remarks
900					0000
905			995: 5GY 4/1 clayey fine sand, sticky, Med plasticity, no fizz, rock frag mostly at harder fine sandstone, pic dog copper coat on inside of sample bag		Vis 30 Wt. 9.5 Sand 2.5%
1000			1000: same as above		
1005			1005 same as above		
1010			1010 same as above		
1015			1015 increase in amount of rock fragments, same as above well cemented sandstone, fizz vigorously matrix		
1020			1020 Stiff clay, same as above		

DAILY FIELD REPORT

COMMENTS

Client/Project: Pipe Tally

1/2

Brown AND Caldwell

(p1)

DP#	length	sum length (down)	time start	time stop	ROP (ft/hr)
1	[redacted]	bit + 2 collars = 25' + 30' = 55 ft bgs			
2	[redacted]	+ 40 ft kelly down = 85 ft bgs			
3	31.75'	116.75'	—	—	—
4	31.25'	148'	—	—	—
5	31.3'	179.3'	—	—	—
6	31.9'	211.2'	1159	1320	22.3
7	31.5'	242.7'	1516	1619	29.1
8	31.8'	274.5'	1653	1835	18.7
9	30.0'	304.5'	1900	2123	12.5
10	31.8'	336.3'	2210	0008	15.9
11	31.2'	367.5'	0035	0221	14.4
12	31.0'	398.5'	0415	0515	31.0
13	31.8'	430.3'	0847	1032	18.1
14	31.0'	461.3'	1126	1256	20.7
15	31.0'	492.3'	1340	1552	14.1
16	31.4'	523.7'	1620	1822	15.5
17	31.6'	555.3'	1904	2120	14.0
18	31.2'	586.5'	2200	2329	20.8
19	31.8'	618.3'	0315	0440	22.5
20	31.2'	649.5'	0526	0726	15.6 [redacted]
21	29.4'	678.9'	0938	1205	12.0
22	32.1'	711.0'	1347	1603	14.2
23	31.6'	742.6'	1715	2115	10.5
24	31.9'	774.5'	2145	~~1310~~ 1130	9.4
25	31.0'	805.5'	137	0510	6.8
26	31.6'	837.1'	330 [redacted]	610	8.6
27	30.0'	867.1'	[redacted] 0731	0840	26.1
28	31.5'	898.6'	0945	1121	19.7

Staff Initials: NB

[redacted]

2/2

Brown AND Caldwell

p2

DAILY FIELD REPORT

COMMENTS

Client/Project: Pipe Tally

DP#	length	sum length (down)	time start	time stop	ROP (ft/hr)
29	31.3'	929.9'	1223	1344	23.2
30	31.7'	961.6'	1424	1612	17.6
31	31.3'	992.9'	1655	1807	26.1
32	31.3'	1024.2	1915	2025	26.9

Staff Initials: NB

Appendix C: Sample Photos

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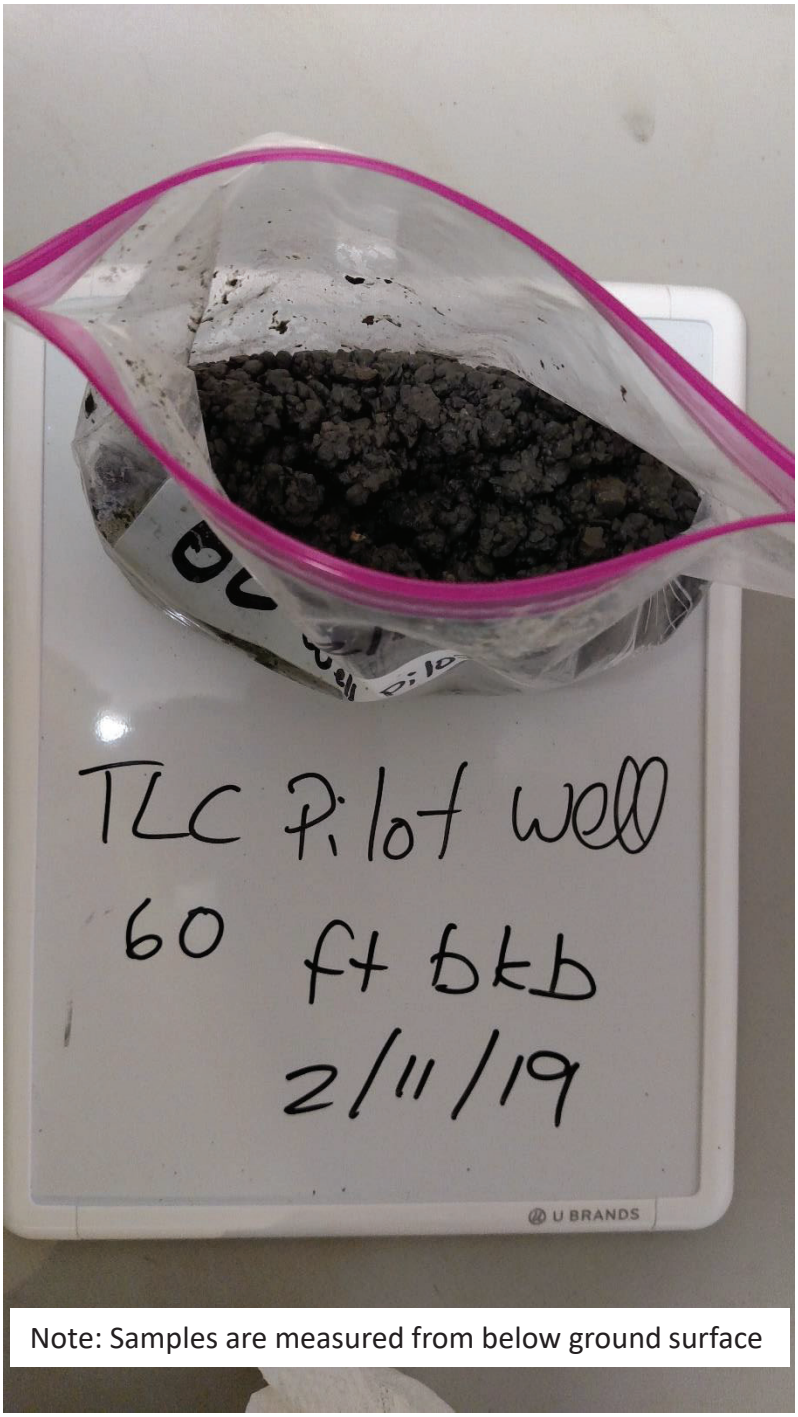
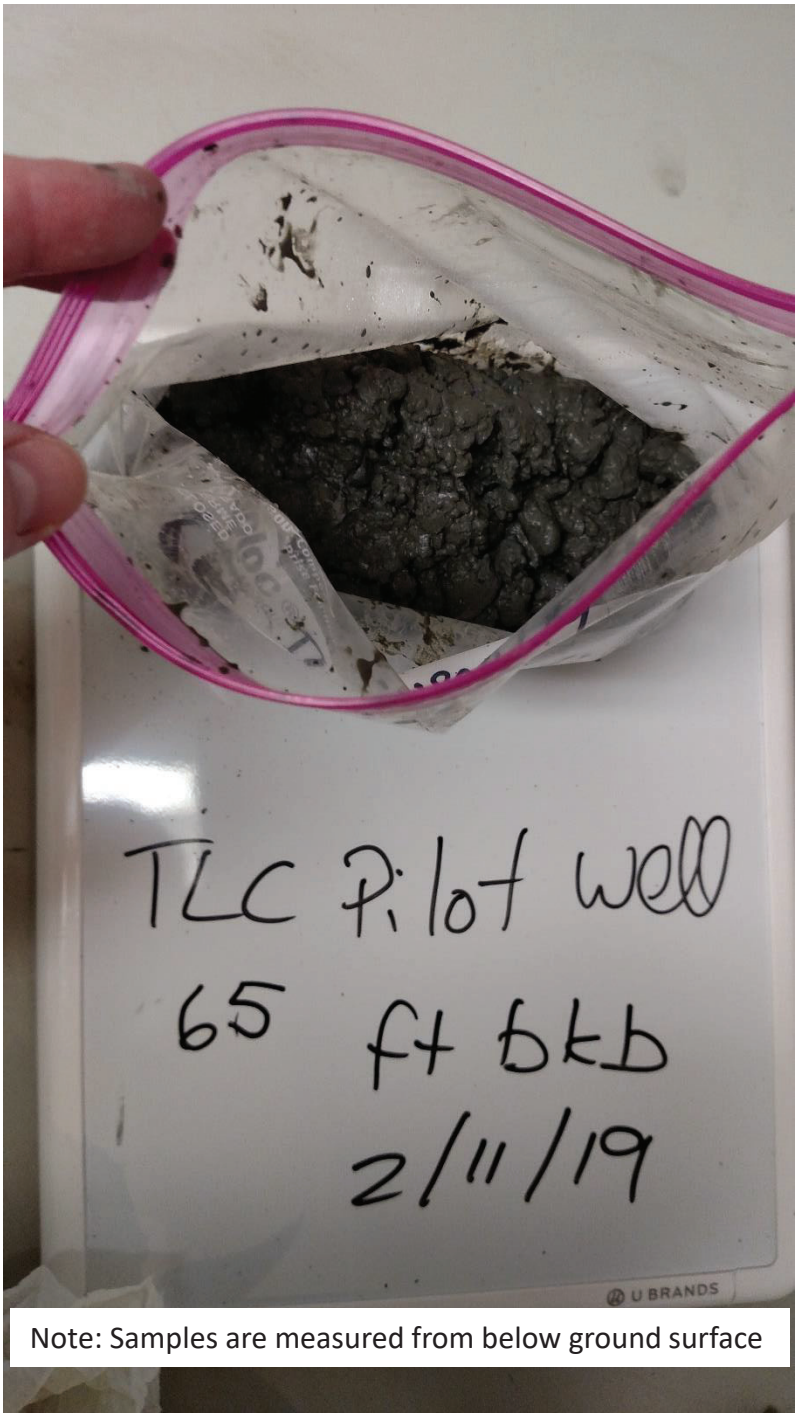


Note: Samples are measured from below ground surface

Figure C-1
Photograph of sample TLC Pilot Well 60 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-2
Photograph of sample TLC Pilot Well 65 ft

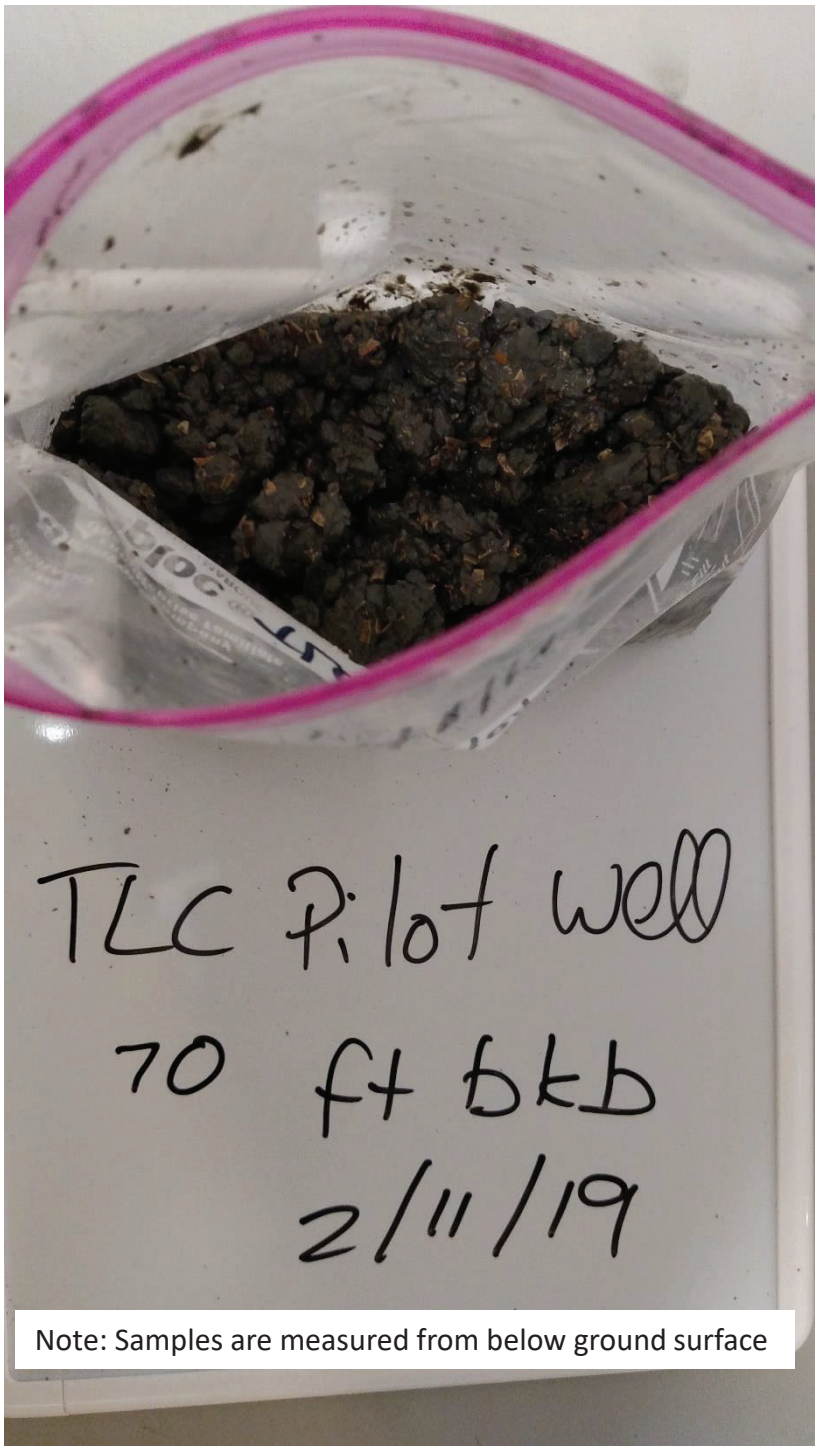
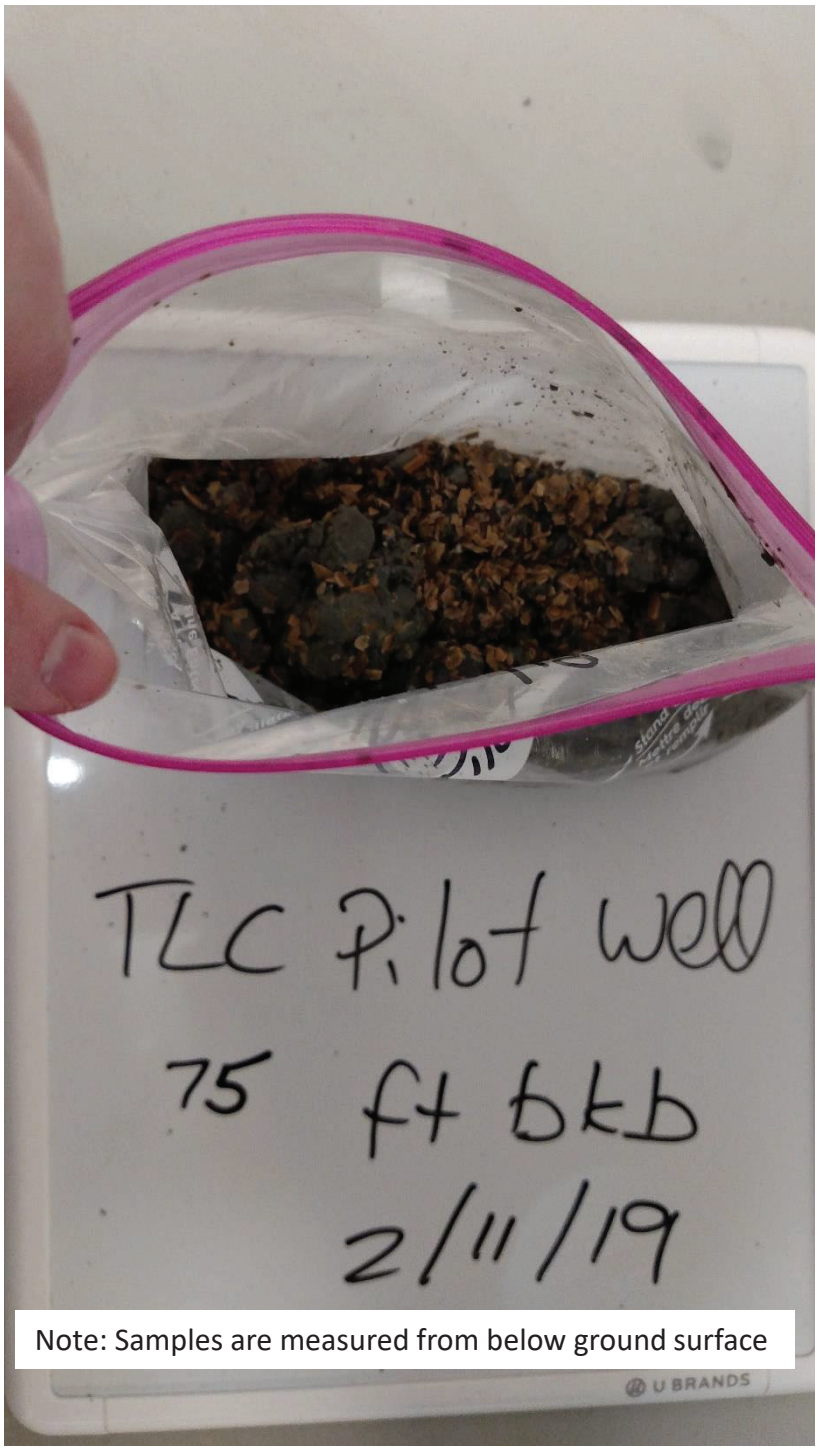


Figure C-3
Photograph of sample TLC Pilot Well 70 ft

Brown AND Caldwell

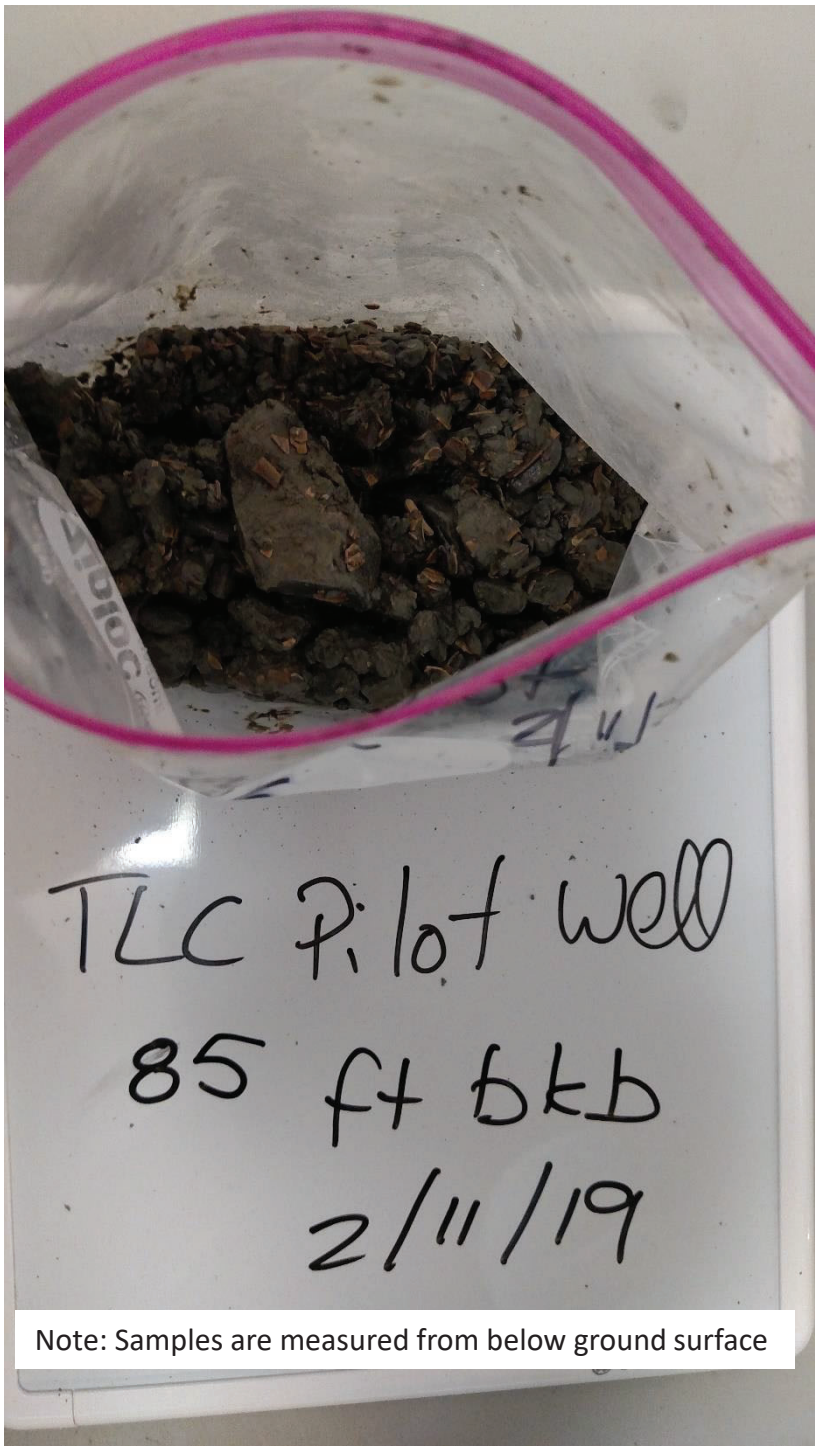


Note: Samples are measured from below ground surface

Figure C-4
Photograph of sample TLC Pilot Well 75 ft

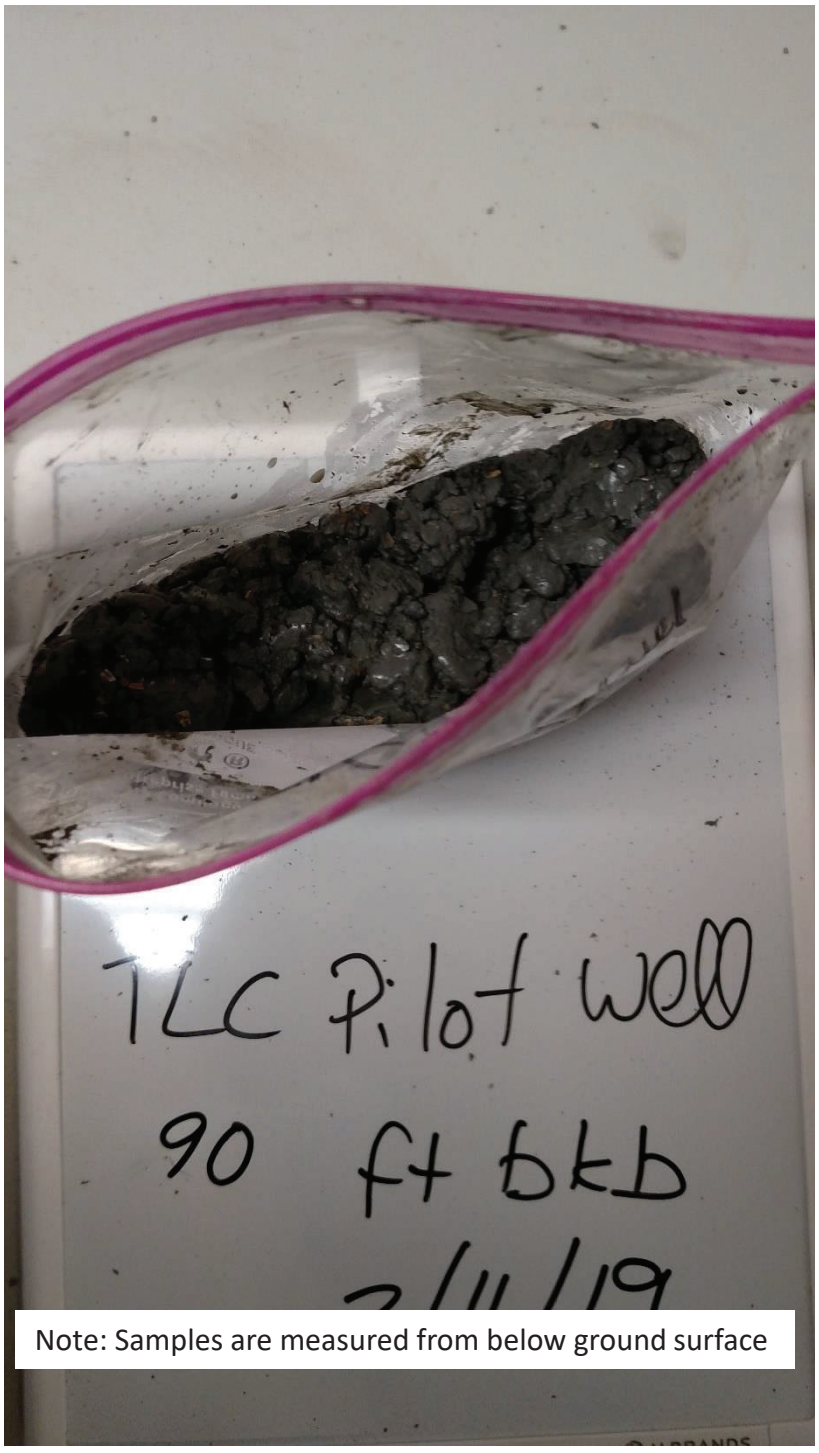


Figure C-5
Photograph of sample TLC Pilot Well 80 ft



Note: Samples are measured from below ground surface

Figure C-6
Photograph of sample TLC Pilot Well 85 ft



Note: Samples are measured from below ground surface

Figure C-7
Photograph of sample TLC Pilot Well 90 ft

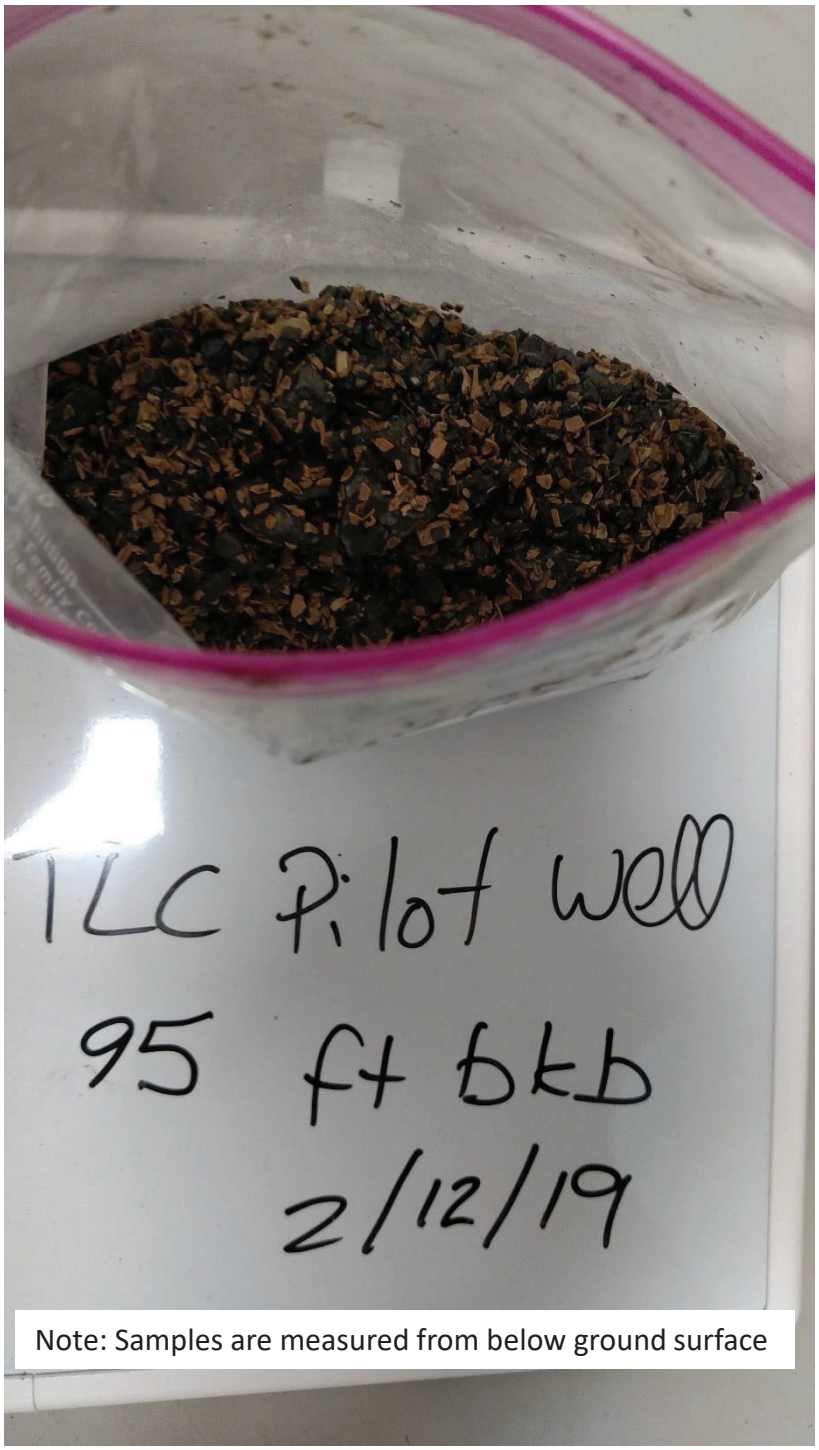


Figure C-8
Photograph of sample TLC Pilot Well 95 ft

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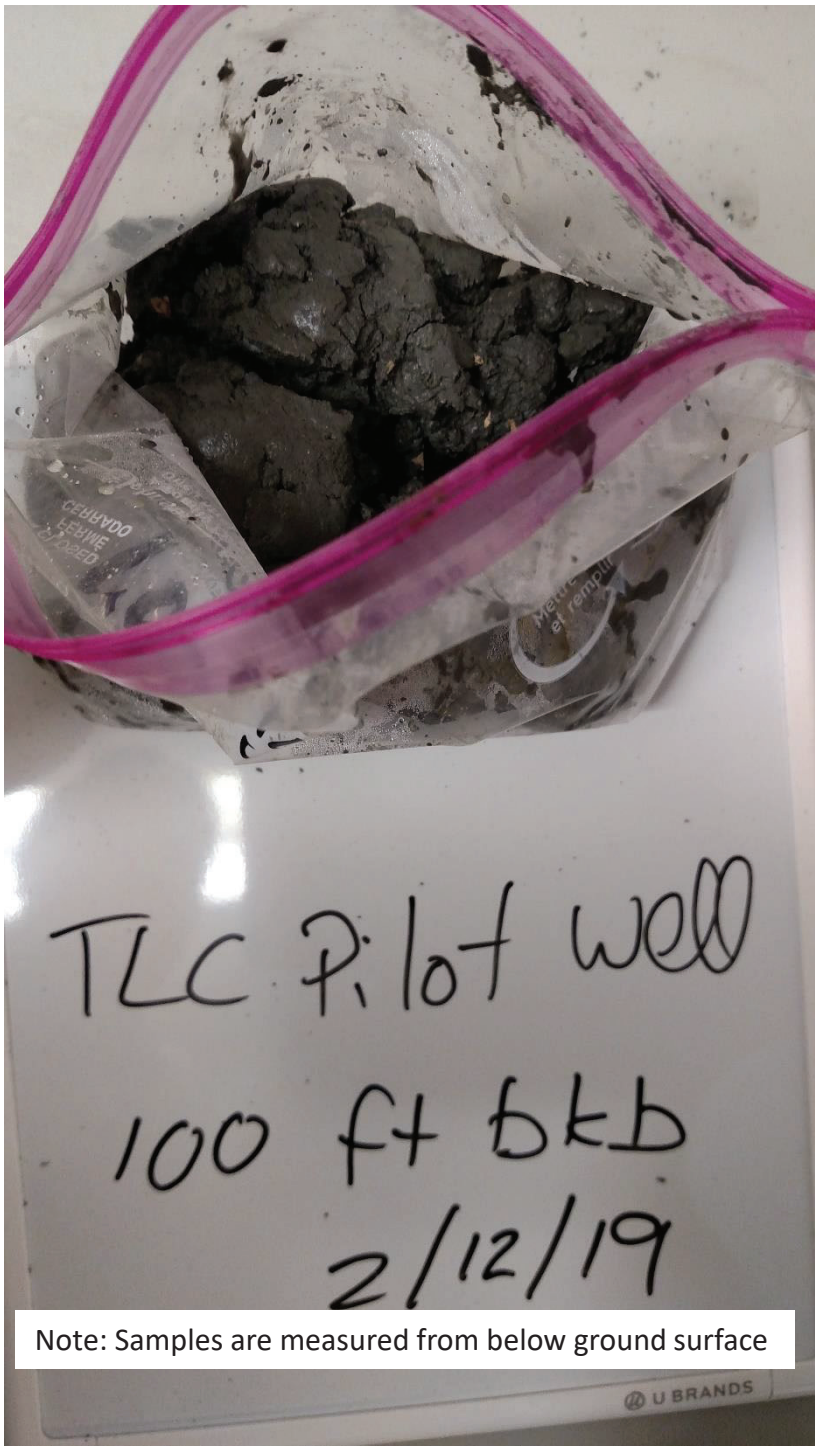
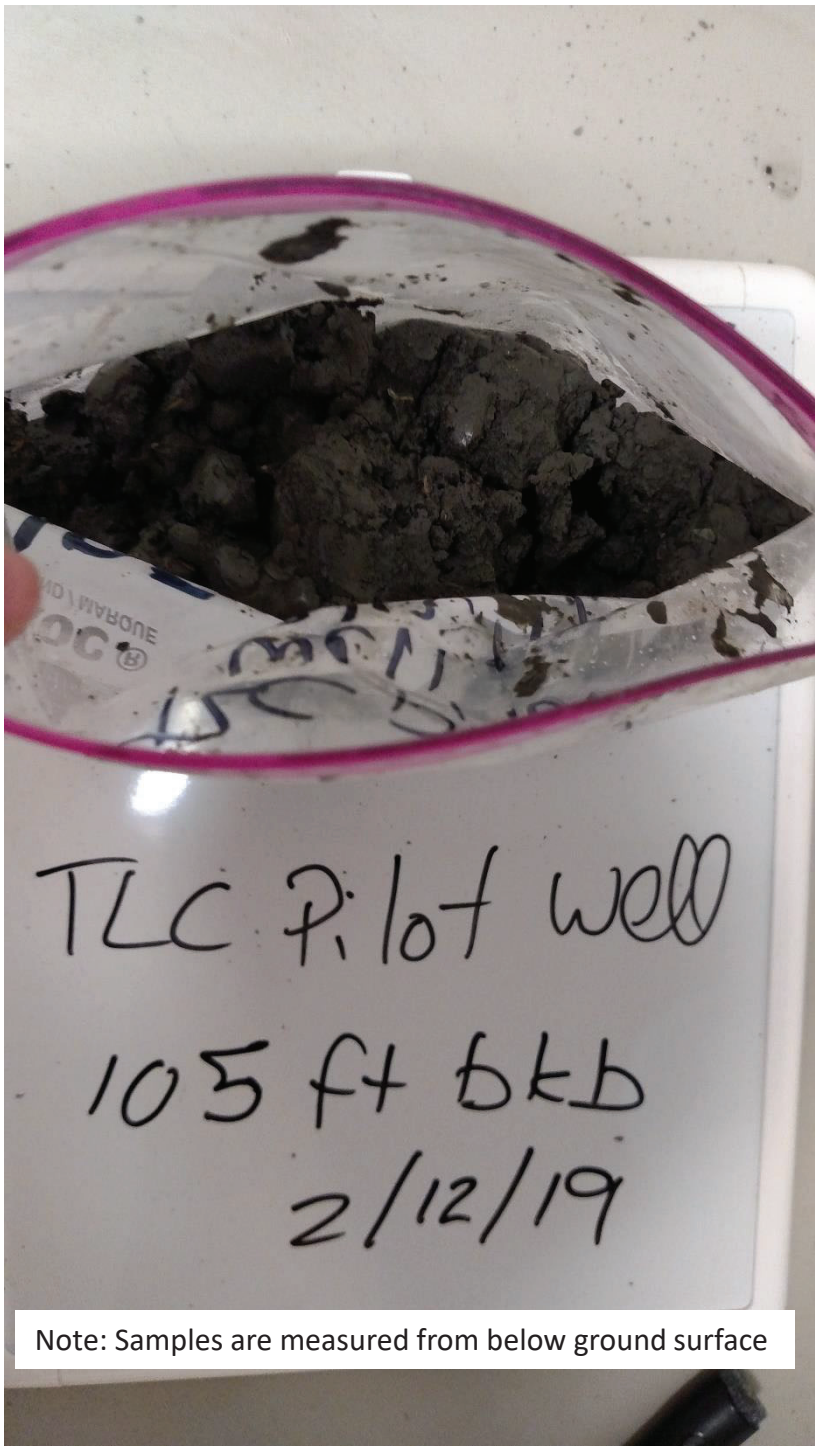


Figure C-9
Photograph of sample TLC Pilot Well 100 ft



Note: Samples are measured from below ground surface

Figure C-10
Photograph of sample TLC Pilot Well 105 ft

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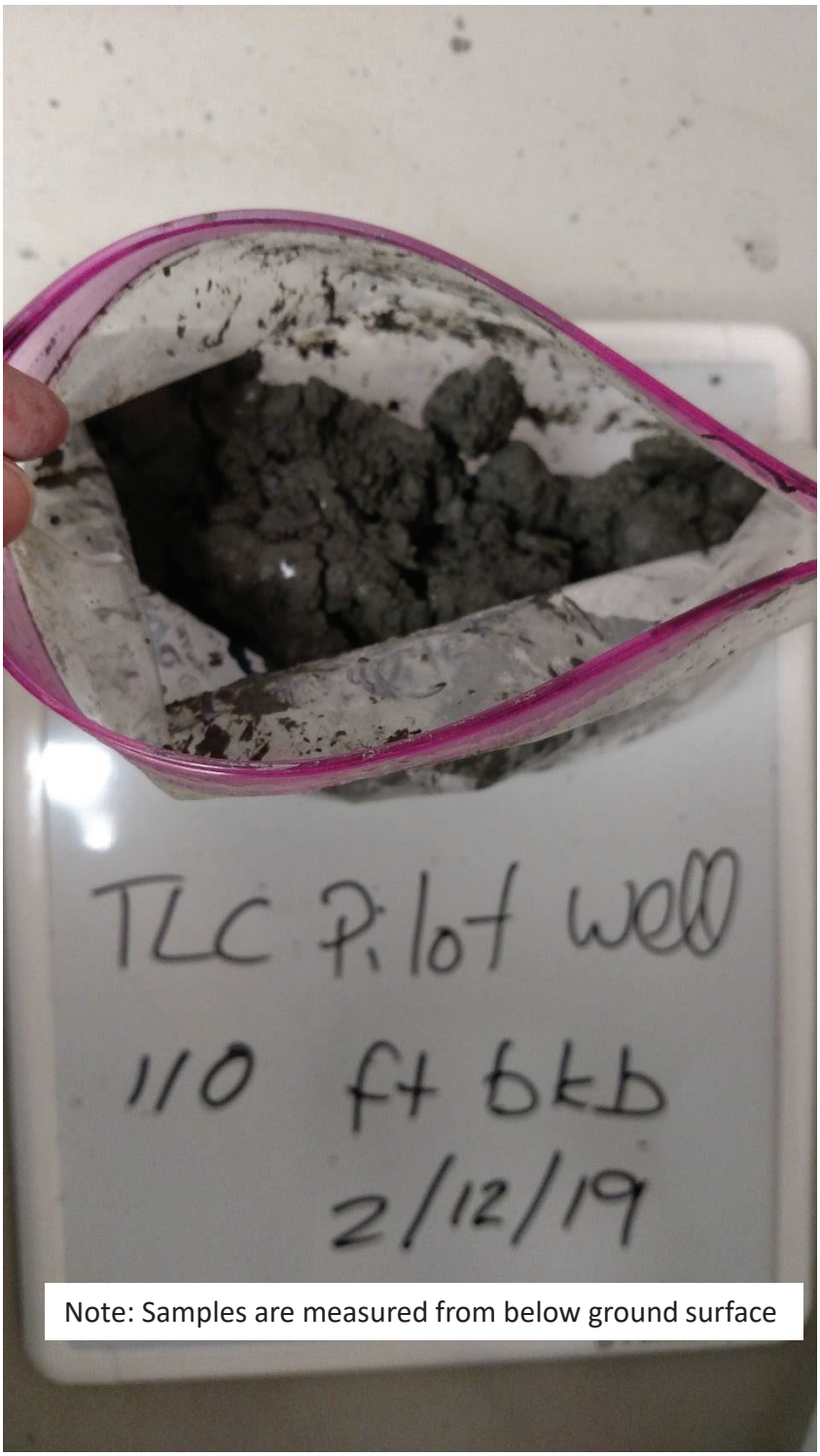


Figure C-11
Photograph of sample TLC Pilot Well 110 ft

Brown AND Caldwell

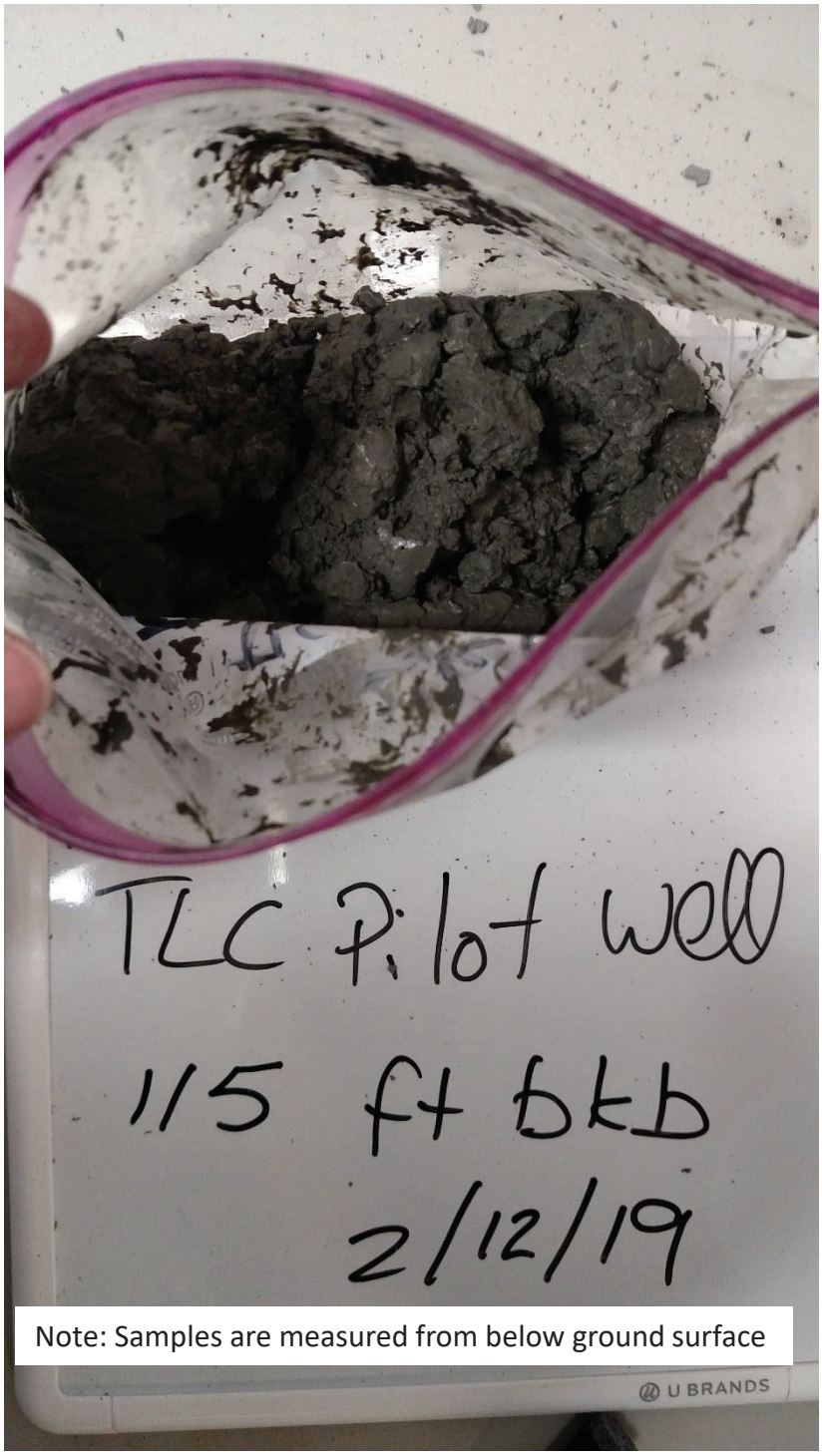
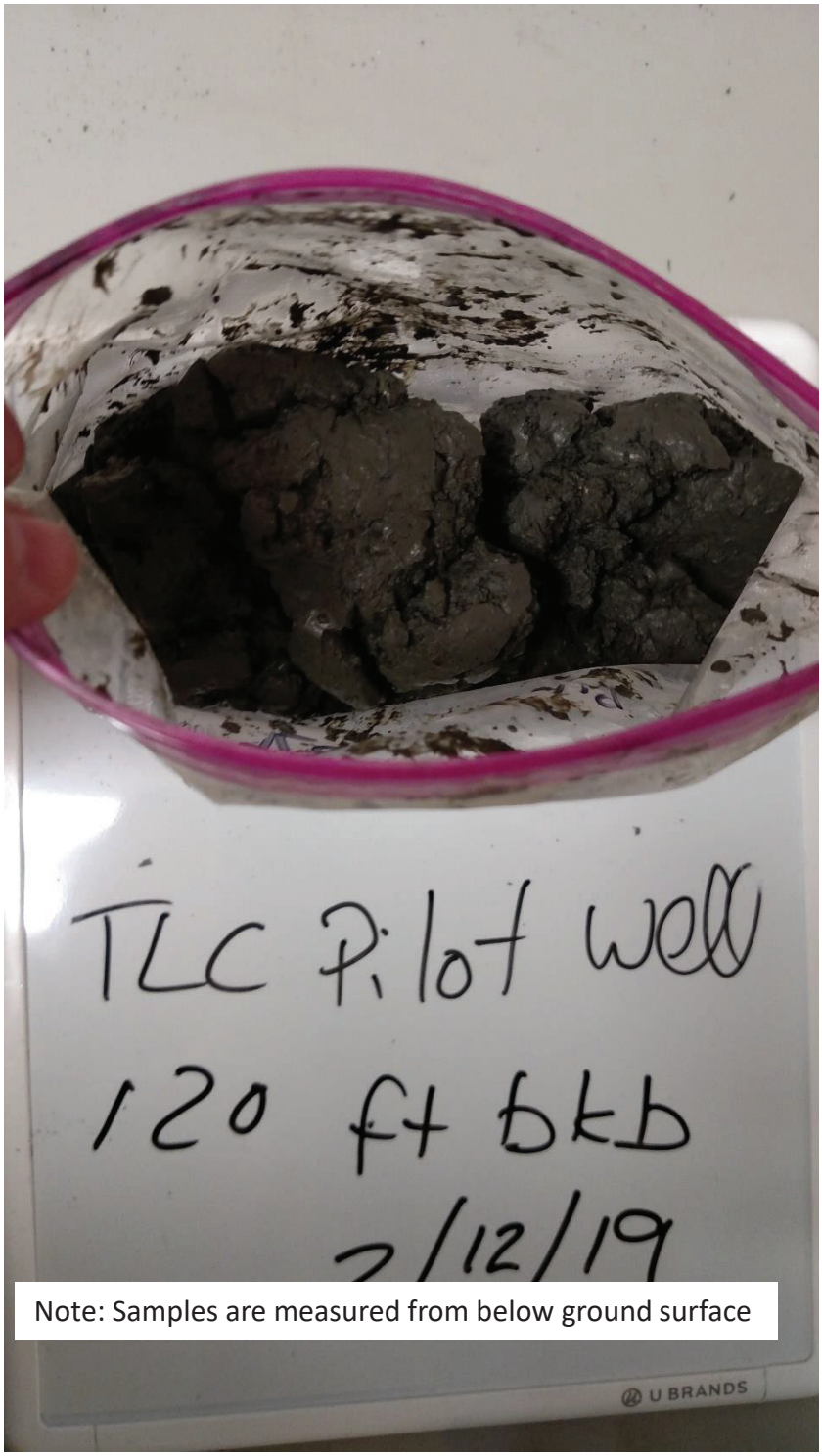


Figure C-12
Photograph of sample TLC Pilot Well 115 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



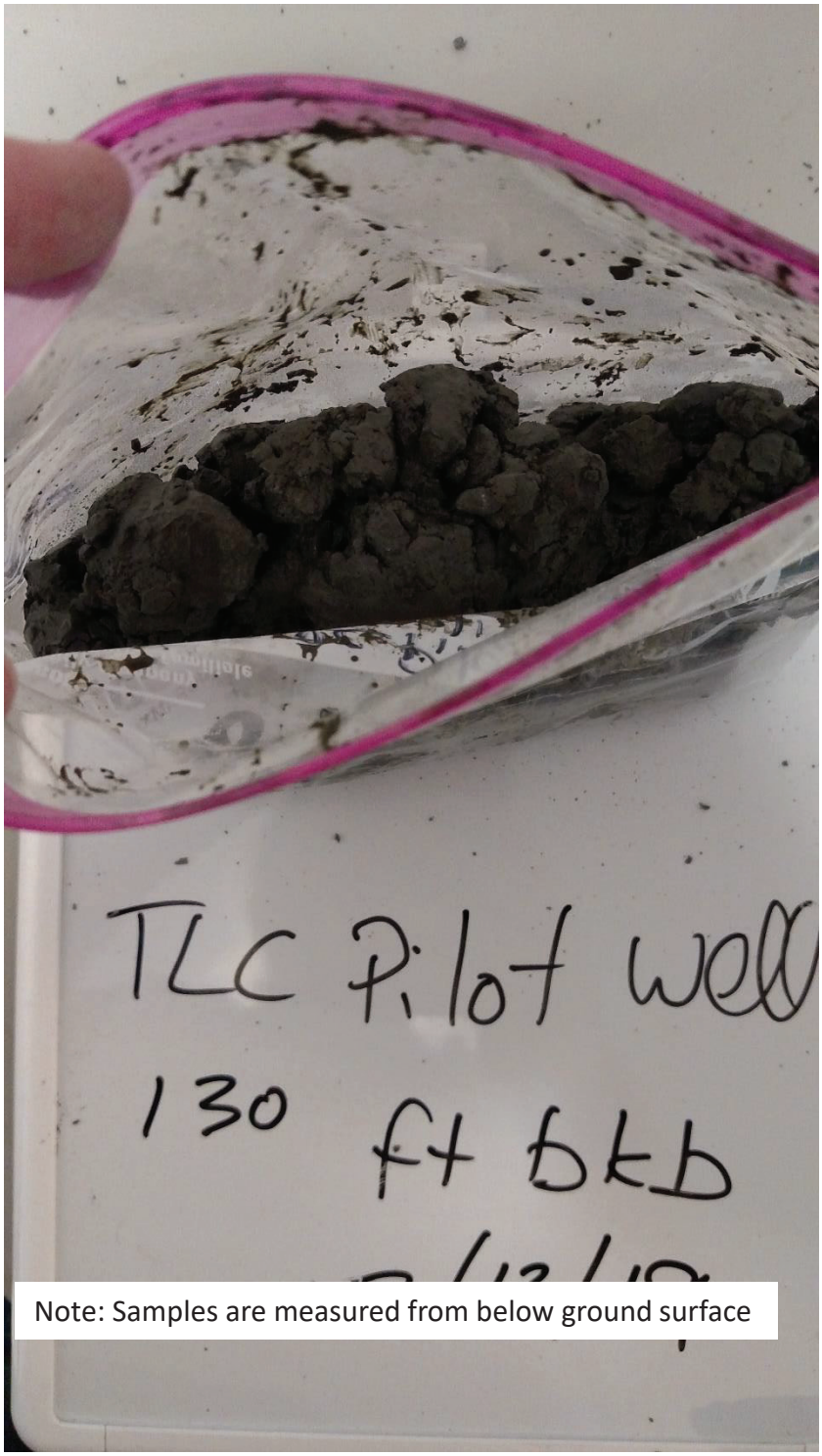
Note: Samples are measured from below ground surface

Figure C-13
Photograph of sample TLC Pilot Well 120 ft



Note: Samples are measured from below ground surface

Figure C-14
Photograph of sample TLC Pilot Well 125 ft



Note: Samples are measured from below ground surface

Figure C-15
Photograph of sample TLC Pilot Well 130 ft

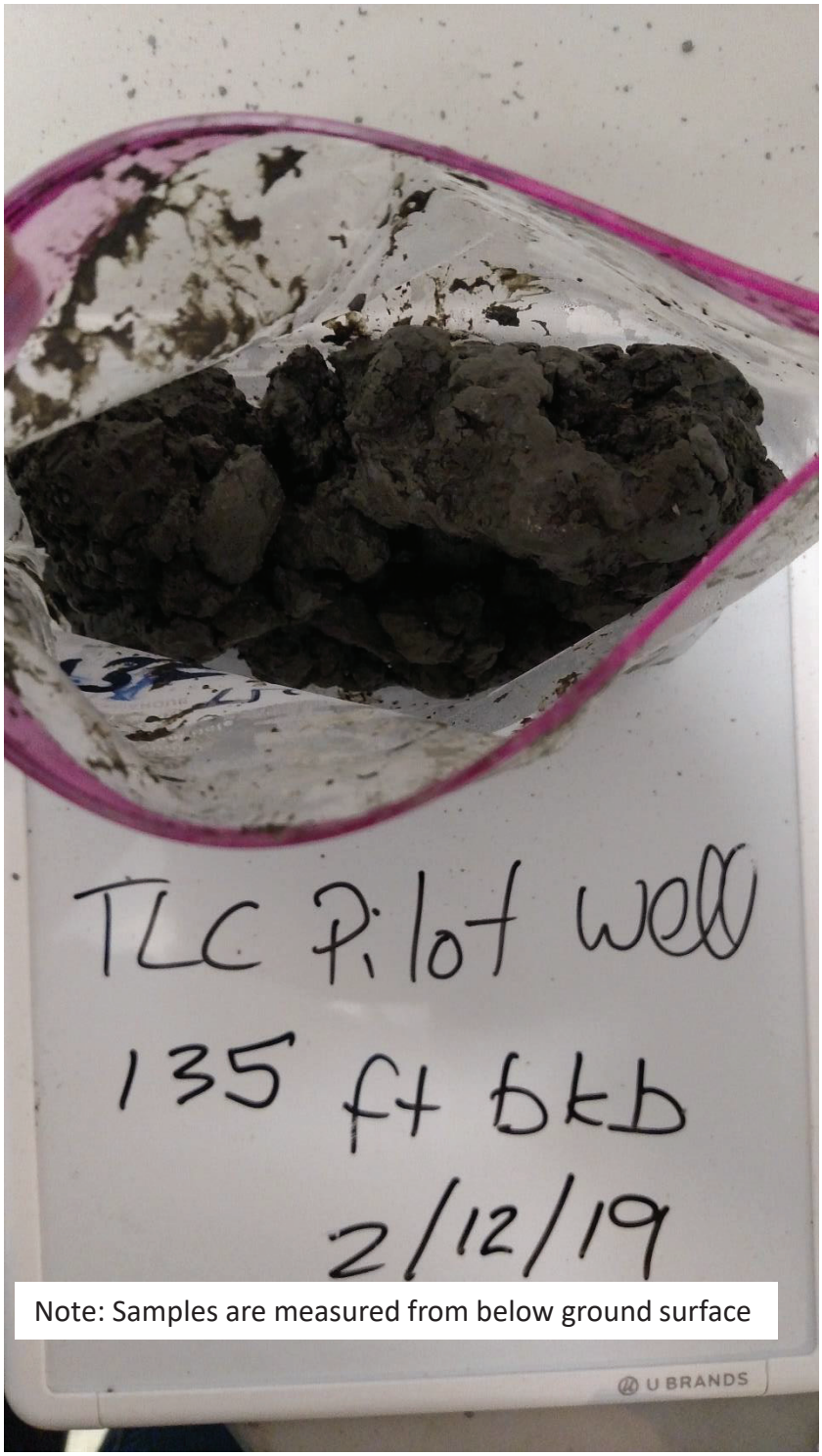
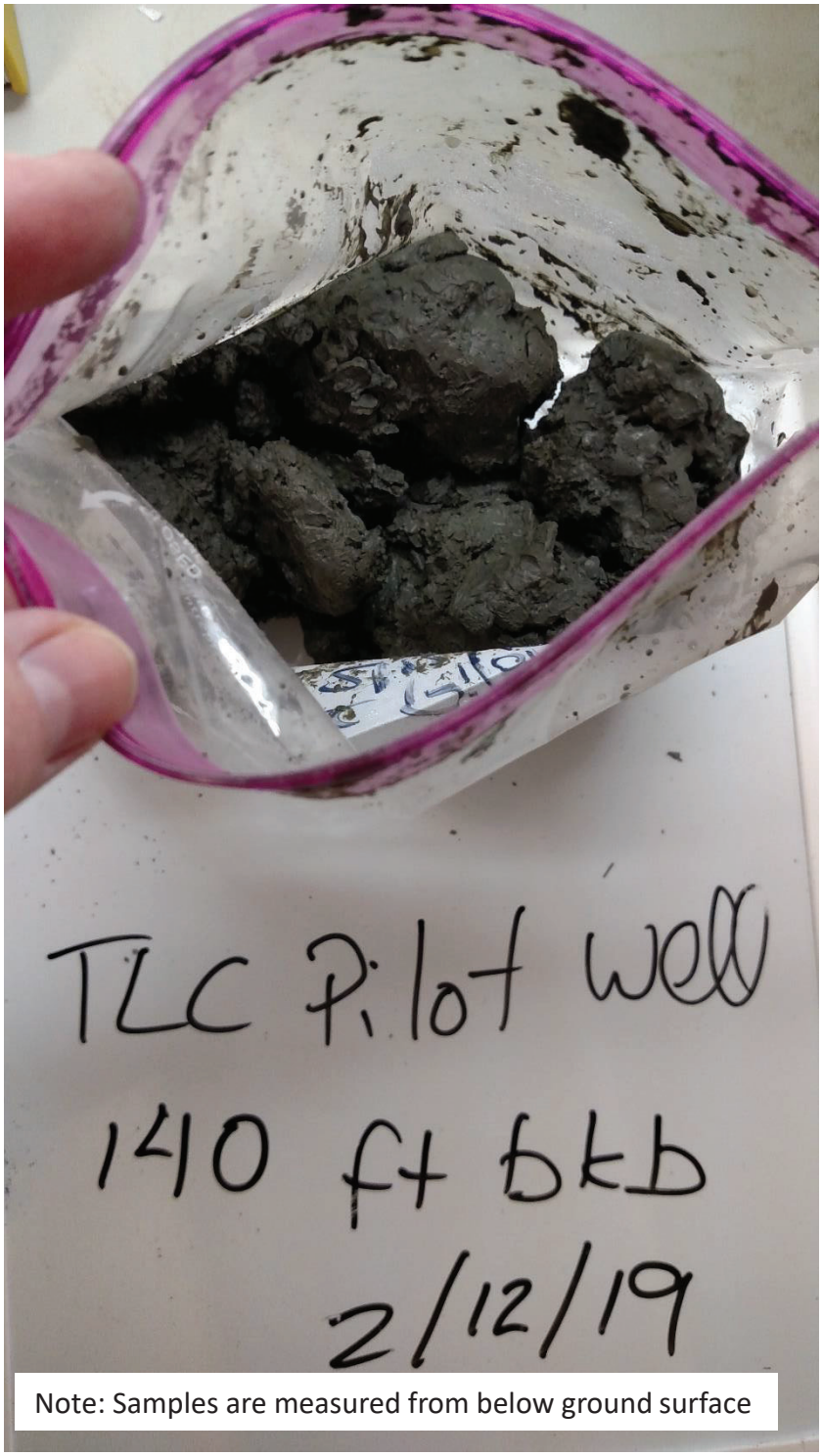


Figure C-16
Photograph of sample TLC Pilot Well 135 ft



Note: Samples are measured from below ground surface

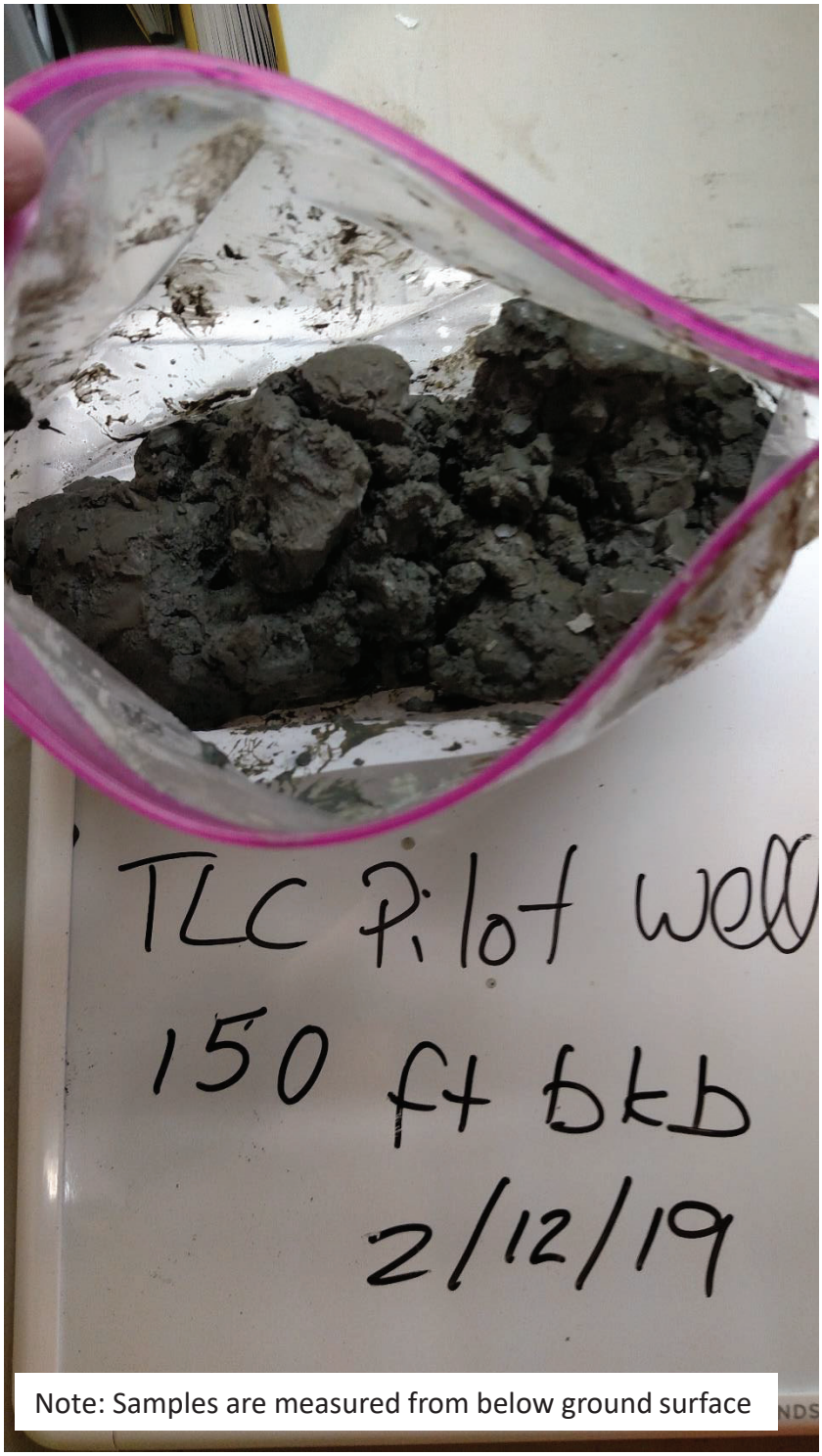
Figure C-17
Photograph of sample TLC Pilot Well 140 ft



Note: Samples are measured from below ground surface

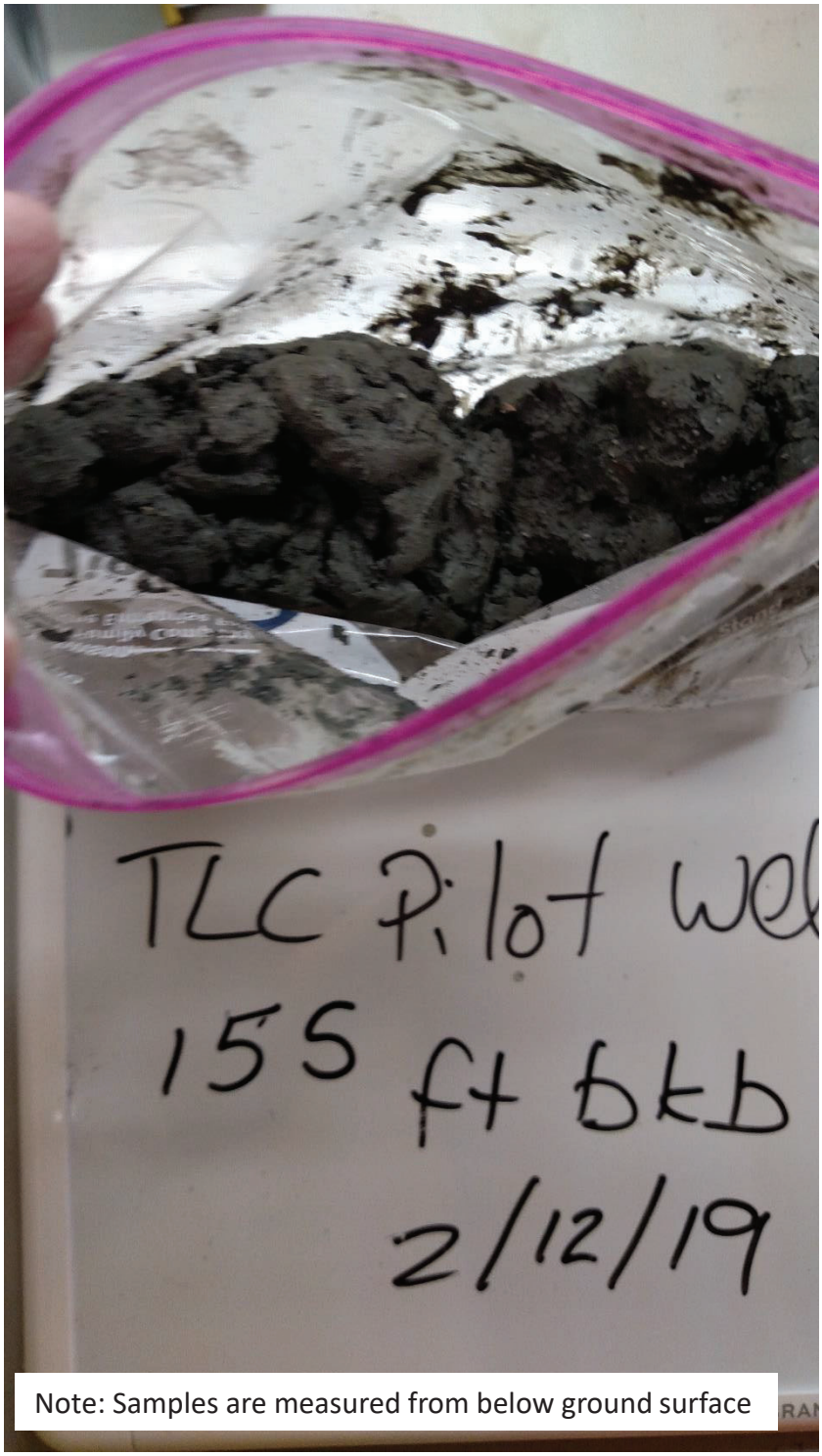
Figure C-18
Photograph of sample TLC Pilot Well 145 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-19
Photograph of sample TLC Pilot Well 150 ft

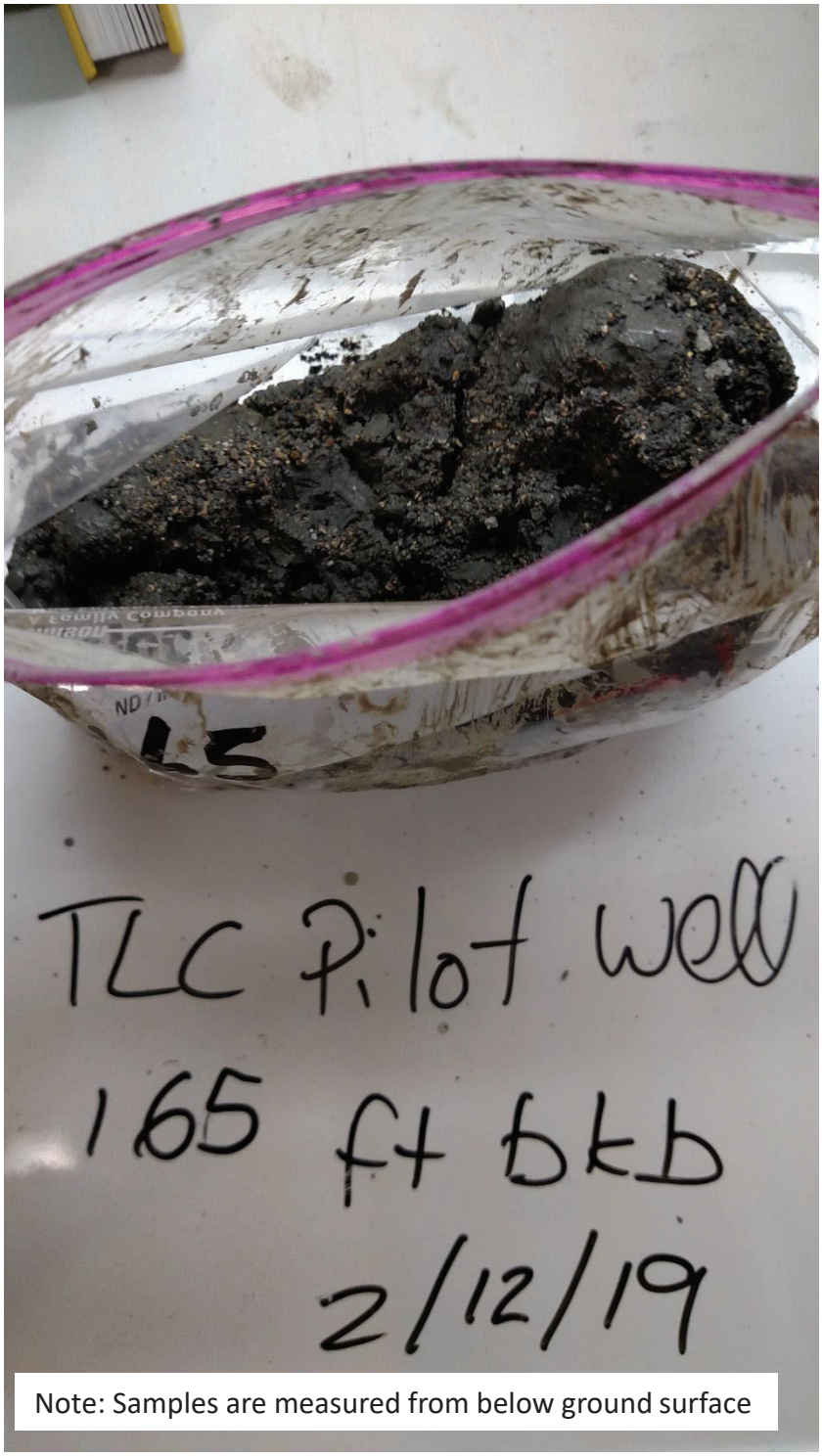


Note: Samples are measured from below ground surface

Figure C-20
Photograph of sample TLC Pilot Well 155 ft



Figure C-21
Photograph of sample TLC Pilot Well 160 ft



Note: Samples are measured from below ground surface

Figure C-22
Photograph of sample TLC Pilot Well 165 ft



Note: Samples are measured from below ground surface

Figure C-23
Photograph of sample TLC Pilot Well 170 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

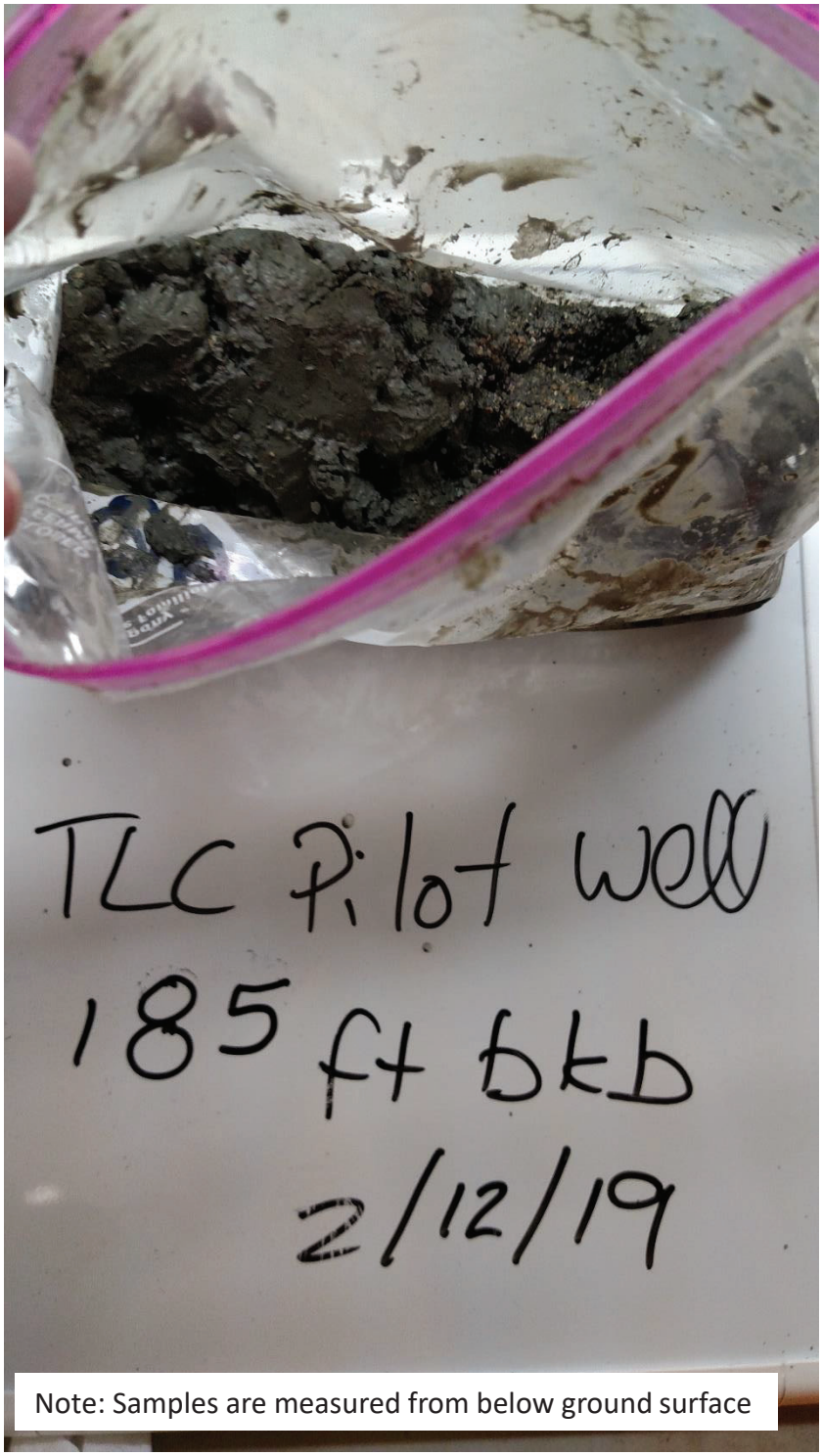
Figure C-24
Photograph of sample TLC Pilot Well 175 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

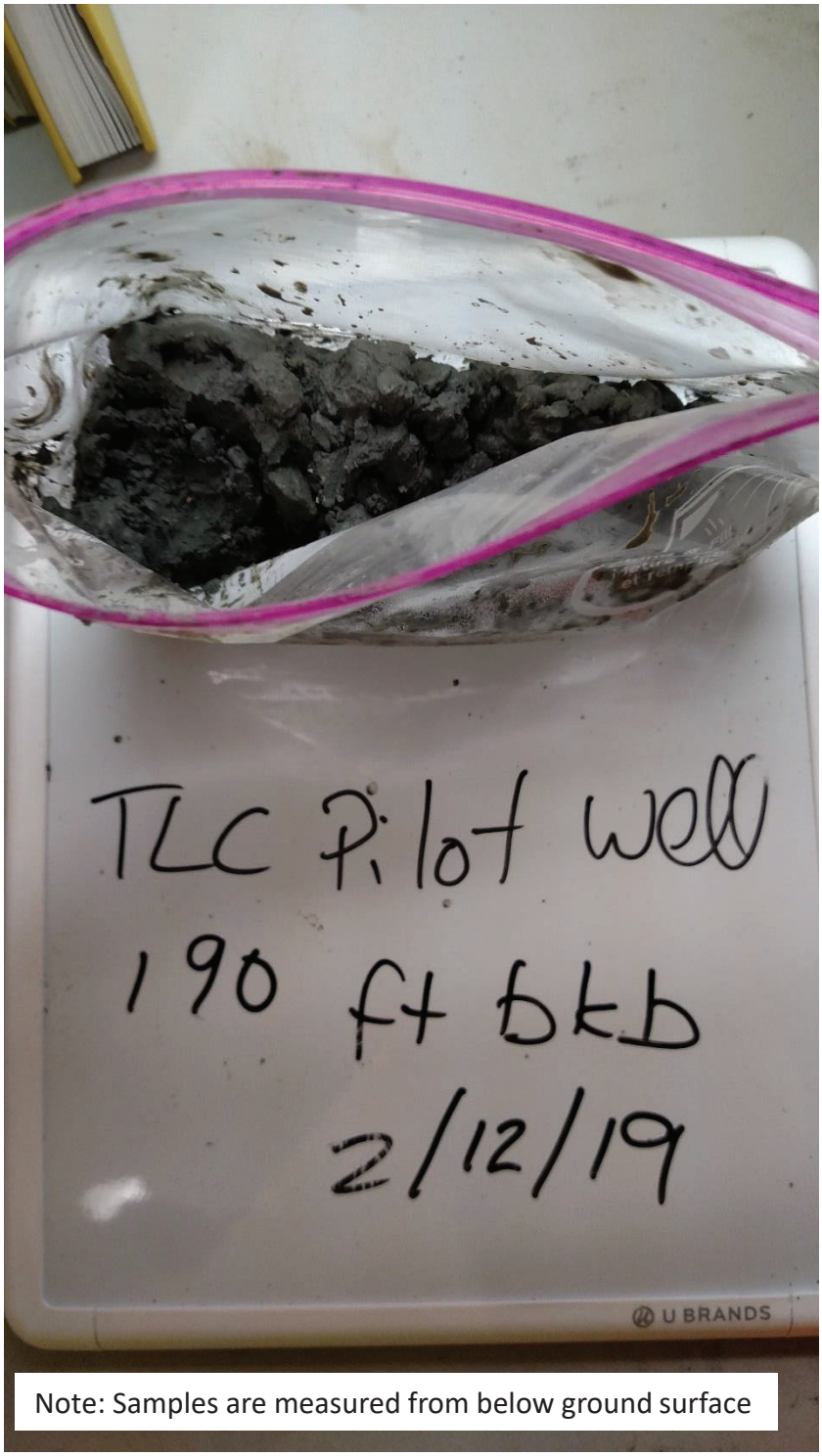
Figure C-25
Photograph of sample TLC Pilot Well 180 ft



Note: Samples are measured from below ground surface

Figure C-26
Photograph of sample TLC Pilot Well 185 ft

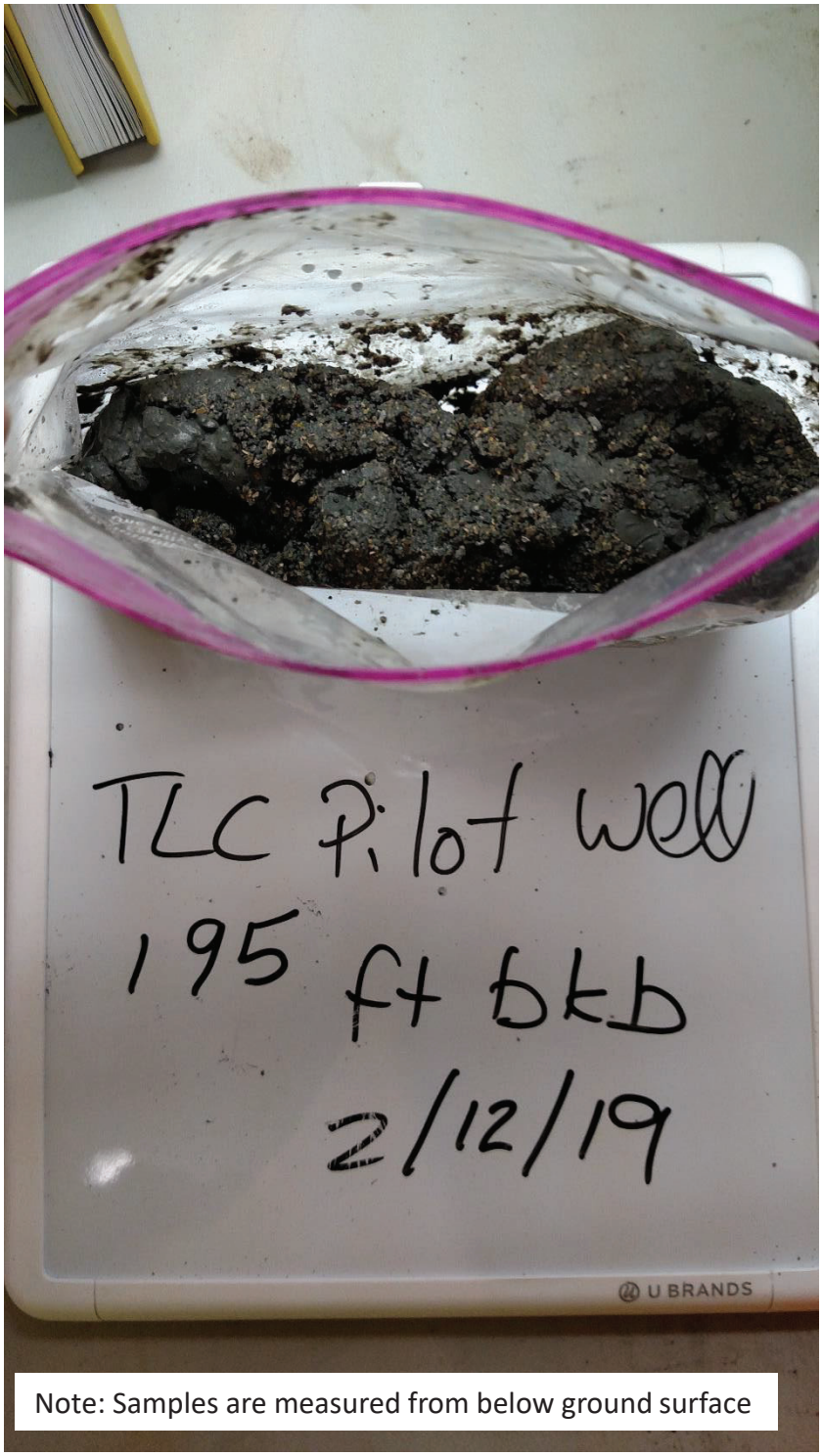
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-27
Photograph of sample TLC Pilot Well 190 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

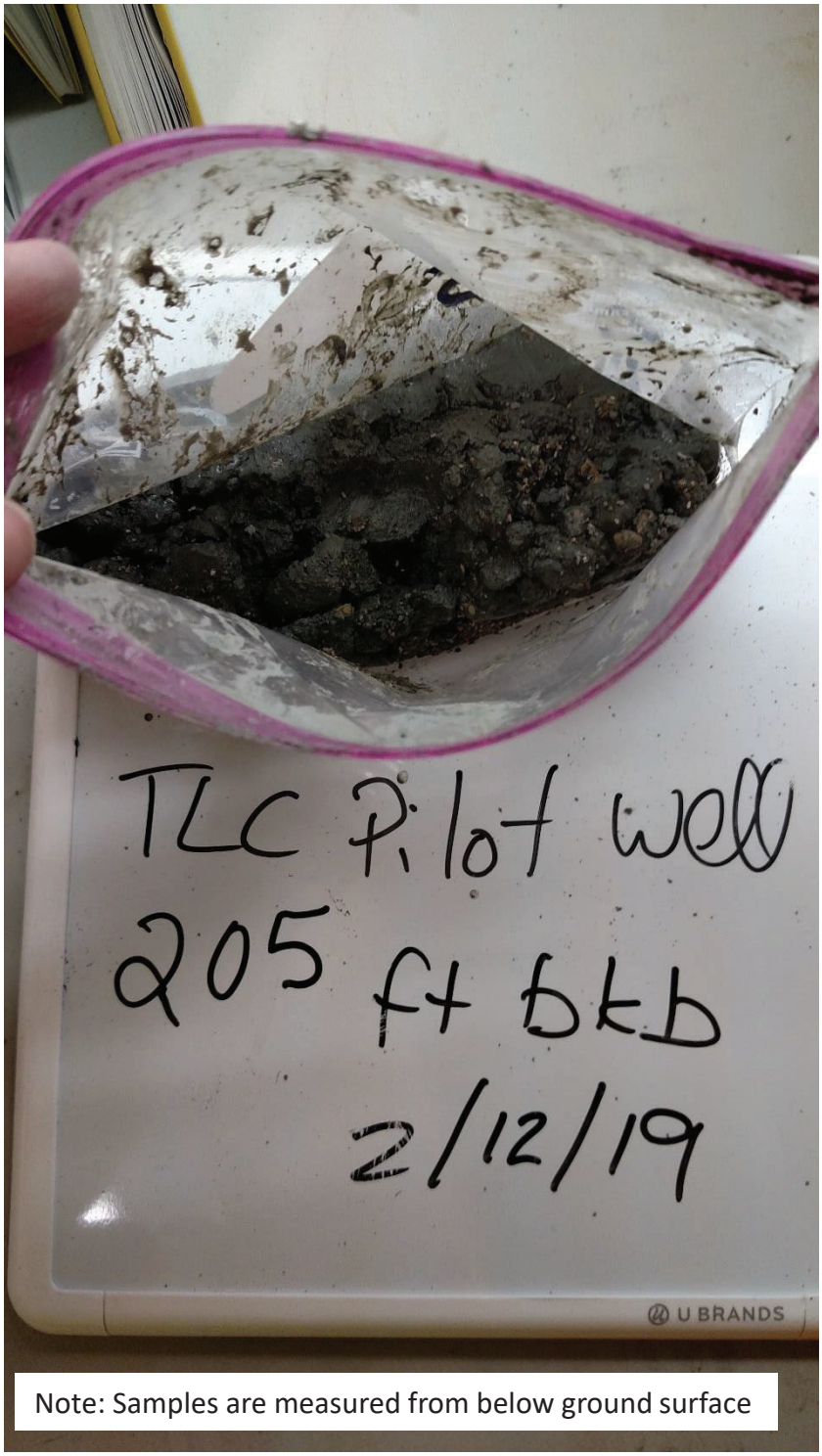
Figure C-28
Photograph of sample TLC Pilot Well 195 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-29
Photograph of sample TLC Pilot Well 200 ft



Note: Samples are measured from below ground surface

Figure C-30
Photograph of sample TLC Pilot Well 205 ft



Note: Samples are measured from below ground surface

Figure C-31
Photograph of sample TLC Pilot Well 210 ft

Brown AND Caldwell

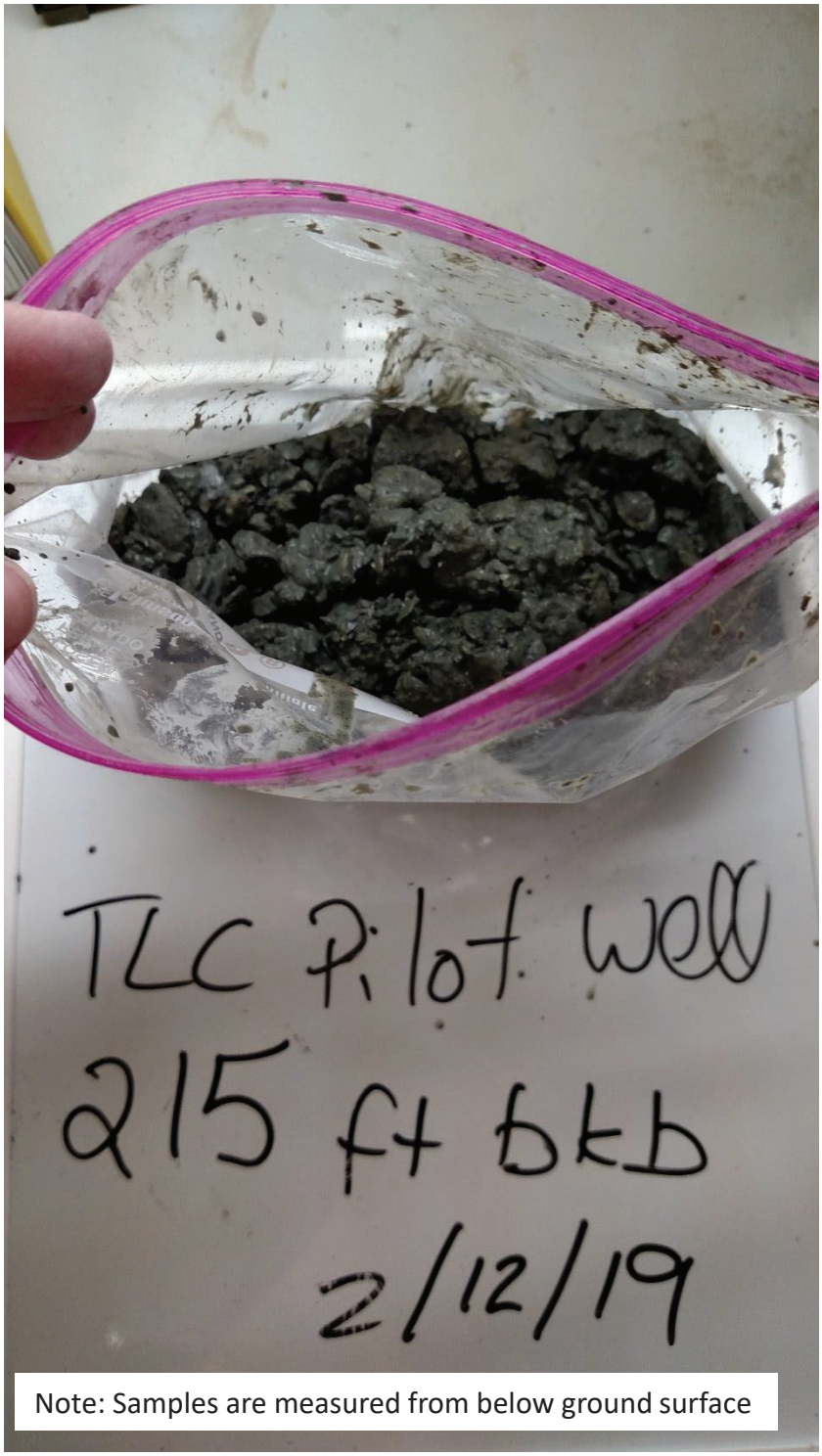


Figure C-32
Photograph of sample TLC Pilot Well 215 ft

Brown AND Caldwell

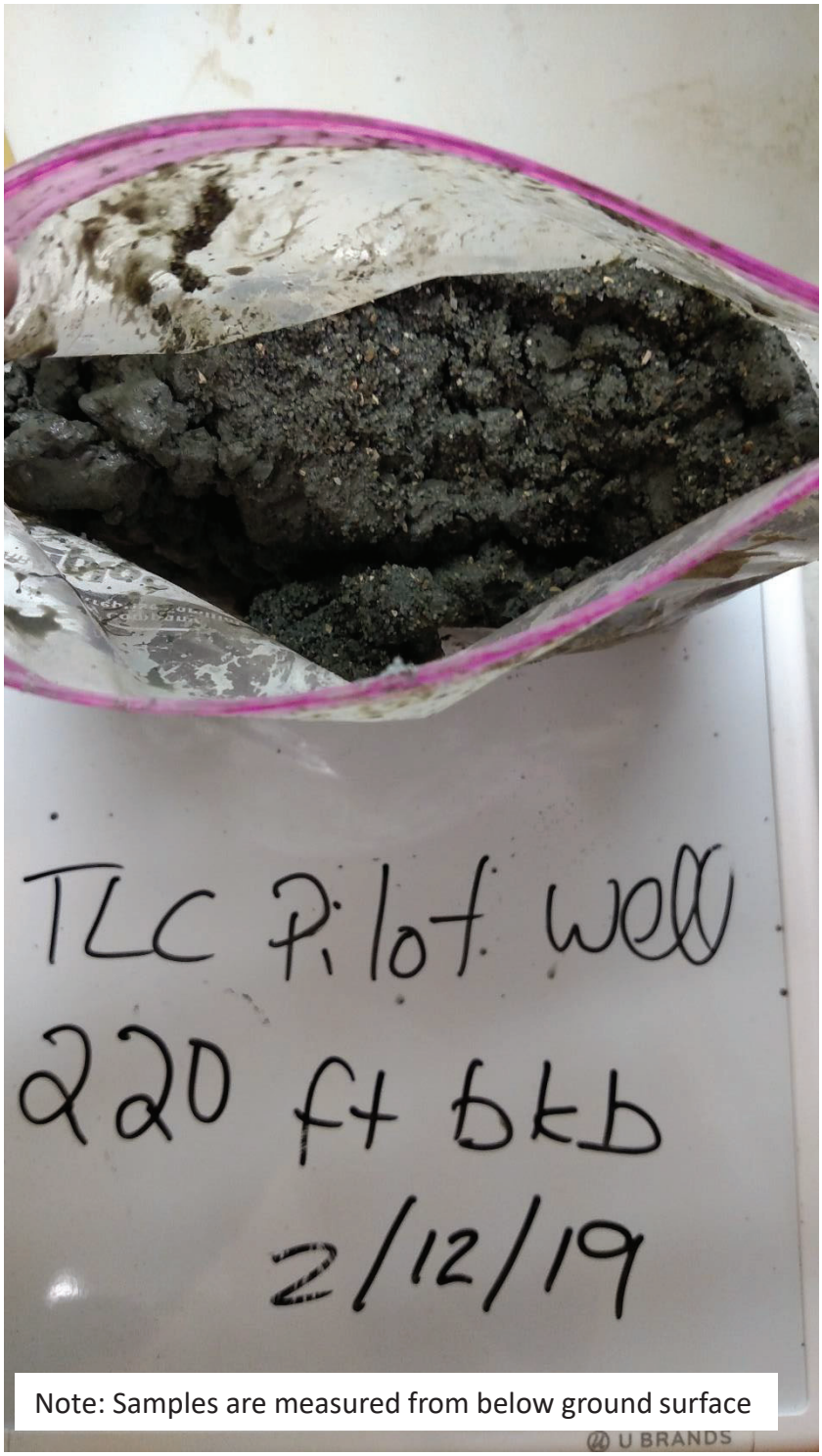
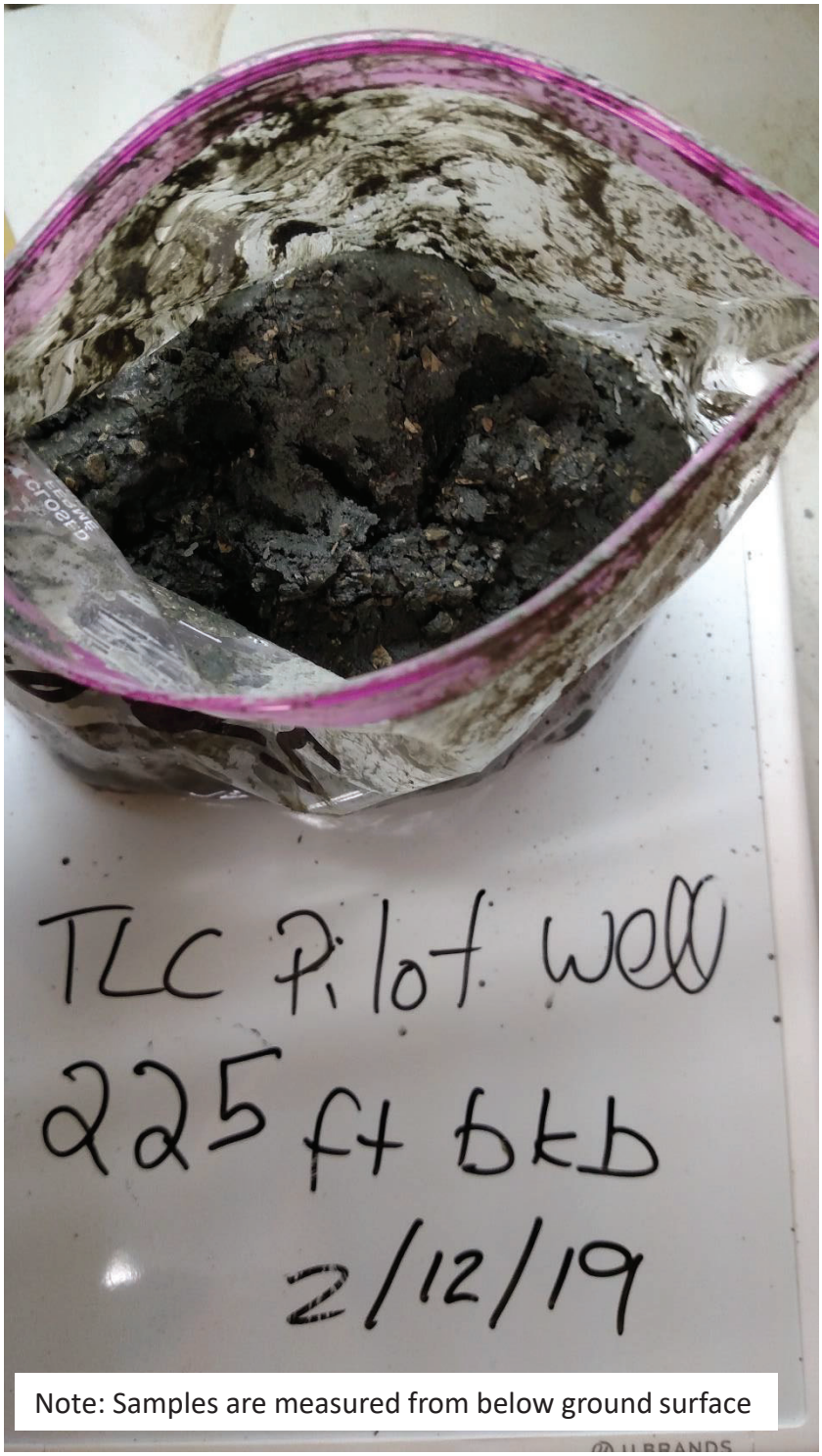
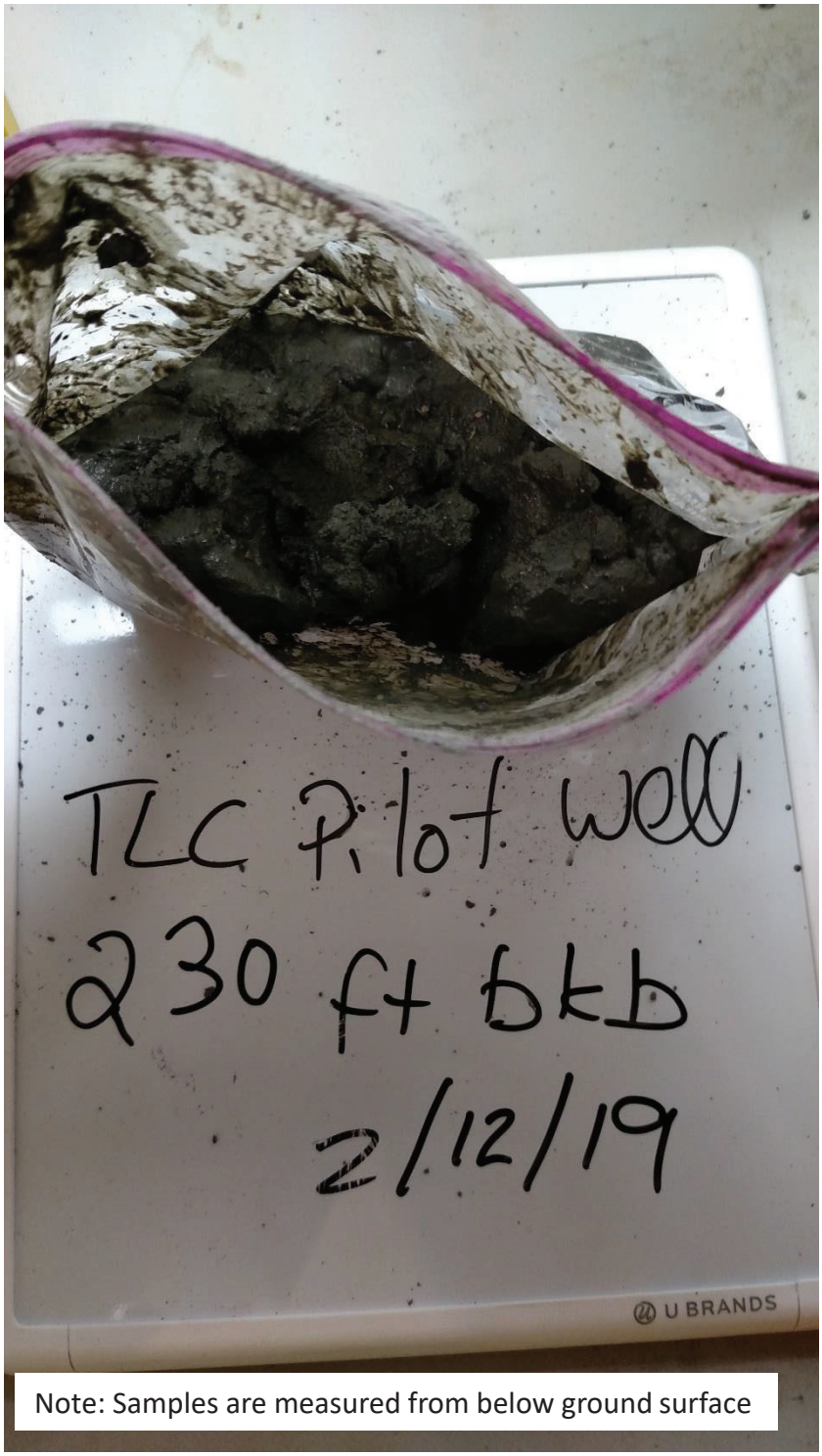


Figure C-33
Photograph of sample TLC Pilot Well 220 ft



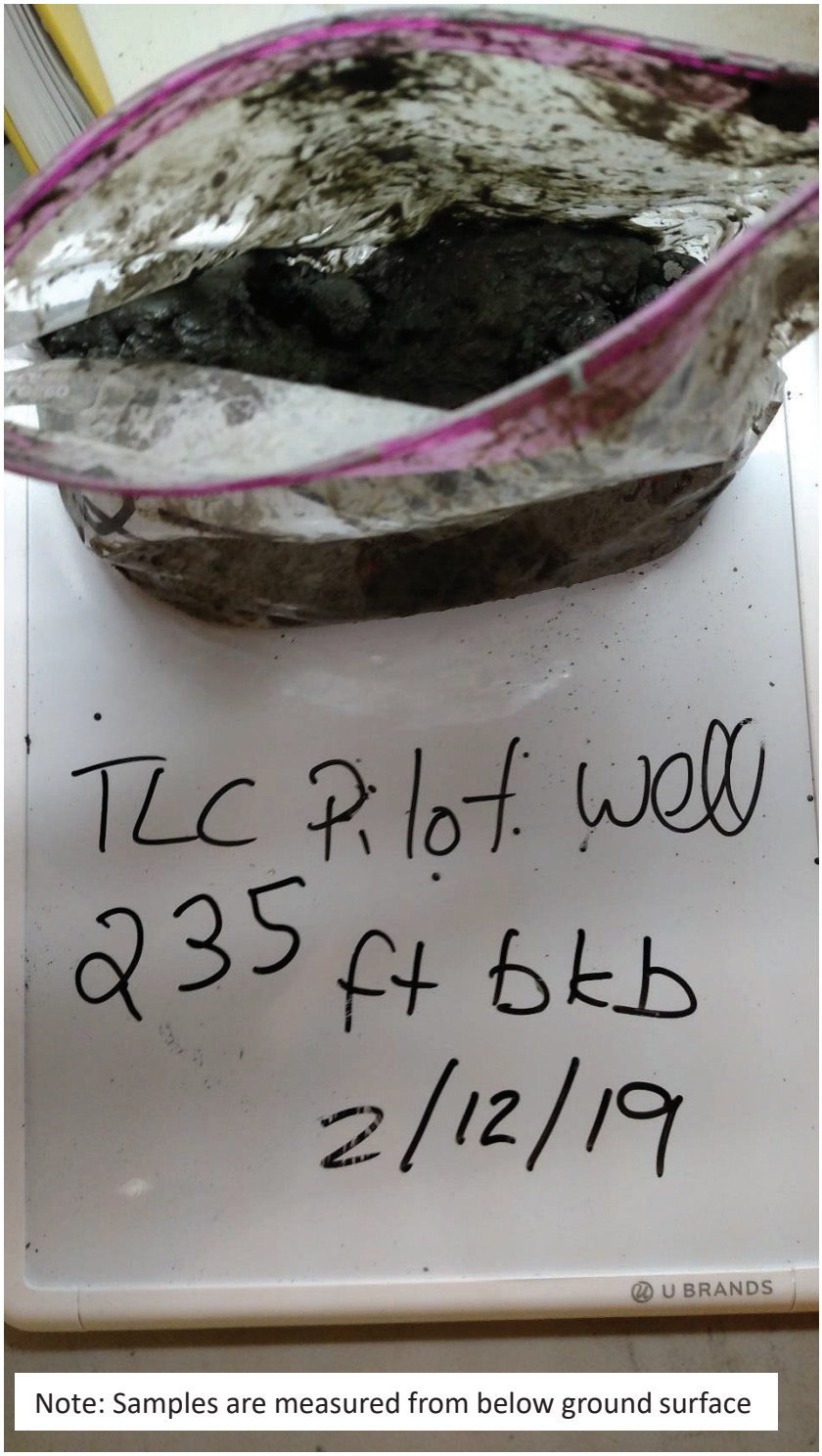
Note: Samples are measured from below ground surface

Figure C-34
Photograph of sample TLC Pilot Well 225 ft



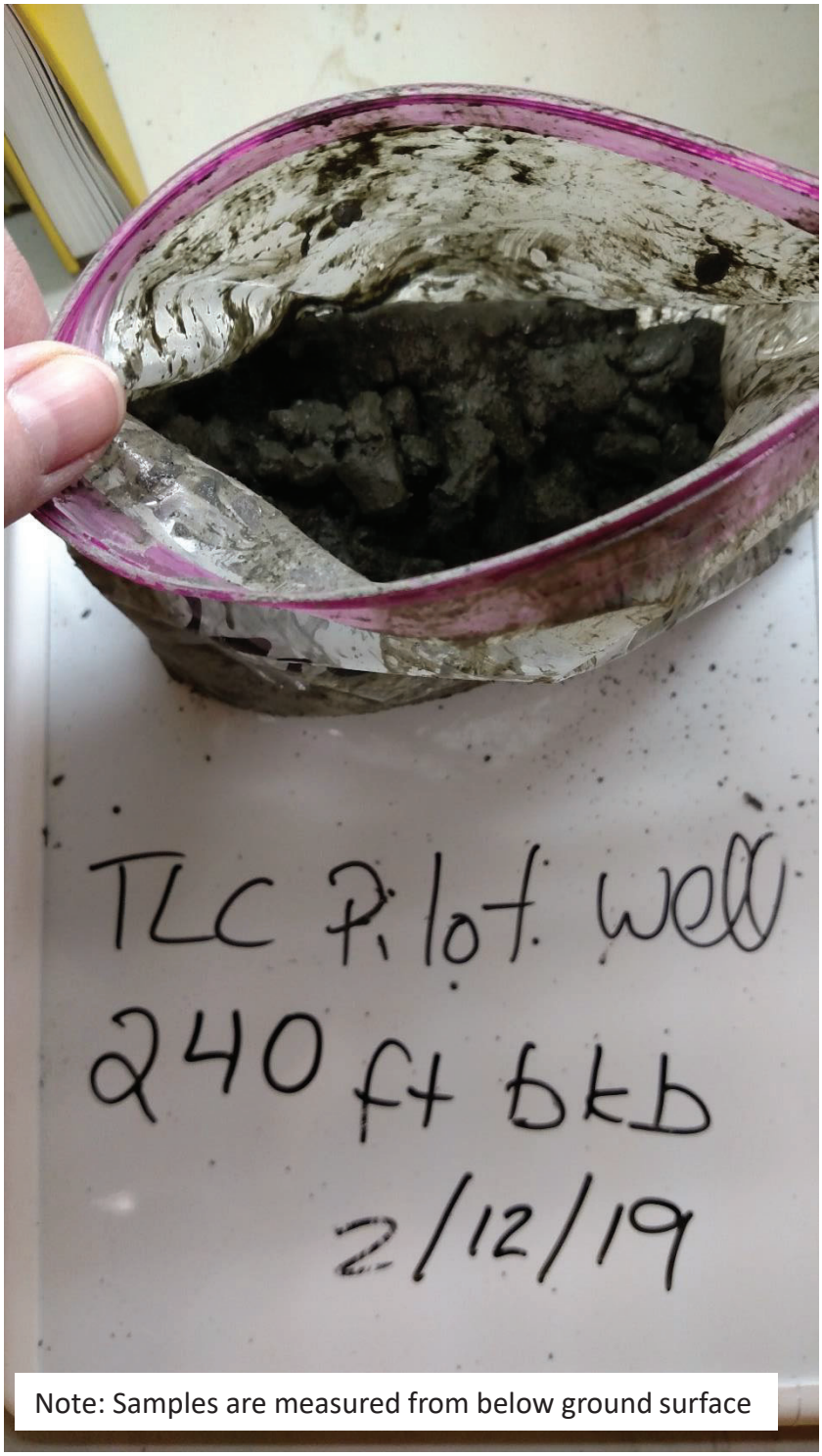
Note: Samples are measured from below ground surface

Figure C-35
Photograph of sample TLC Pilot Well 230 ft



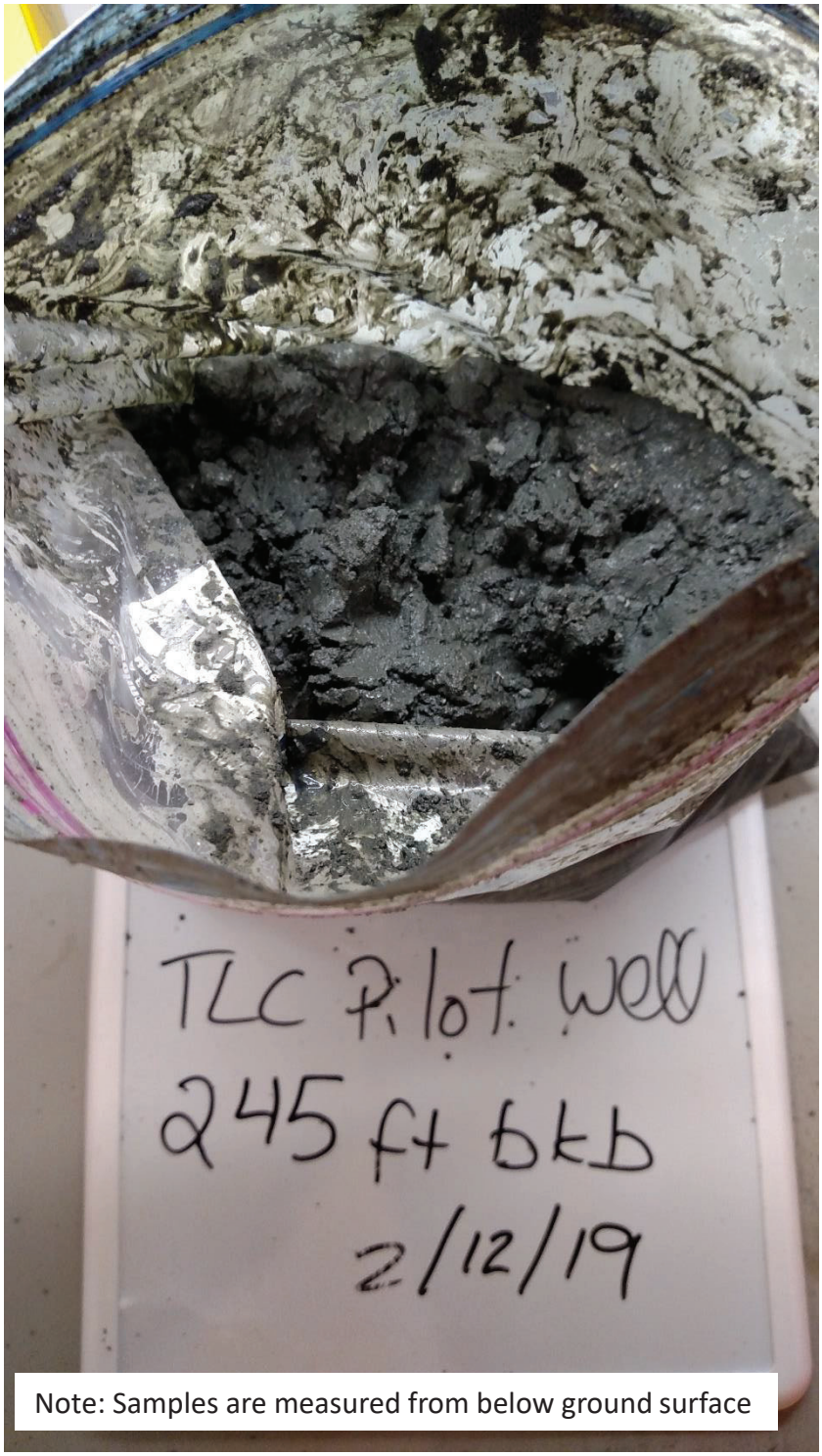
Note: Samples are measured from below ground surface

Figure C-36
Photograph of sample TLC Pilot Well 235 ft



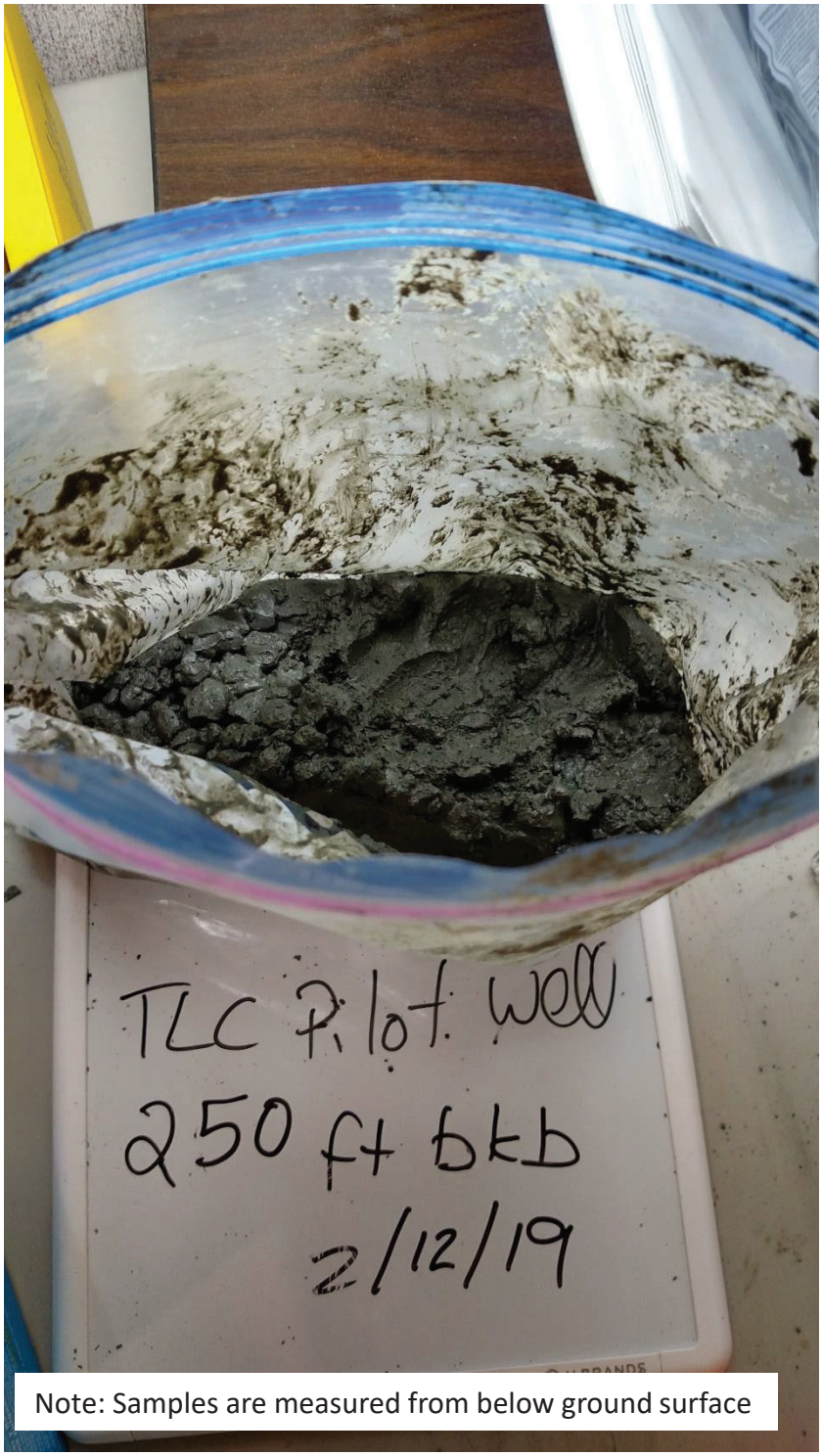
Note: Samples are measured from below ground surface

Figure C-37
Photograph of sample TLC Pilot Well 240 ft



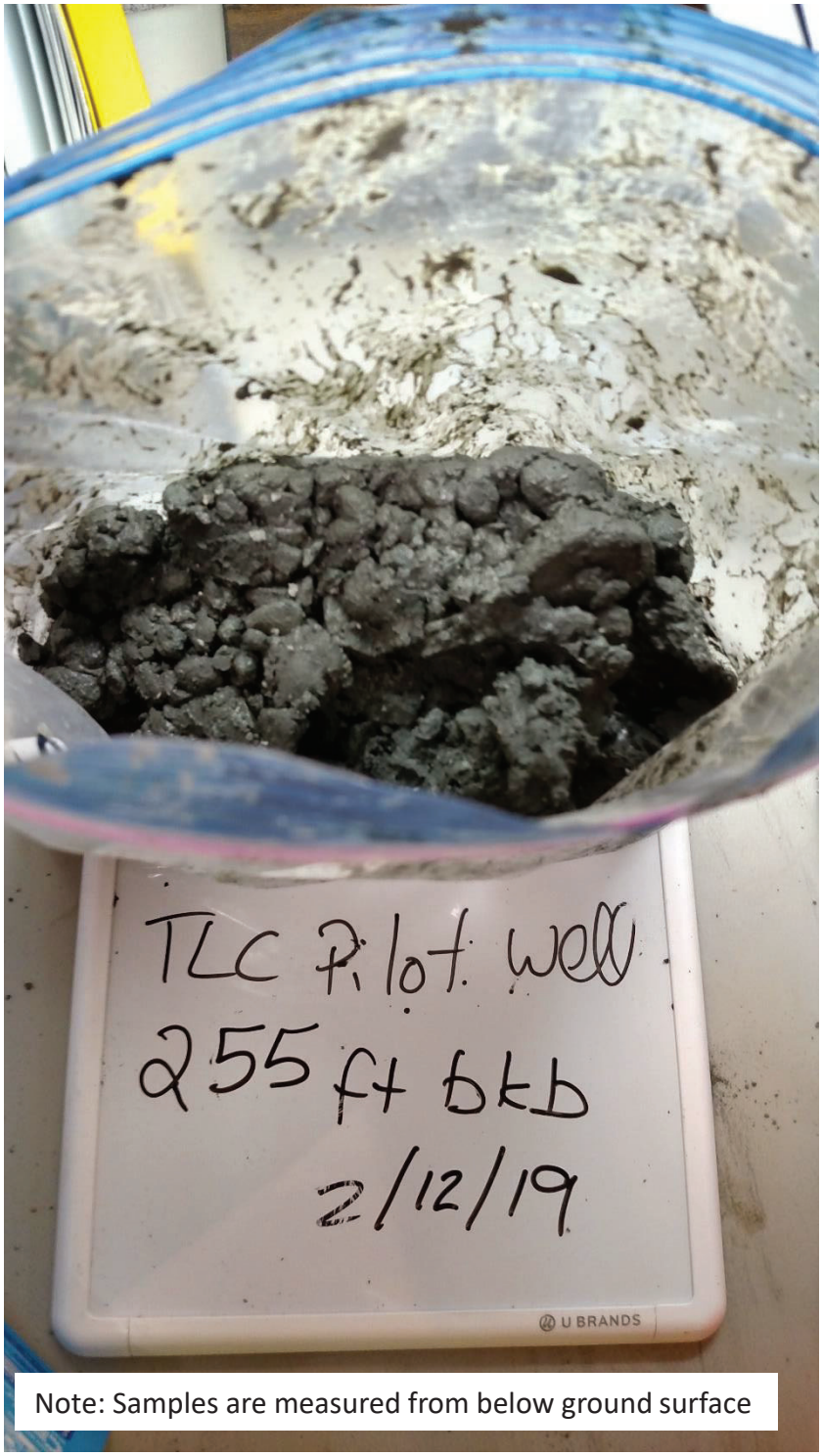
Note: Samples are measured from below ground surface

Figure C-38
Photograph of sample TLC Pilot Well 245 ft



Note: Samples are measured from below ground surface

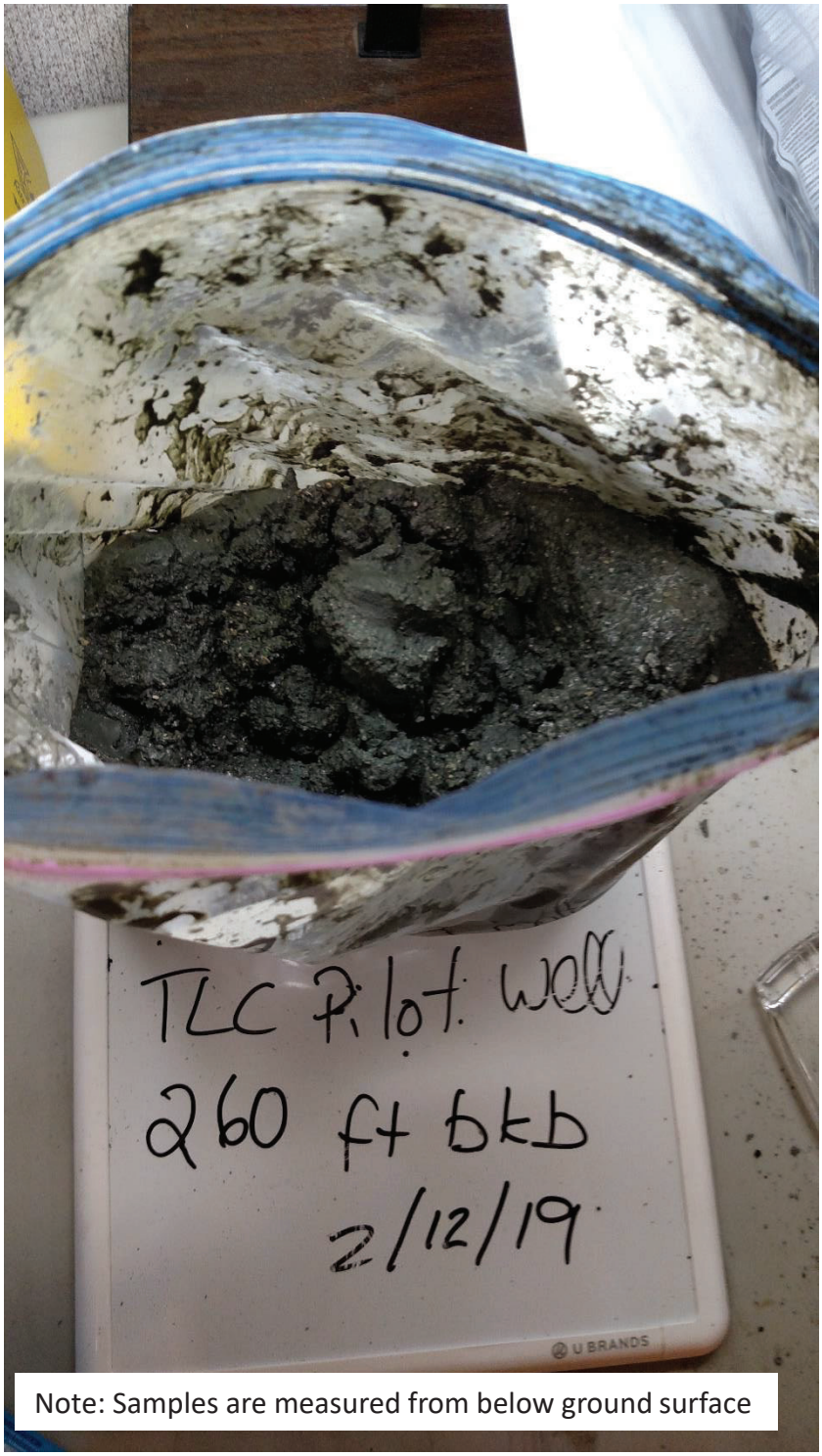
Figure C-39
Photograph of sample TLC Pilot Well 250 ft



Note: Samples are measured from below ground surface

Figure C-40
Photograph of sample TLC Pilot Well 255 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-41
Photograph of sample TLC Pilot Well 260 ft

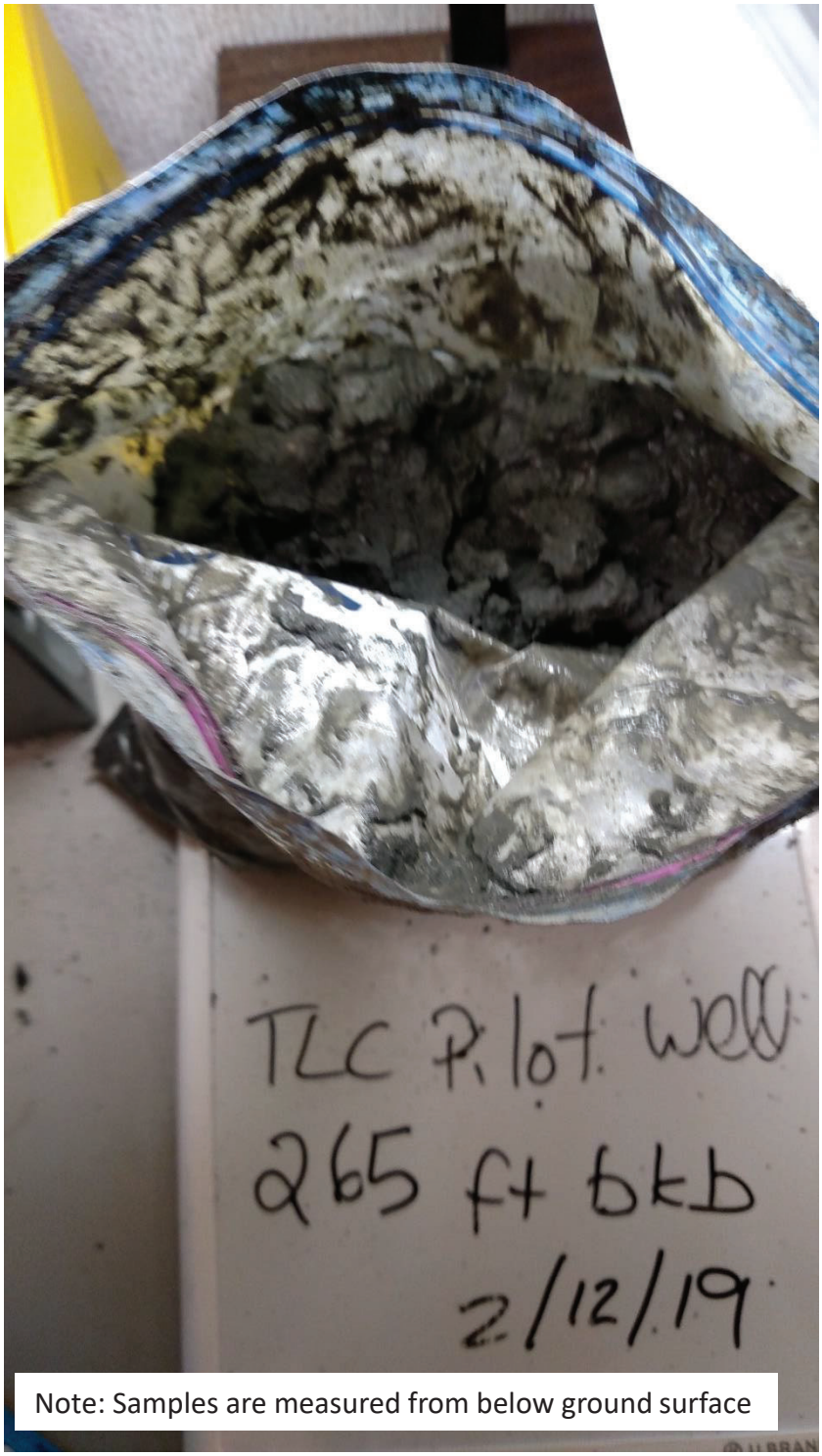


Figure C-42
Photograph of sample TLC Pilot Well 265 ft

Brown AND Caldwell

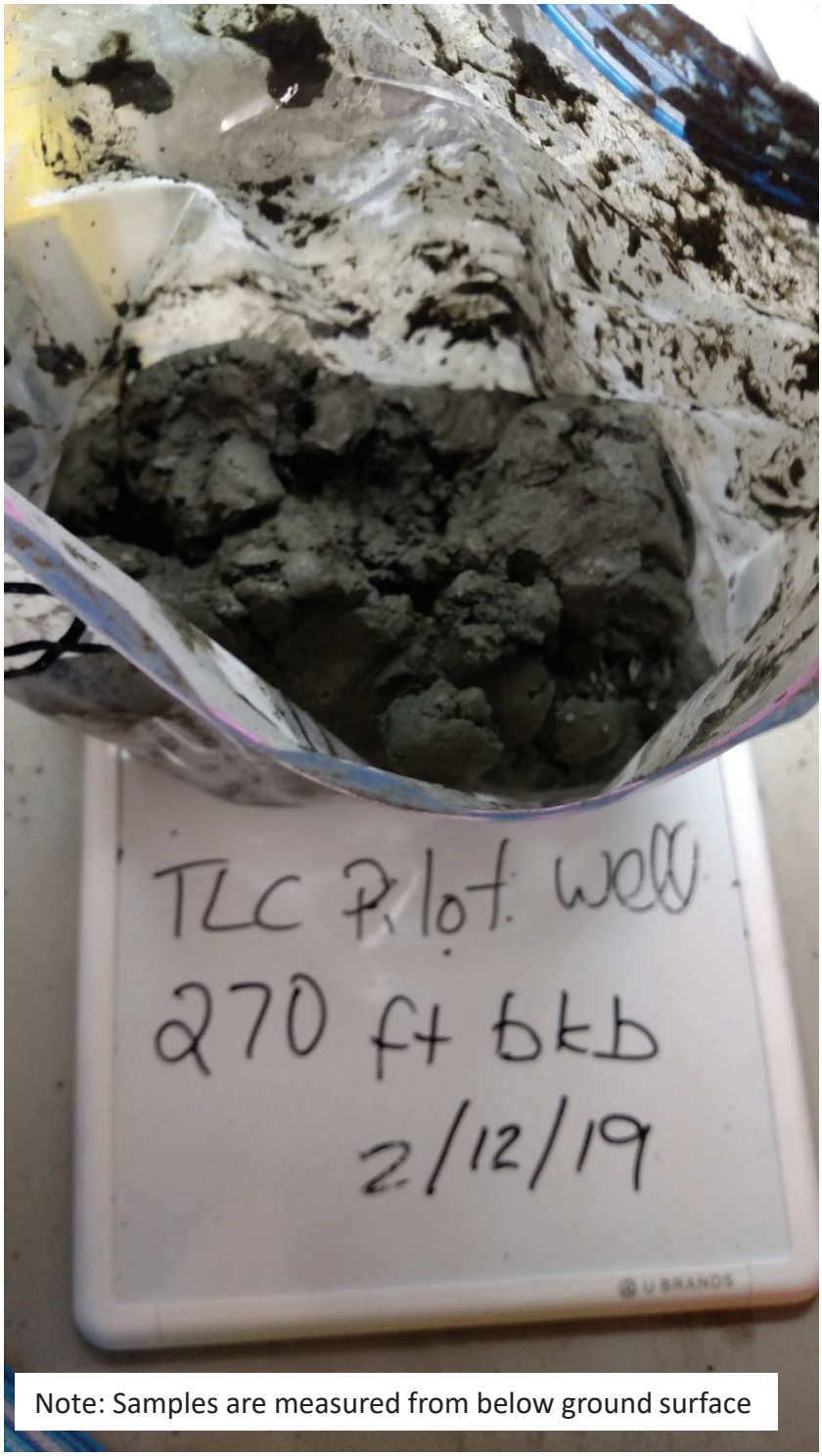
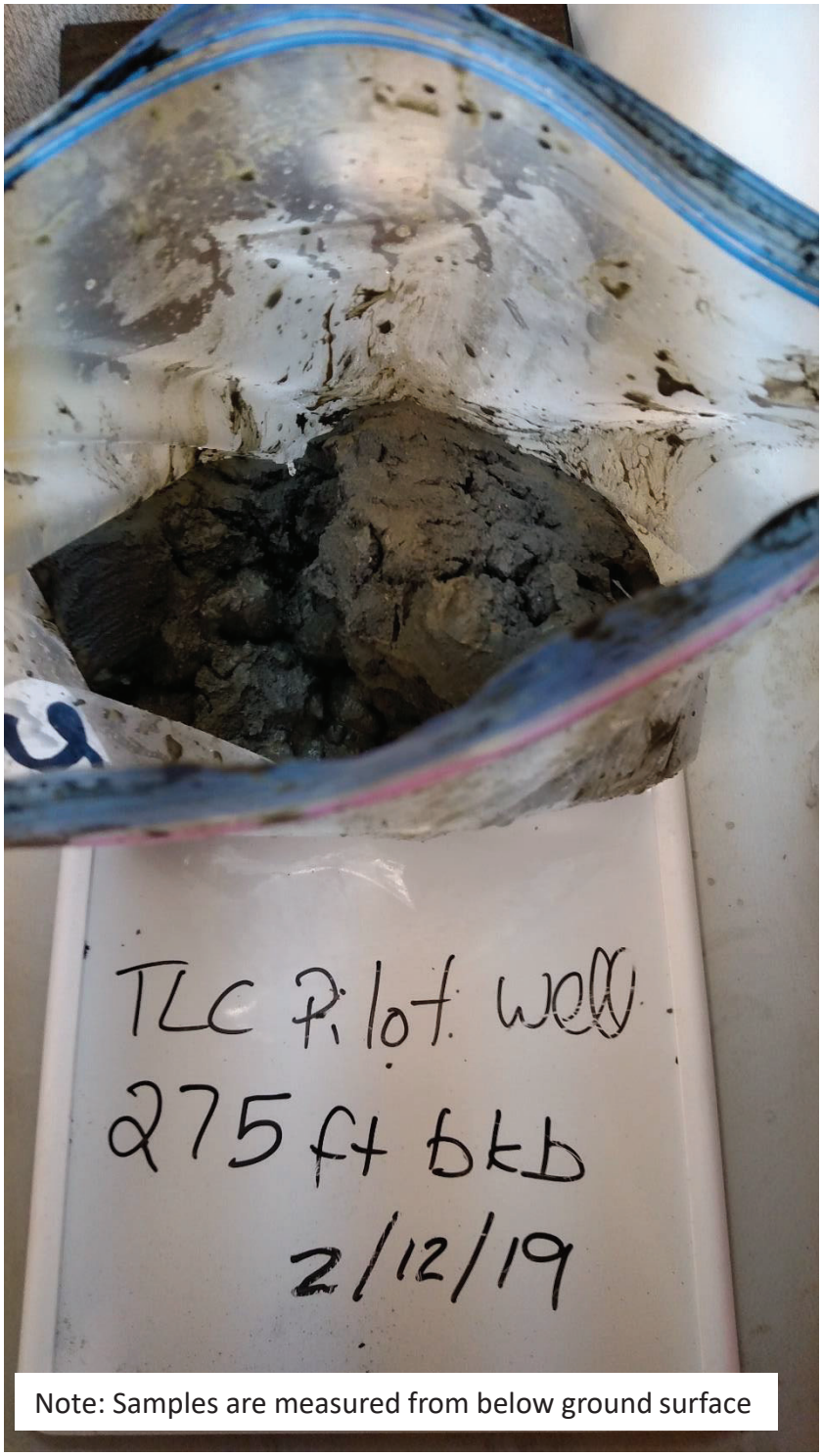
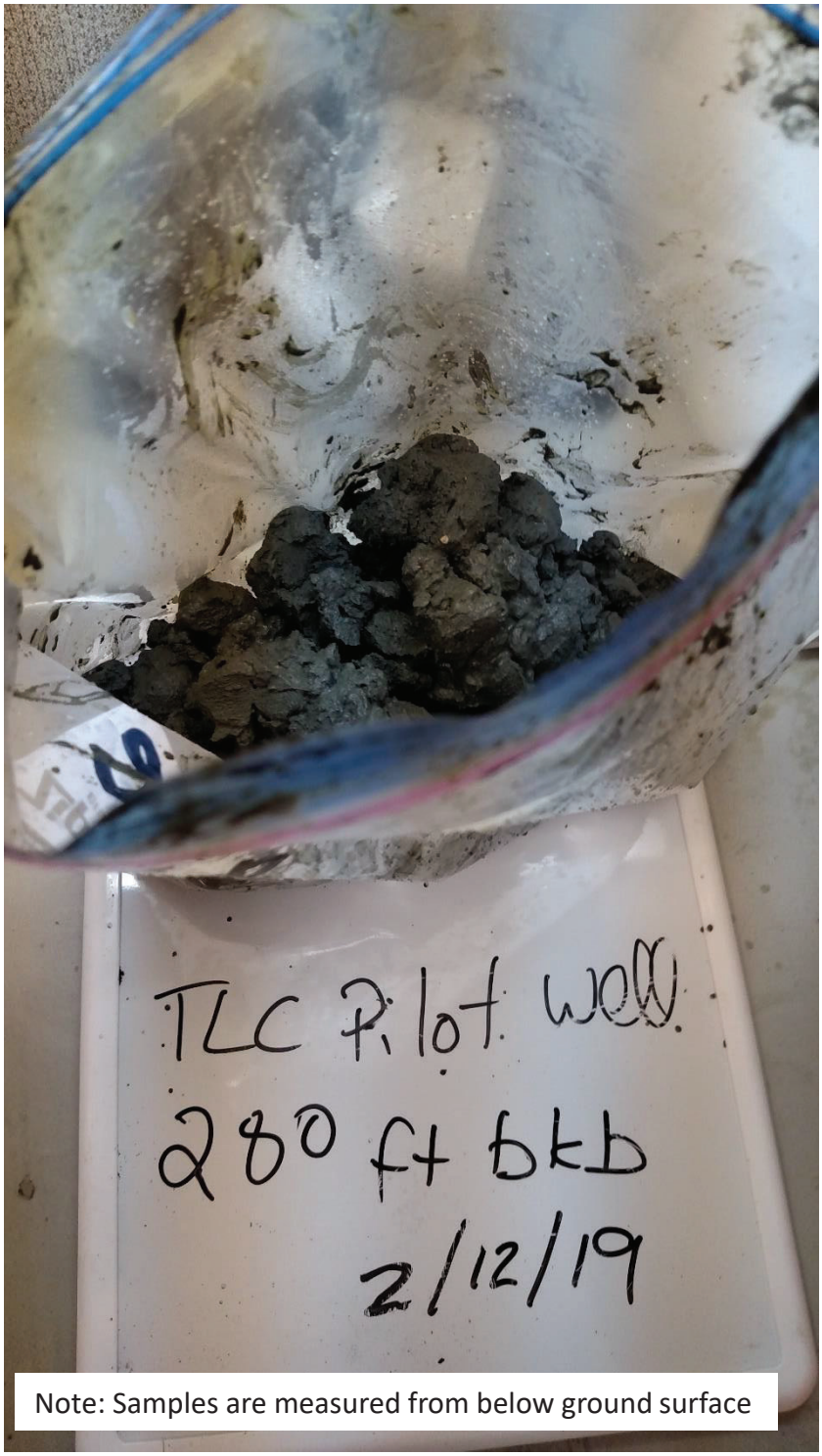


Figure C-43
Photograph of sample TLC Pilot Well 270 ft



Note: Samples are measured from below ground surface

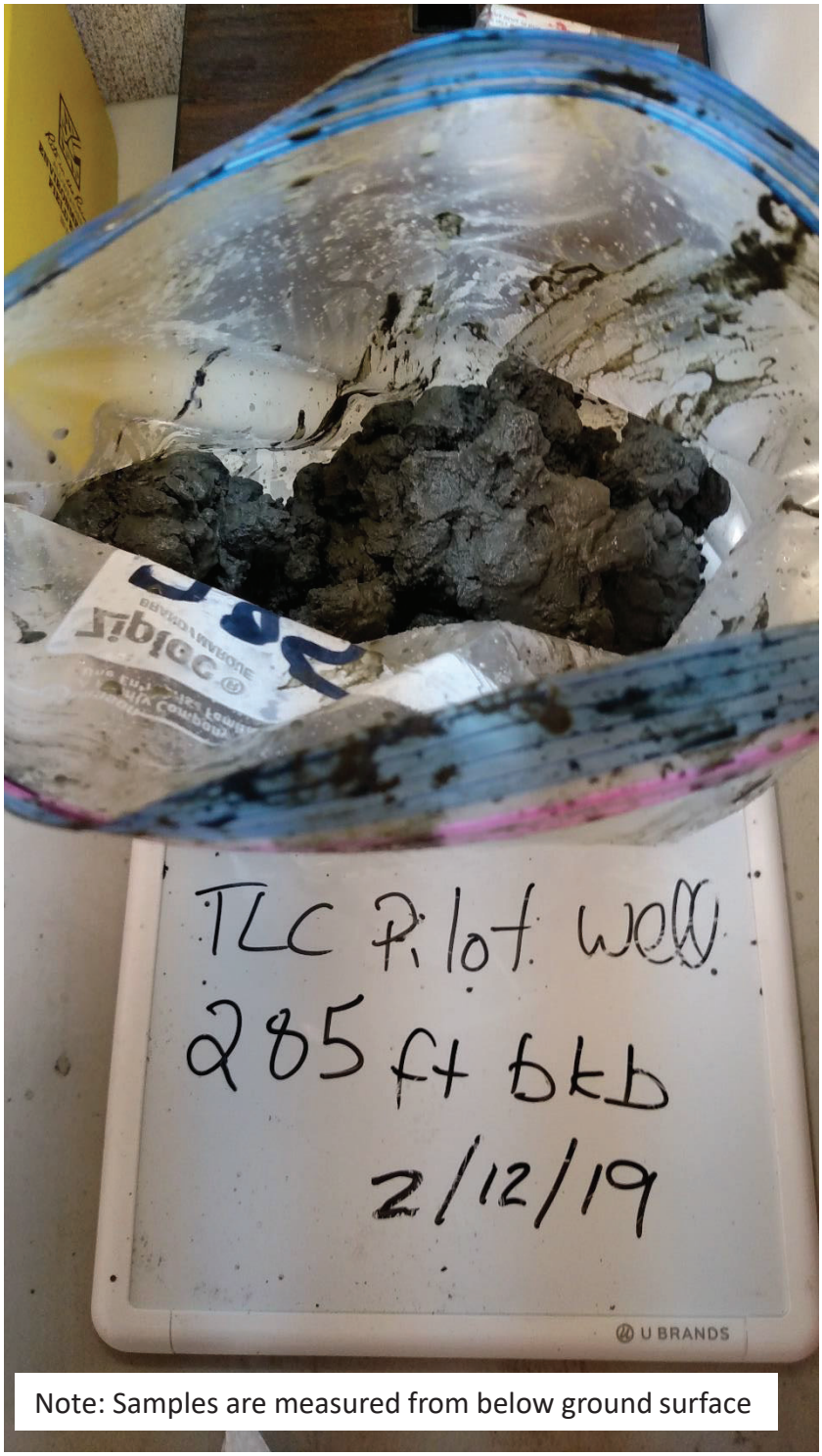
Figure C-44
Photograph of sample TLC Pilot Well 275 ft



Note: Samples are measured from below ground surface

Figure C-45
Photograph of sample TLC Pilot Well 280 ft

Brown AND Caldwell



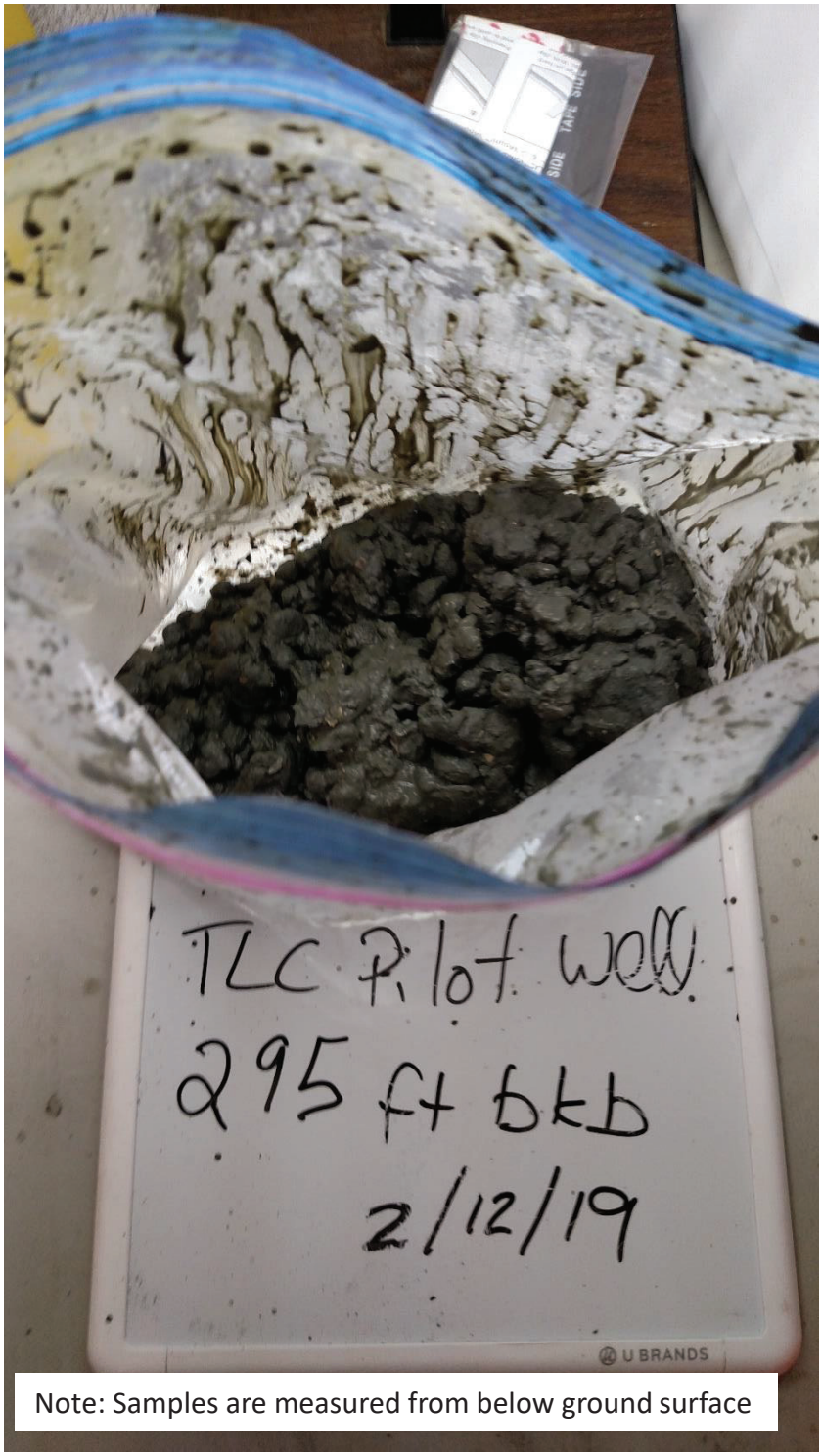
Note: Samples are measured from below ground surface

Figure C-46
Photograph of sample TLC Pilot Well 285 ft



Note: Samples are measured from below ground surface

Figure C-47
Photograph of sample TLC Pilot Well 290 ft



Note: Samples are measured from below ground surface

Figure C-48
Photograph of sample TLC Pilot Well 295 ft



Figure C-49
Photograph of sample TLC Pilot Well 300 ft

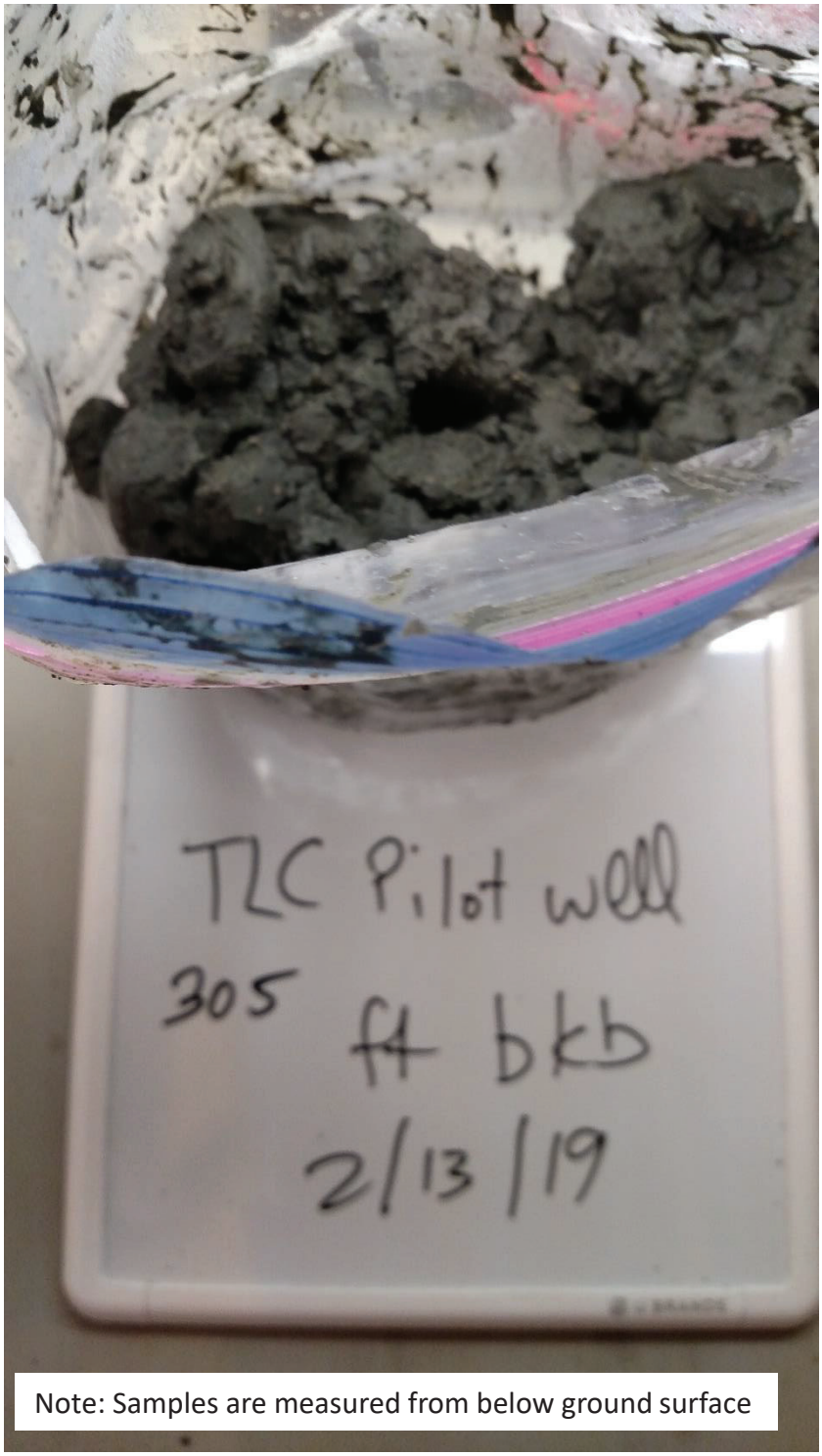
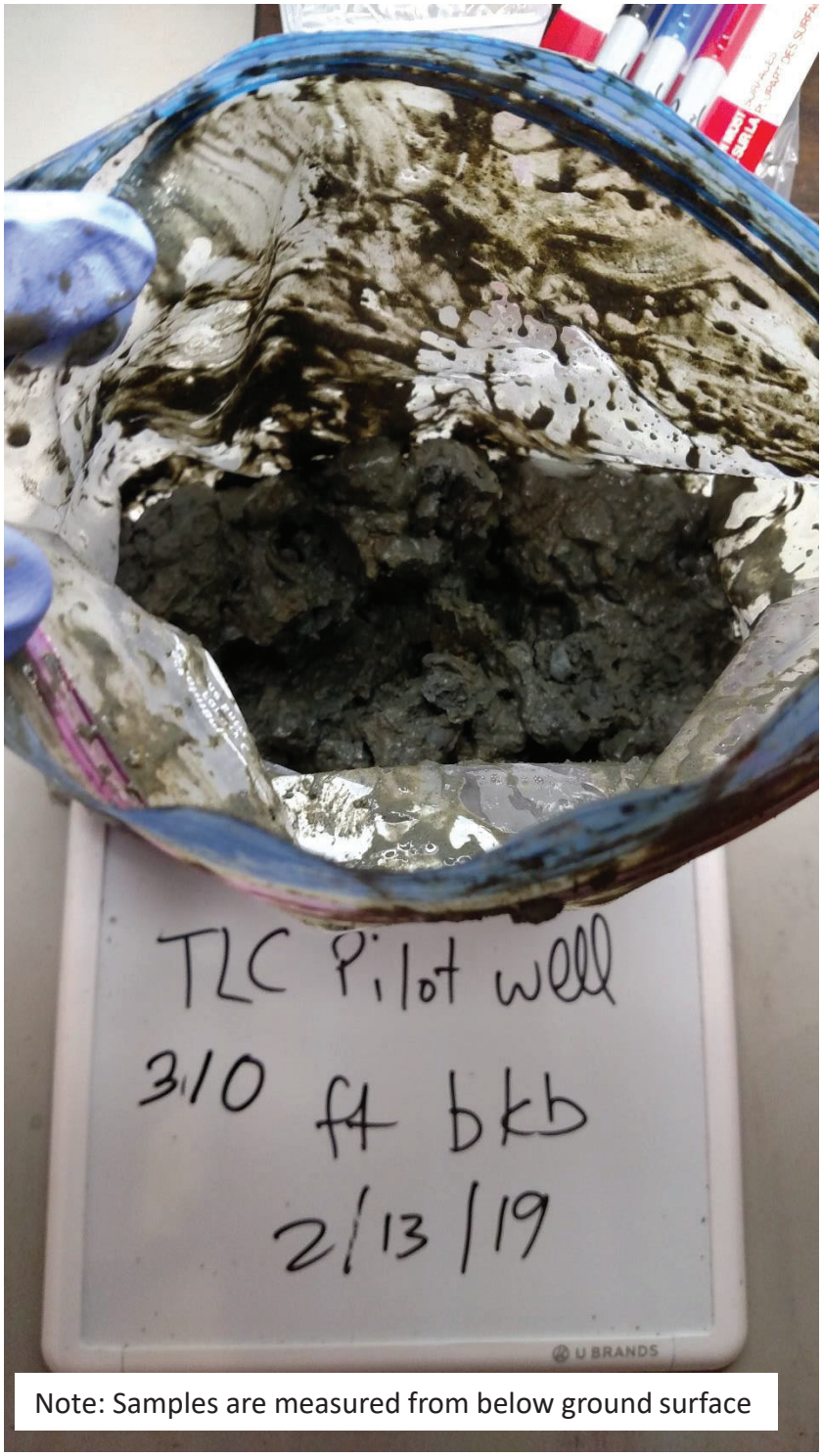
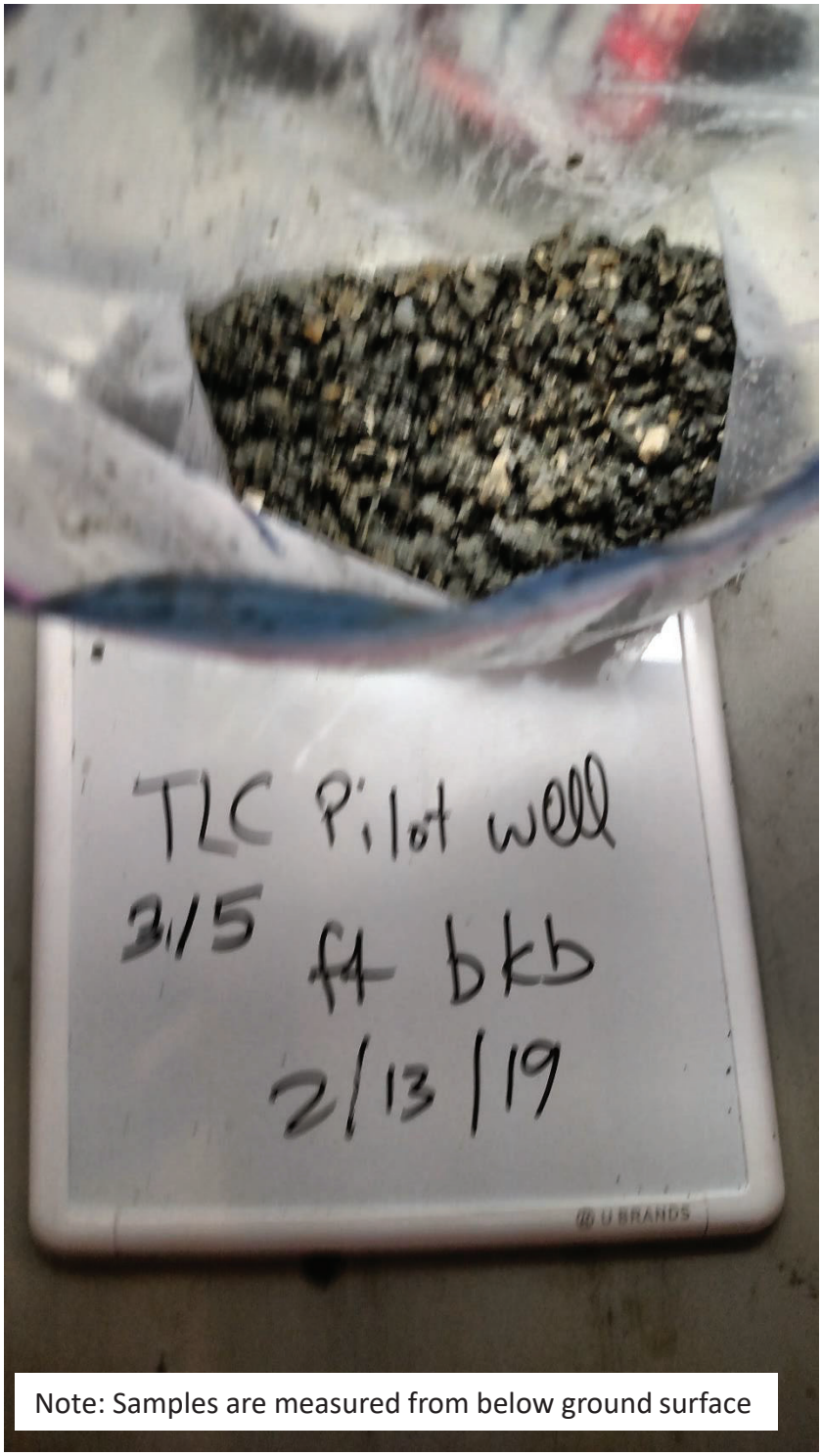


Figure C-50
Photograph of sample TLC Pilot Well 305 ft



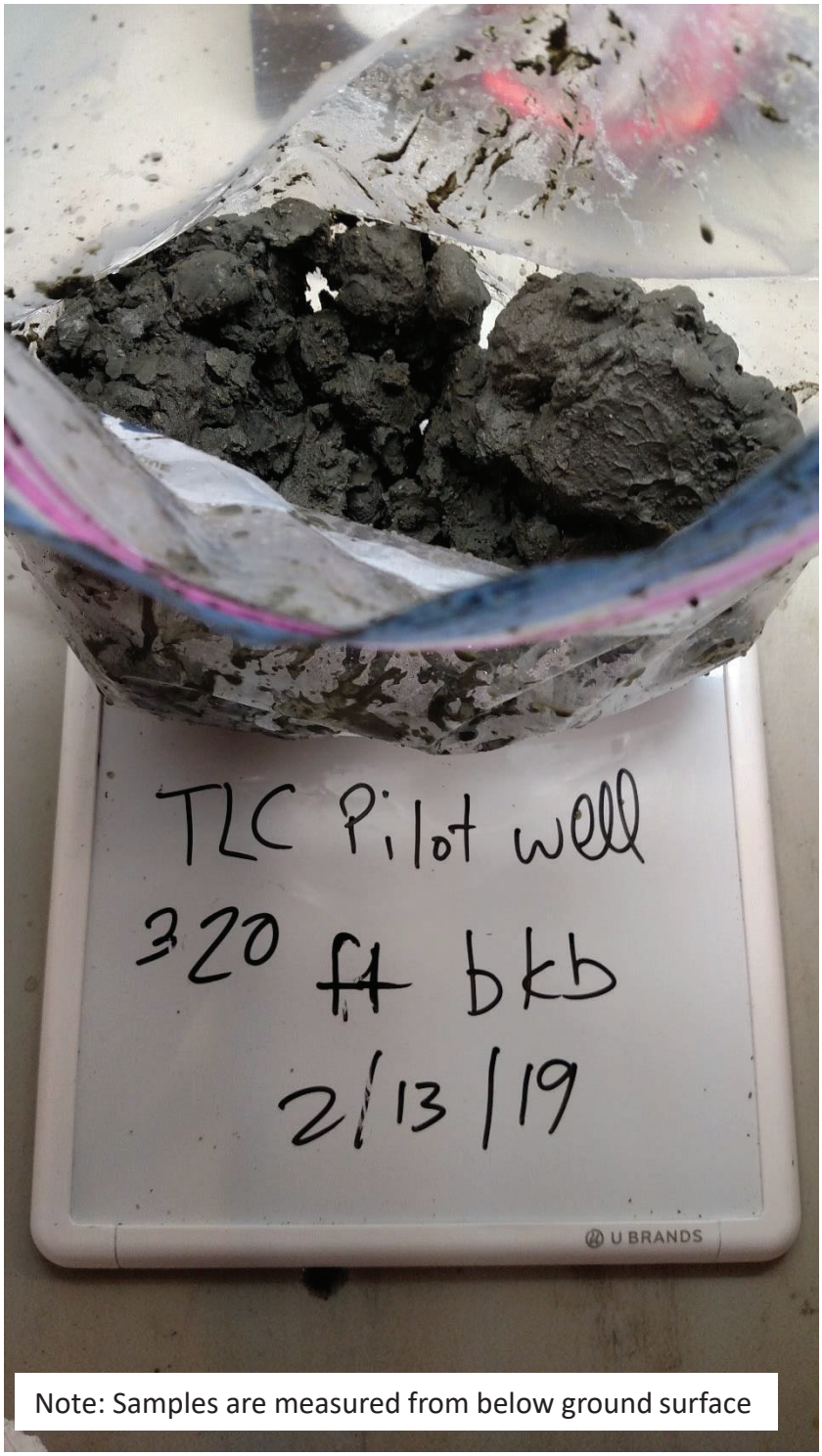
Note: Samples are measured from below ground surface

Figure C-51
Photograph of sample TLC Pilot Well 310 ft



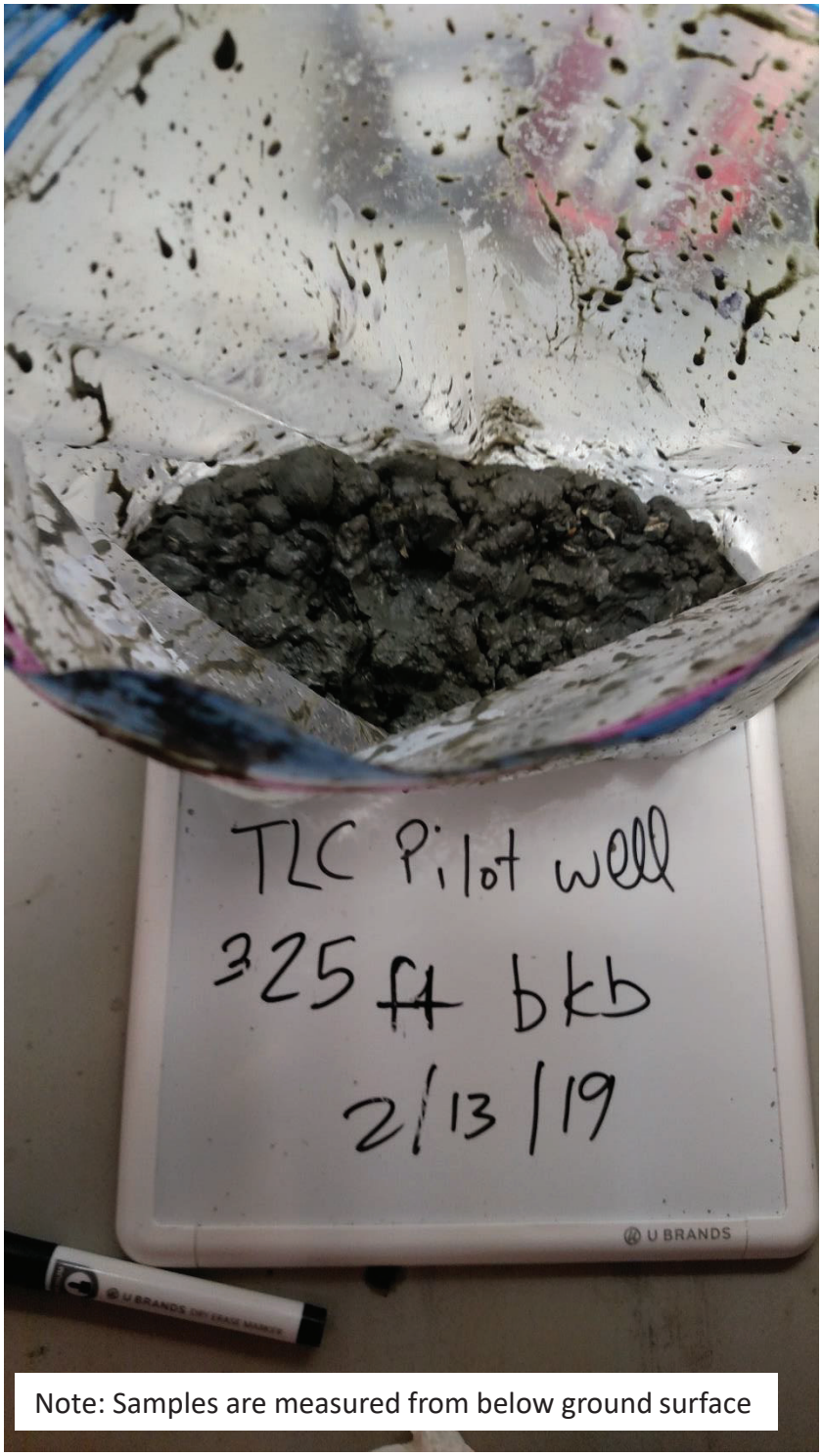
Note: Samples are measured from below ground surface

Figure C-52
Photograph of sample TLC Pilot Well 315 ft



Note: Samples are measured from below ground surface

Figure C-53
Photograph of sample TLC Pilot Well 320 ft



Note: Samples are measured from below ground surface

Figure C-54
Photograph of sample TLC Pilot Well 325 ft

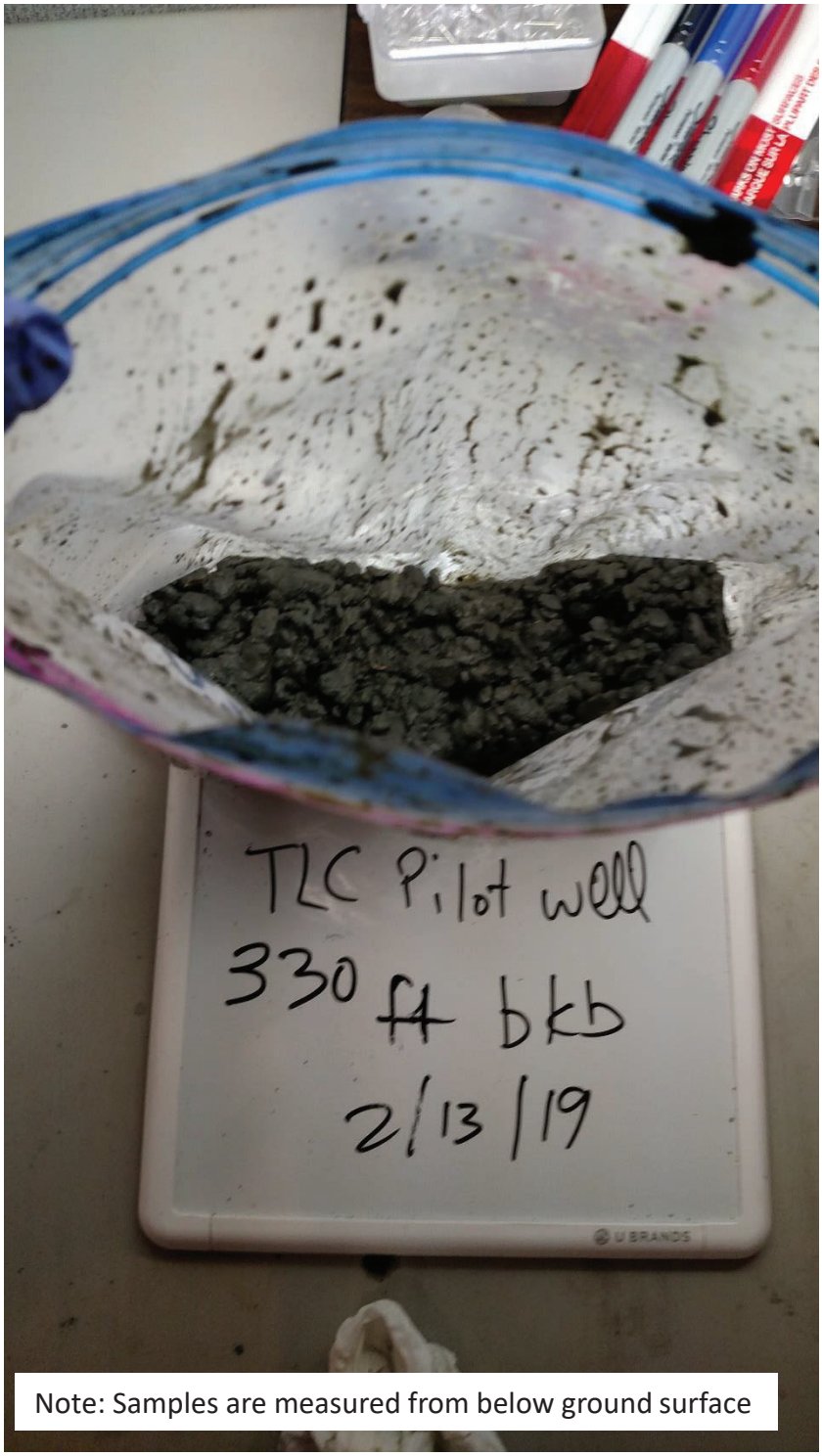
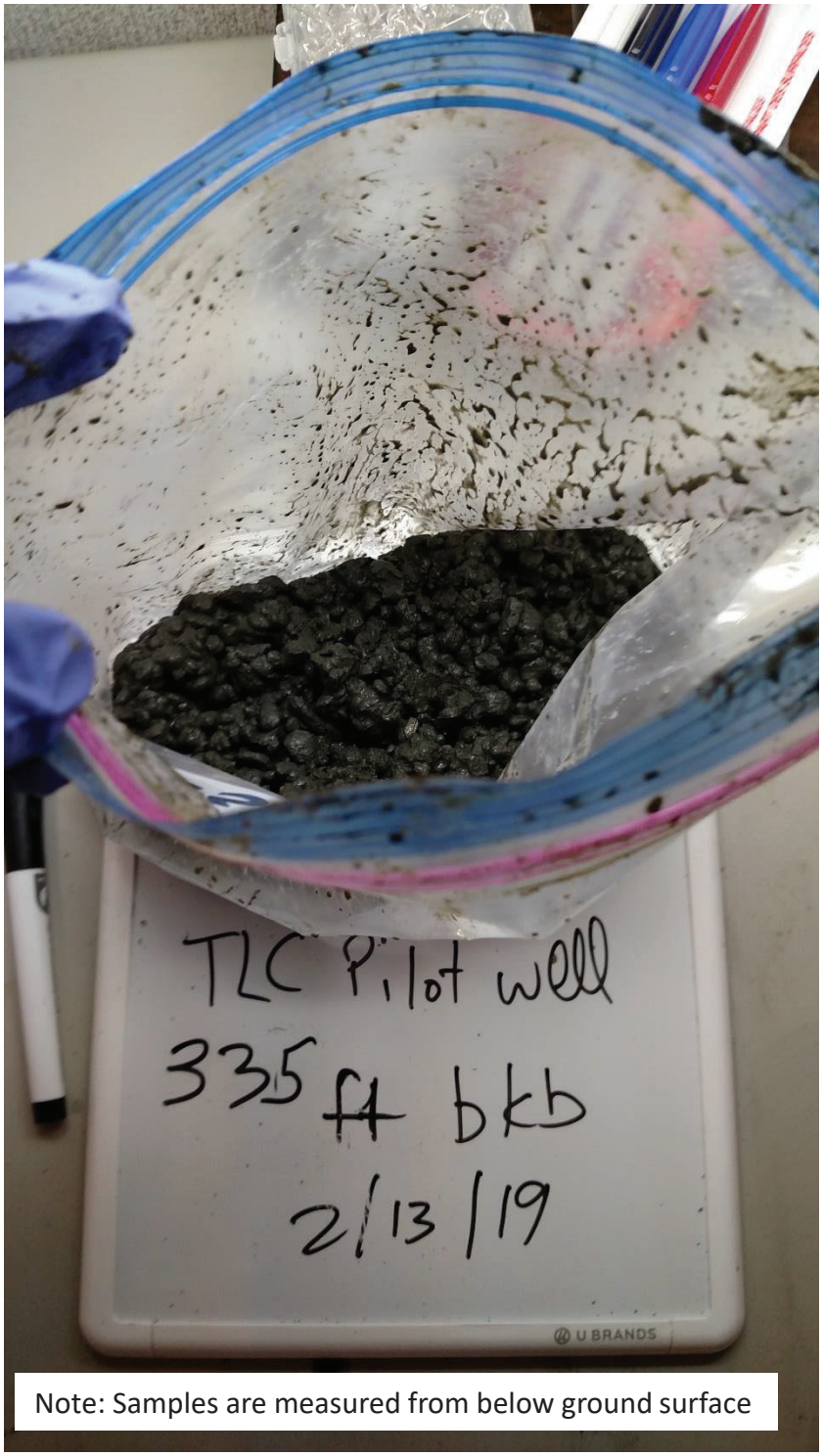


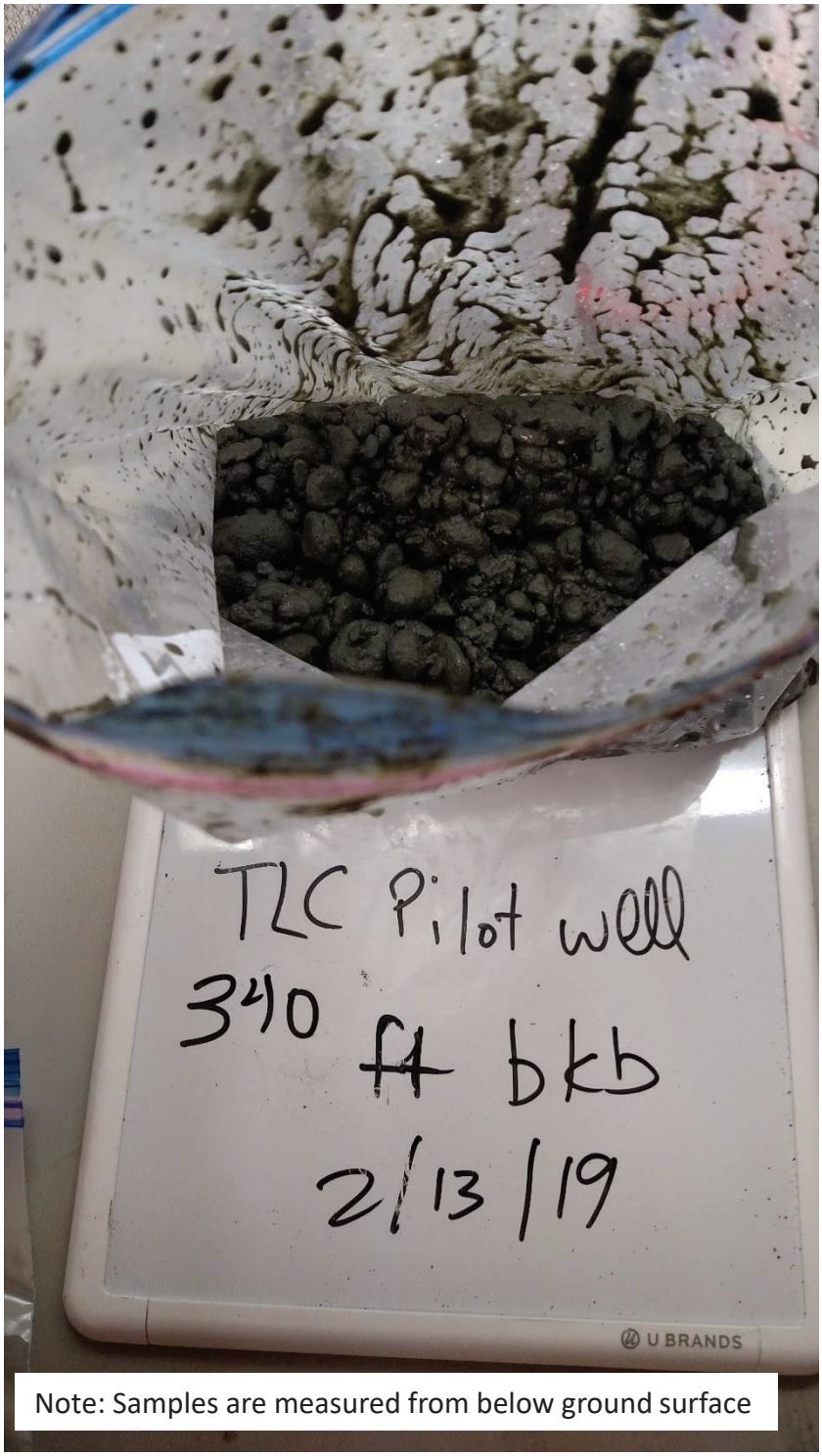
Figure C-55
Photograph of sample TLC Pilot Well 330 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-56
Photograph of sample TLC Pilot Well 335 ft



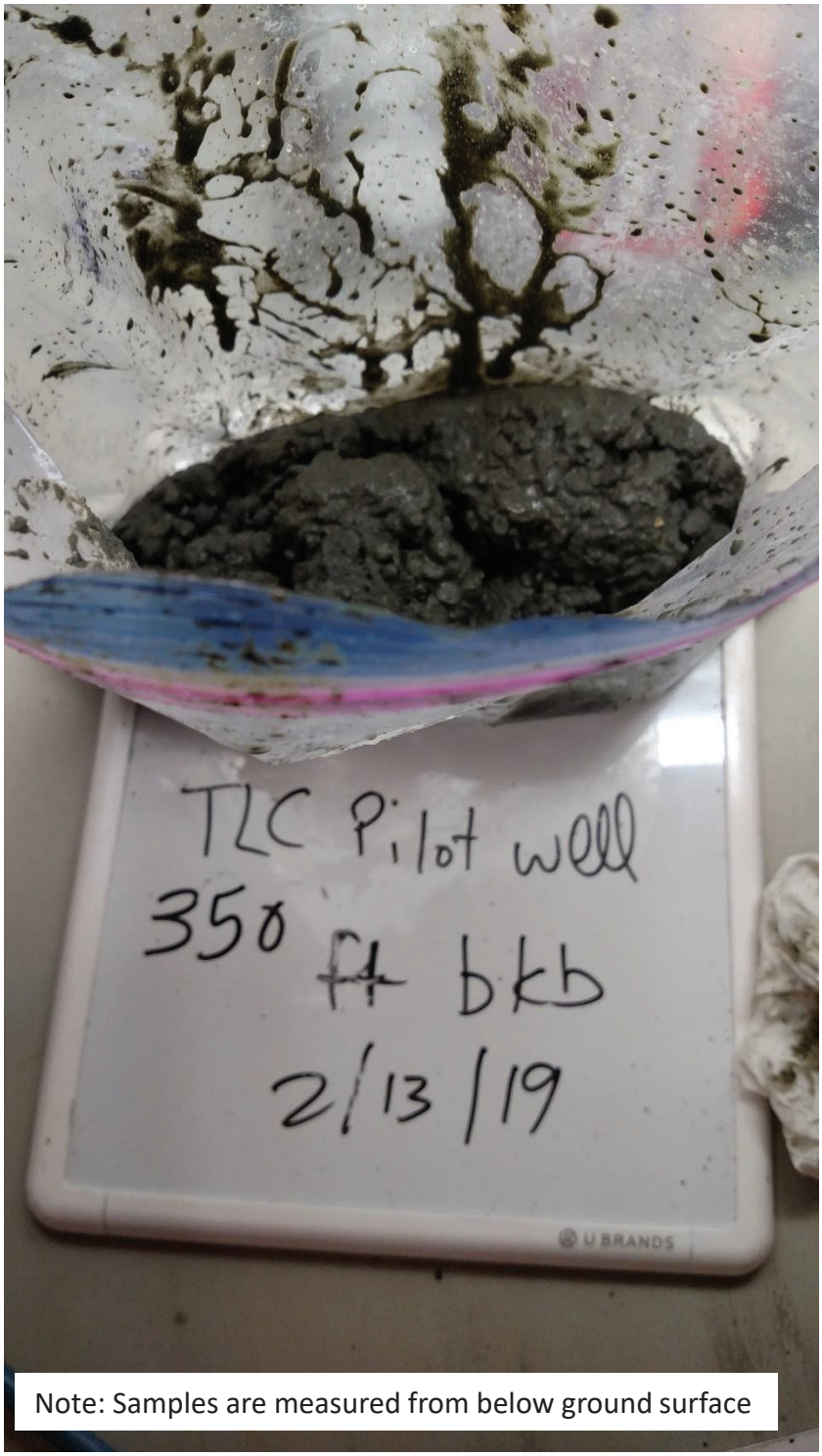
Note: Samples are measured from below ground surface

Figure C-57
Photograph of sample TLC Pilot Well 340 ft



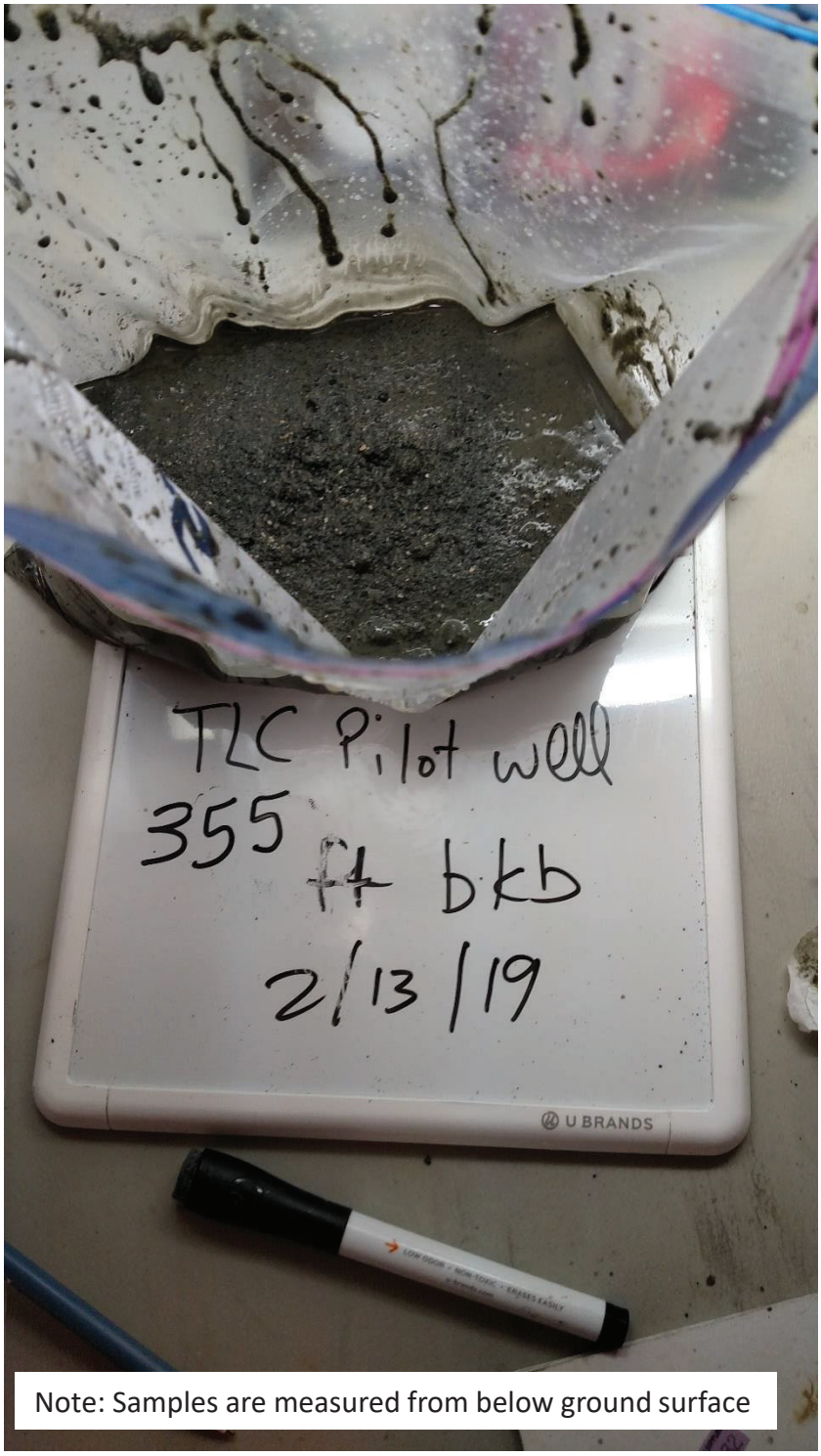
Note: Samples are measured from below ground surface

Figure C-58
Photograph of sample TLC Pilot Well 345 ft



Note: Samples are measured from below ground surface

Figure C-59
Photograph of sample TLC Pilot Well 350 ft



Note: Samples are measured from below ground surface

Figure C-60
Photograph of sample TLC Pilot Well 355 ft

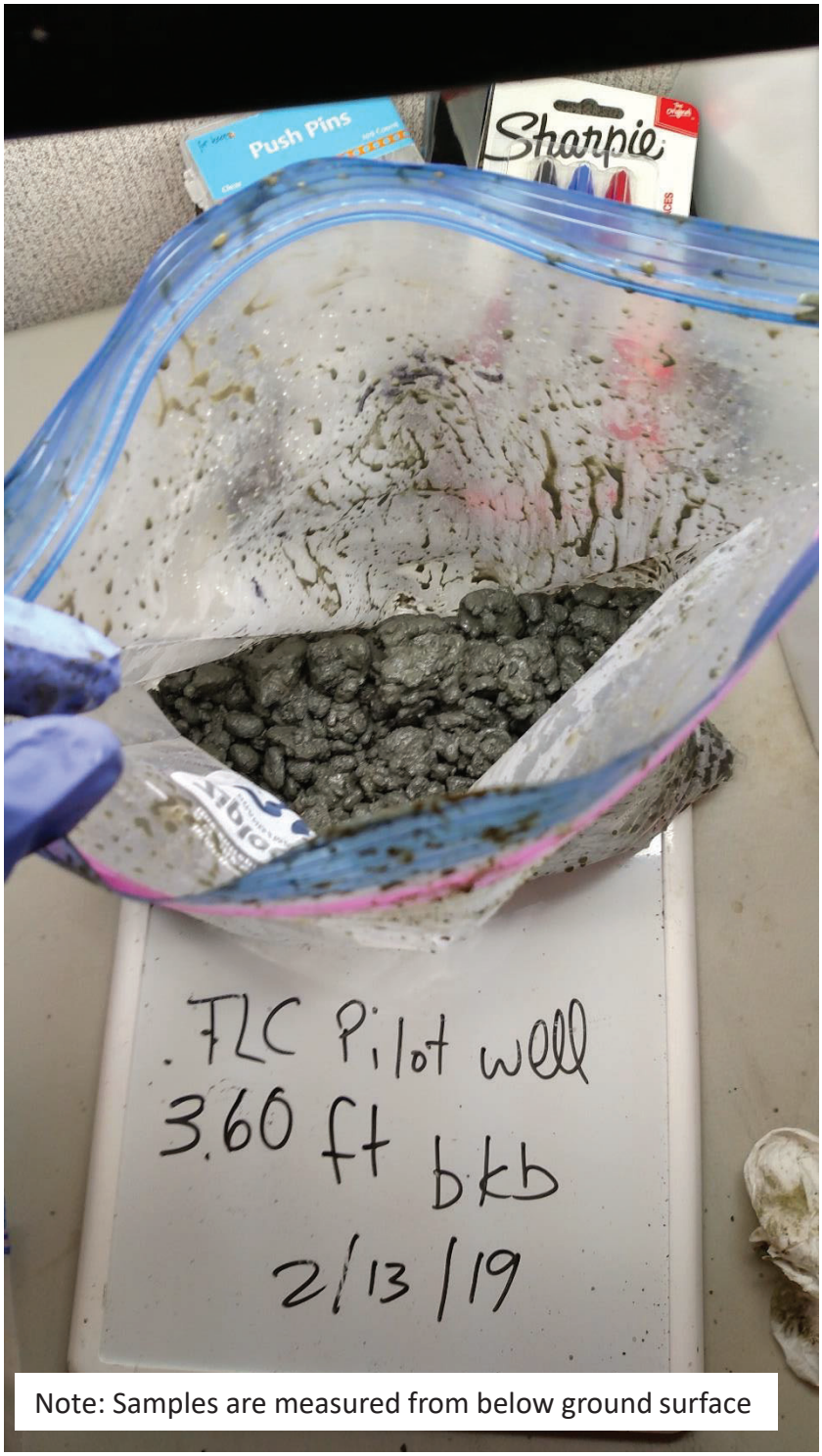
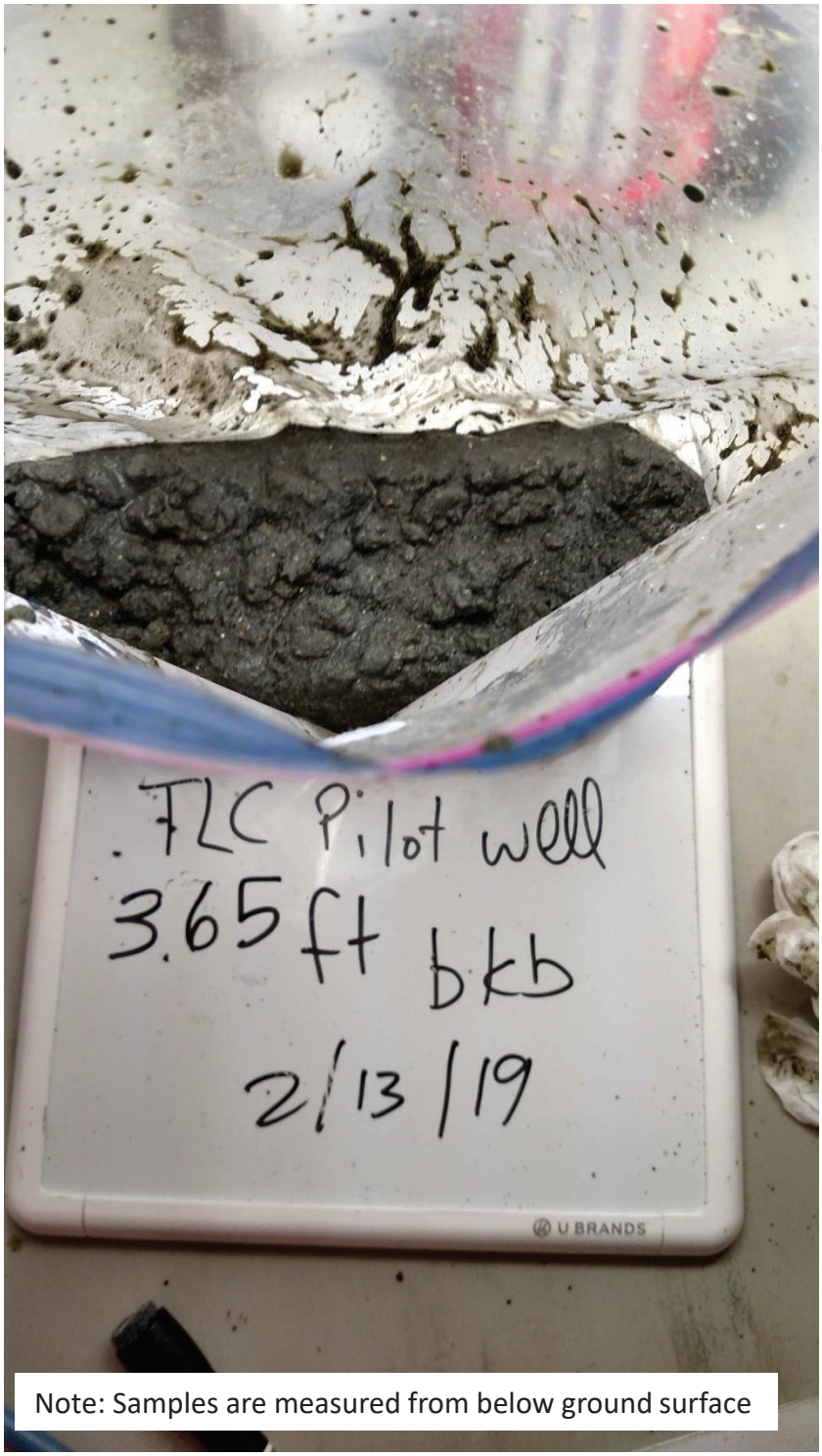


Figure C-61
Photograph of sample TLC Pilot Well 360 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-62
Photograph of sample TLC Pilot Well 365 ft

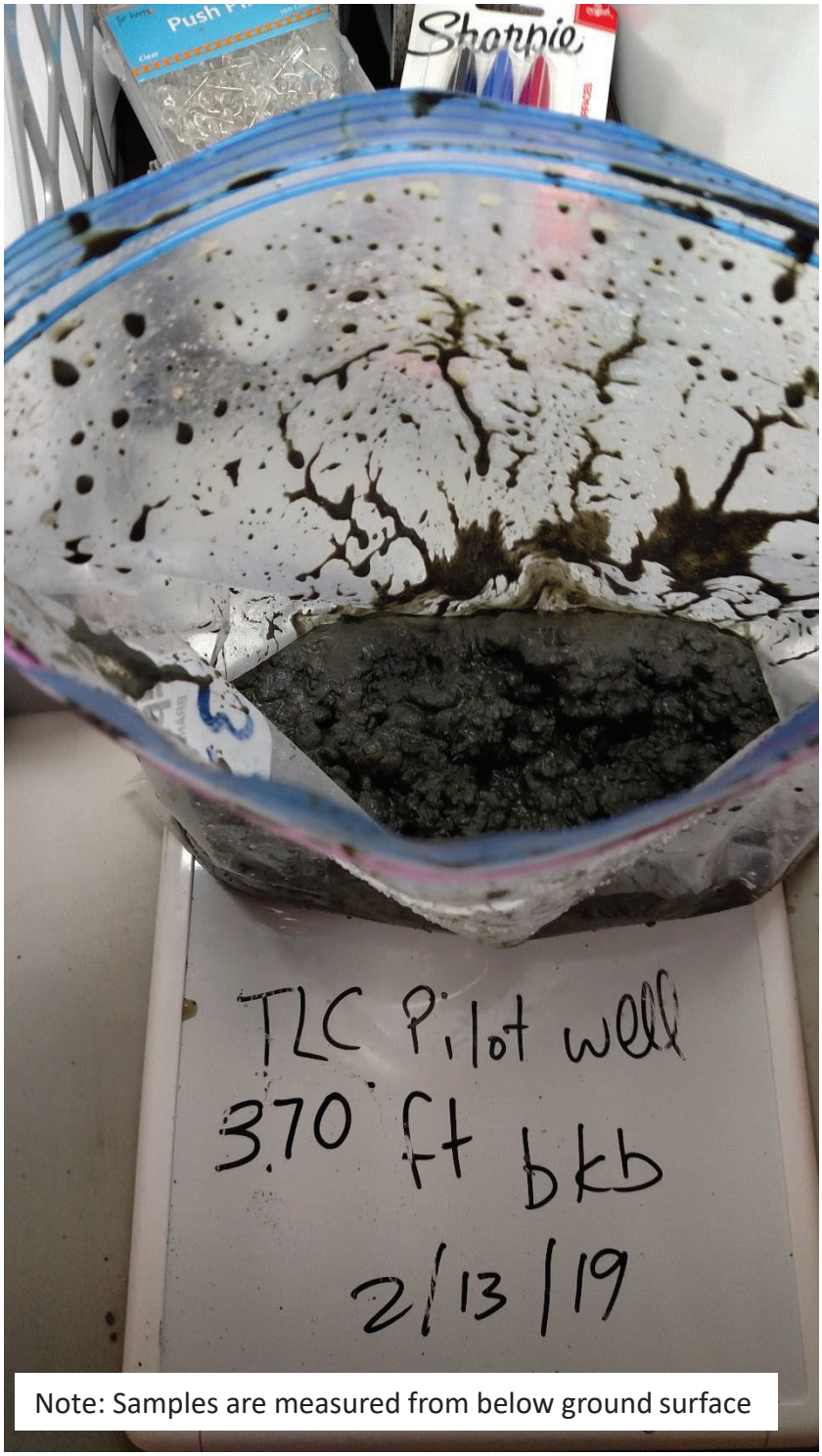
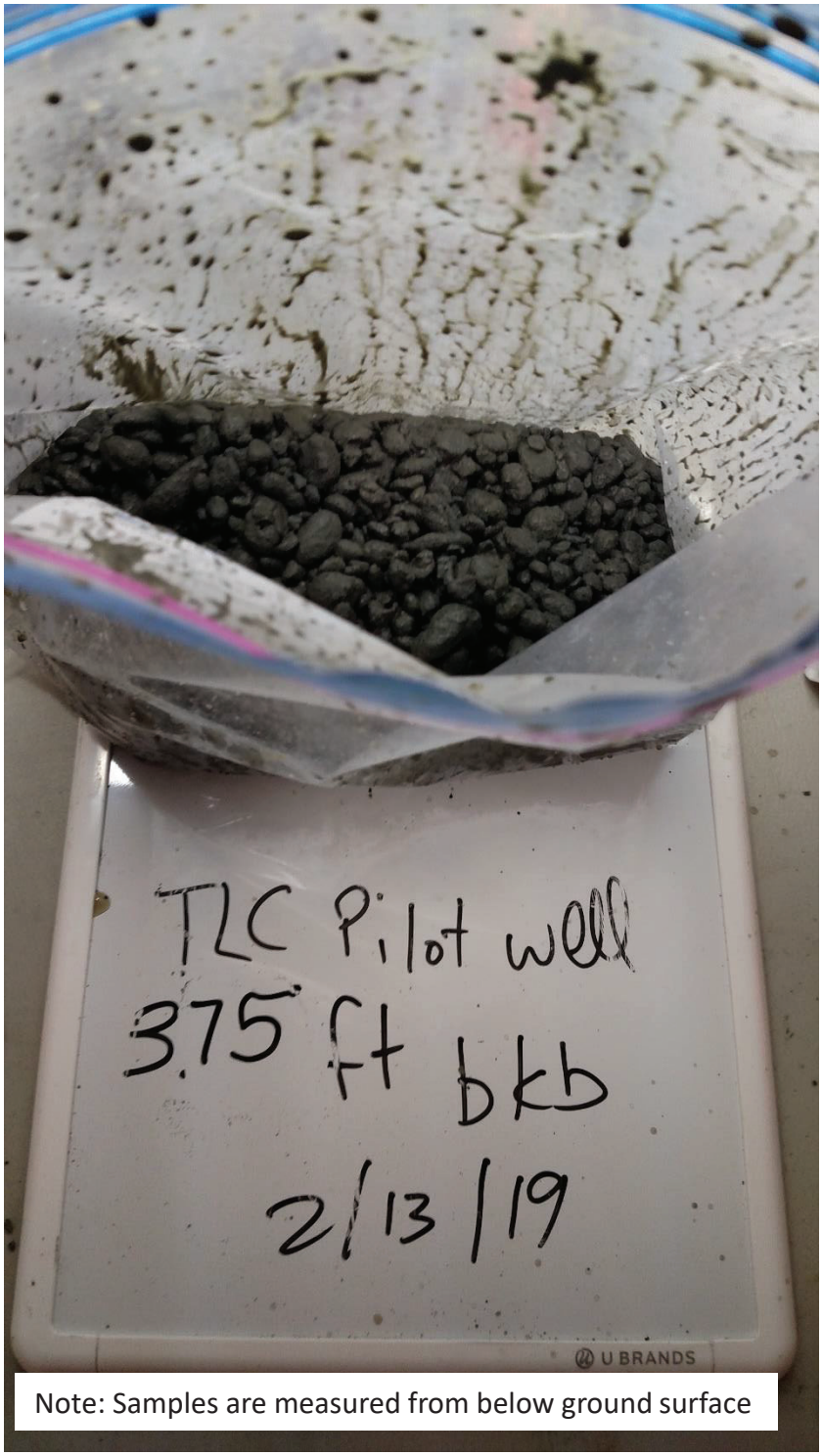


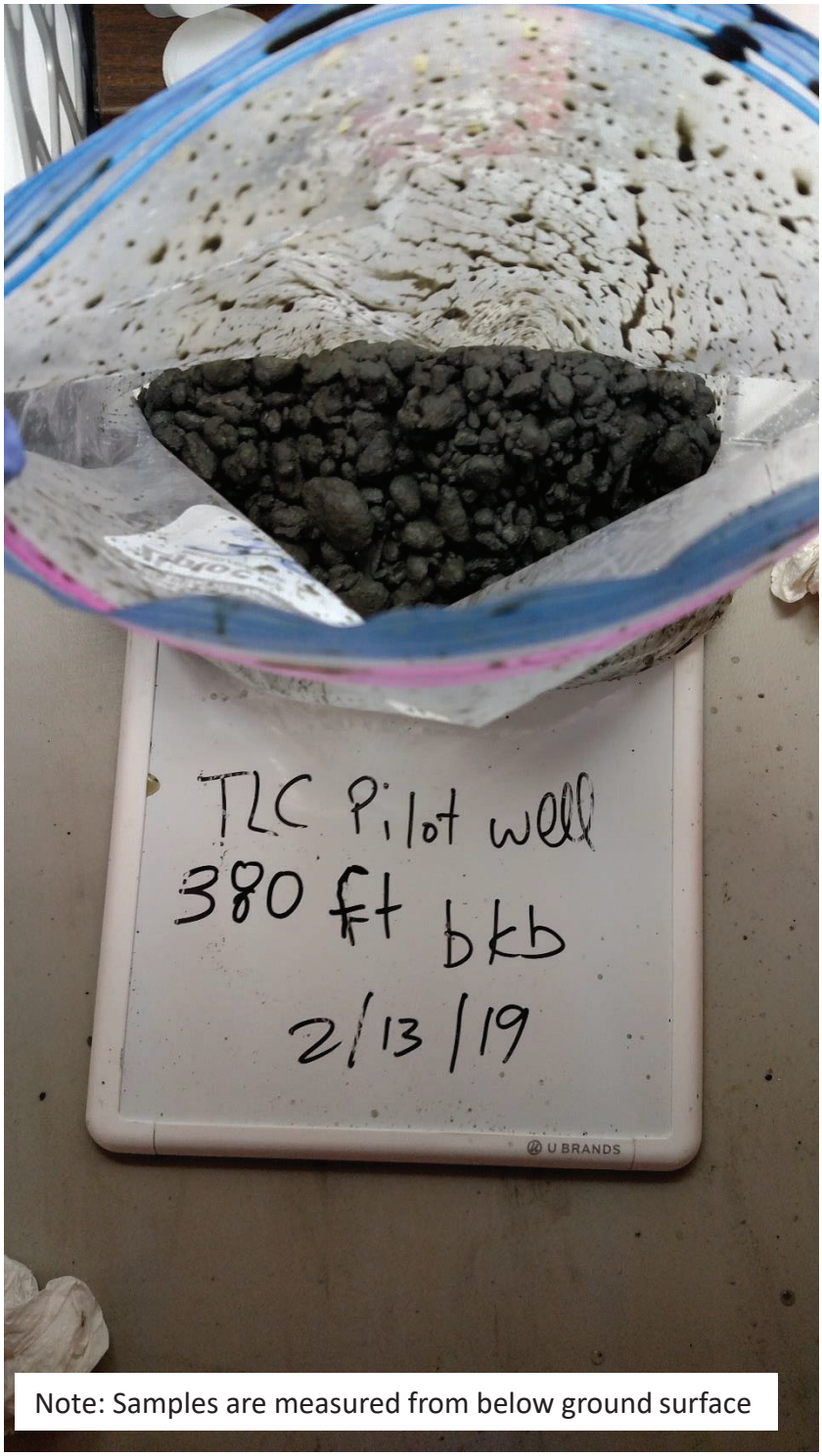
Figure C-63
Photograph of sample TLC Pilot Well 370 ft



Note: Samples are measured from below ground surface

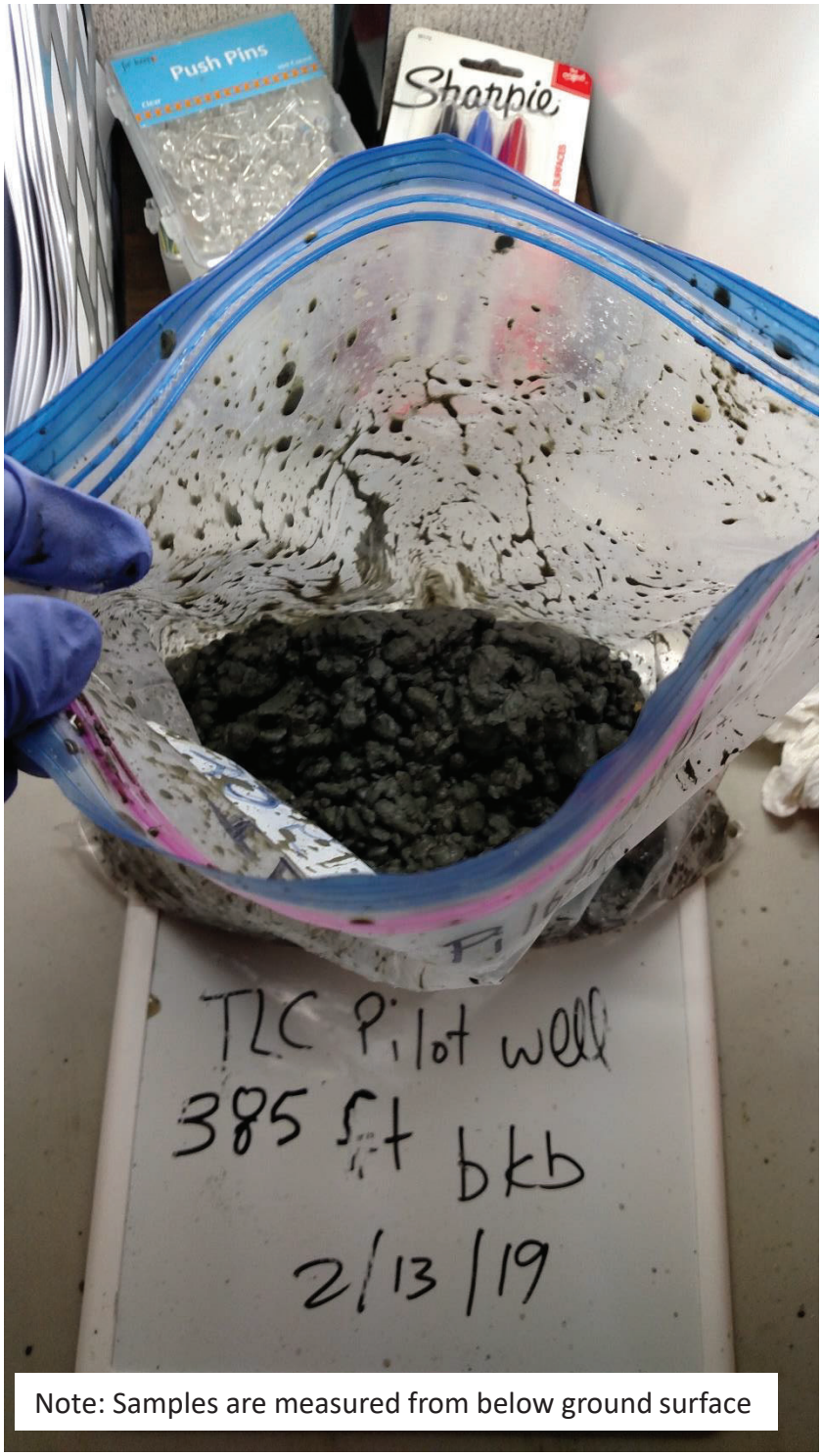
Figure C-64
Photograph of sample TLC Pilot Well 375 ft

Brown AND Caldwell



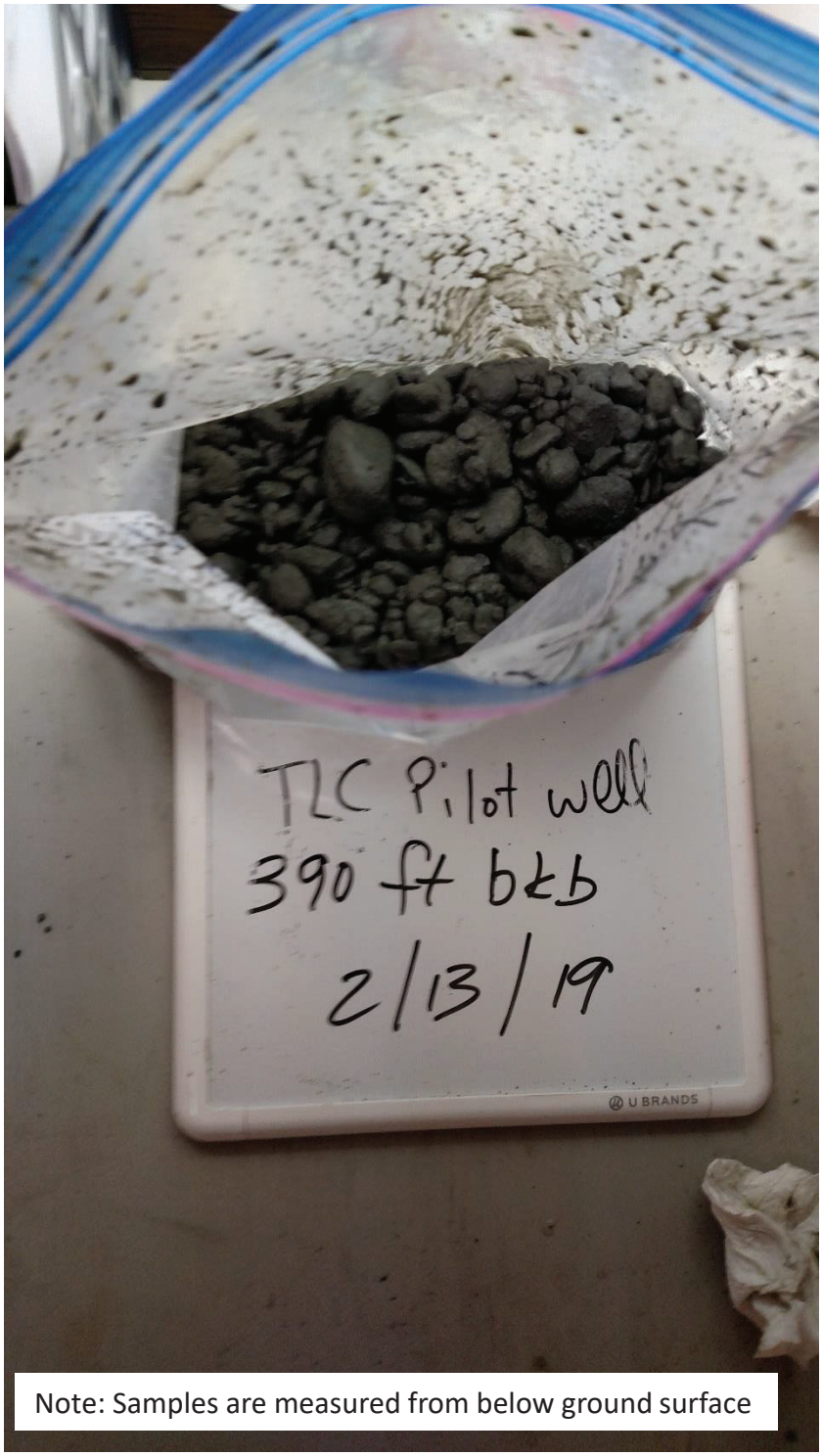
Note: Samples are measured from below ground surface

Figure C-65
Photograph of sample TLC Pilot Well 380 ft



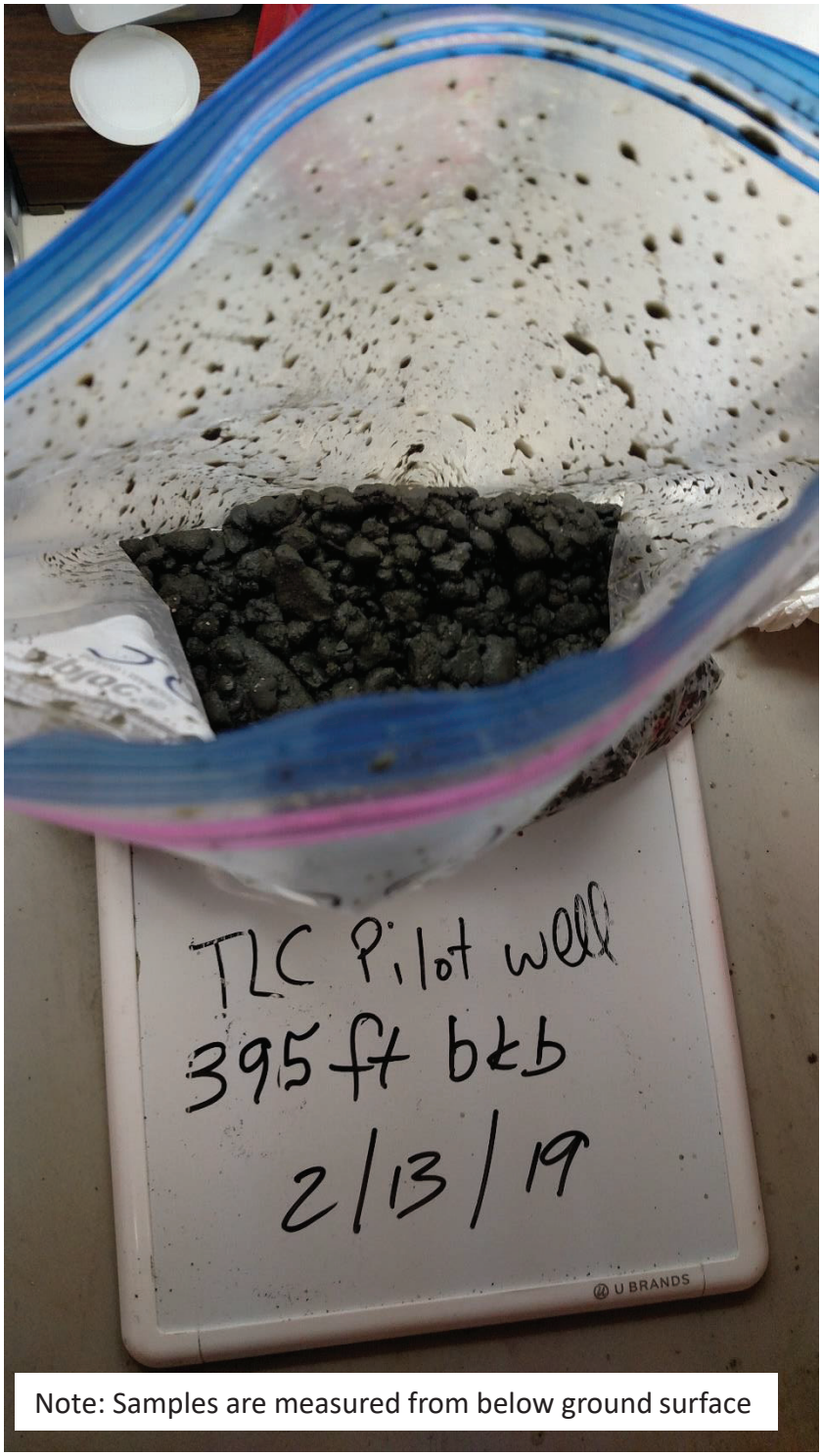
Note: Samples are measured from below ground surface

Figure C-66
Photograph of sample TLC Pilot Well 385 ft



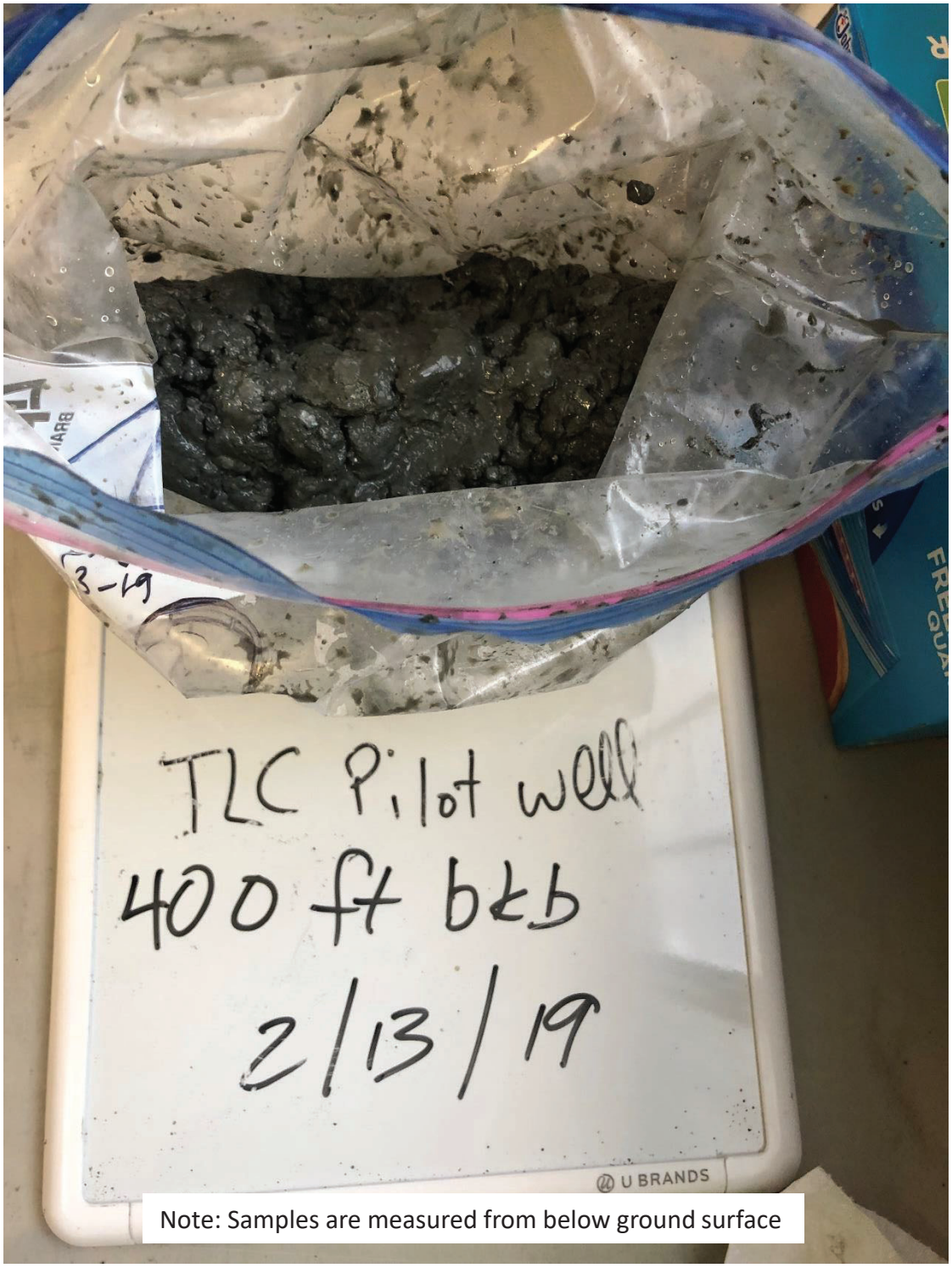
Note: Samples are measured from below ground surface

Figure C-67
Photograph of sample TLC Pilot Well 390 ft



Note: Samples are measured from below ground surface

Figure C-68
Photograph of sample TLC Pilot Well 395 ft



Note: Samples are measured from below ground surface

Figure C-69
Photograph of sample TLC Pilot Well 400 ft

Brown AND Caldwell

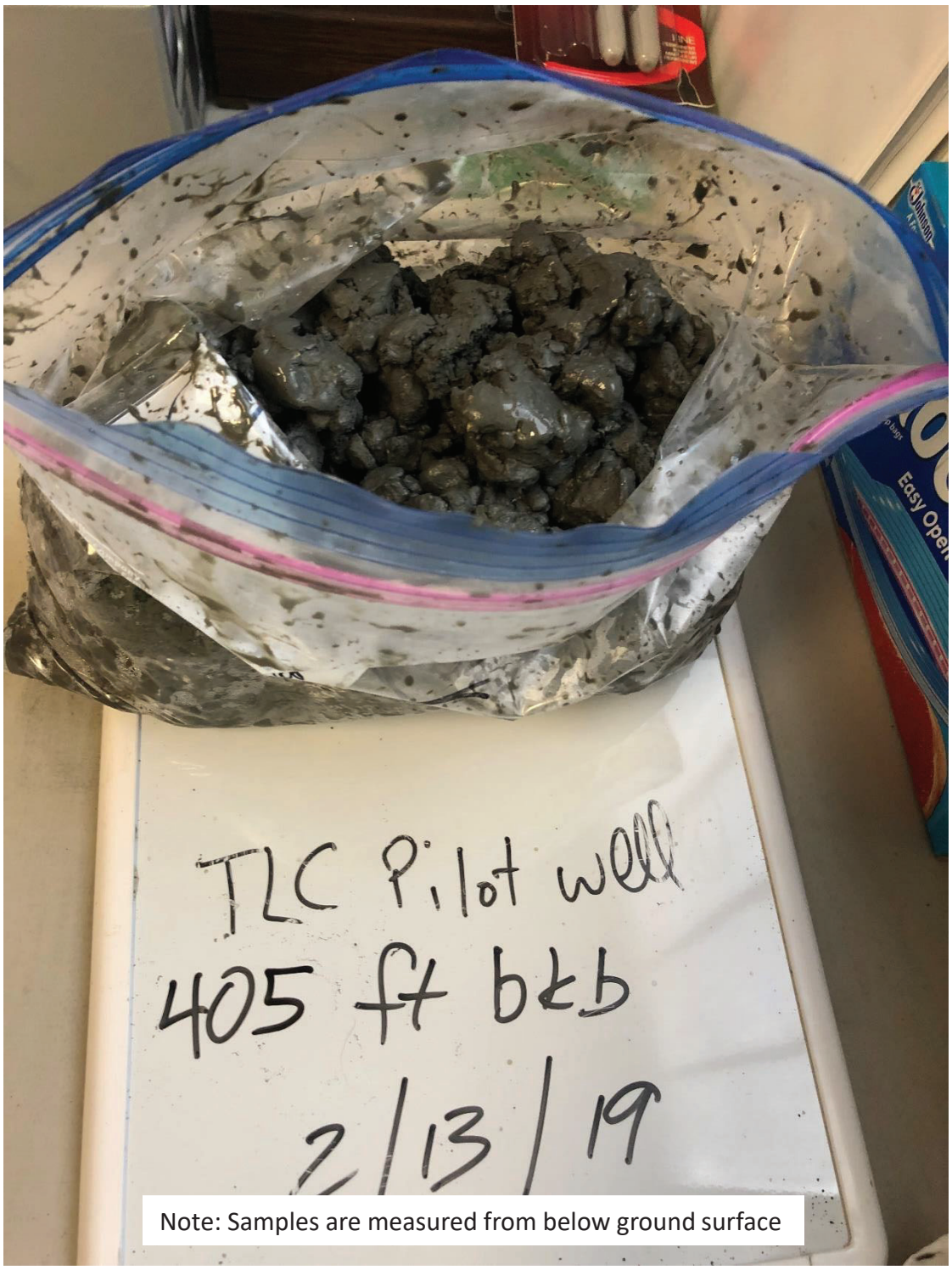
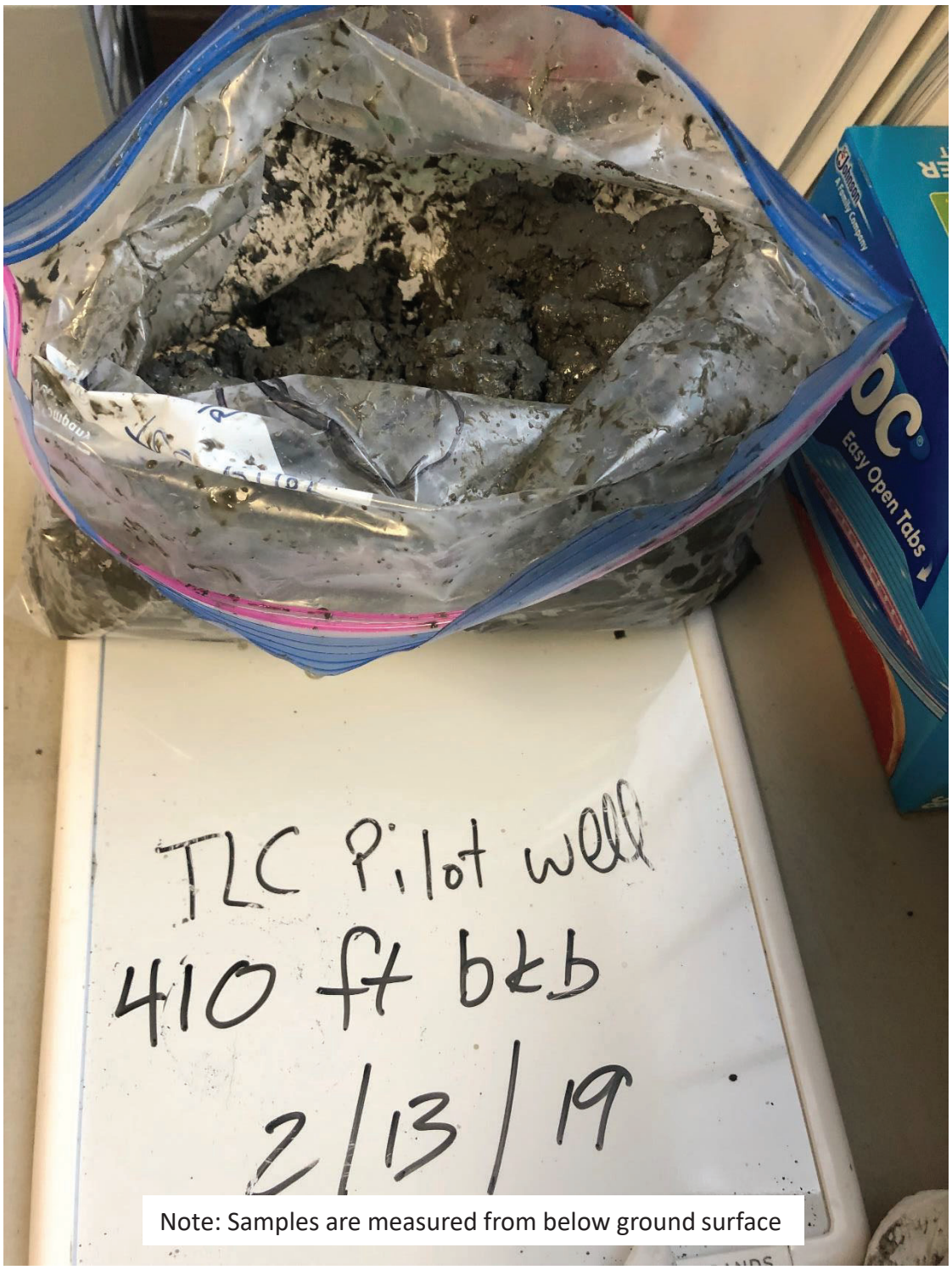


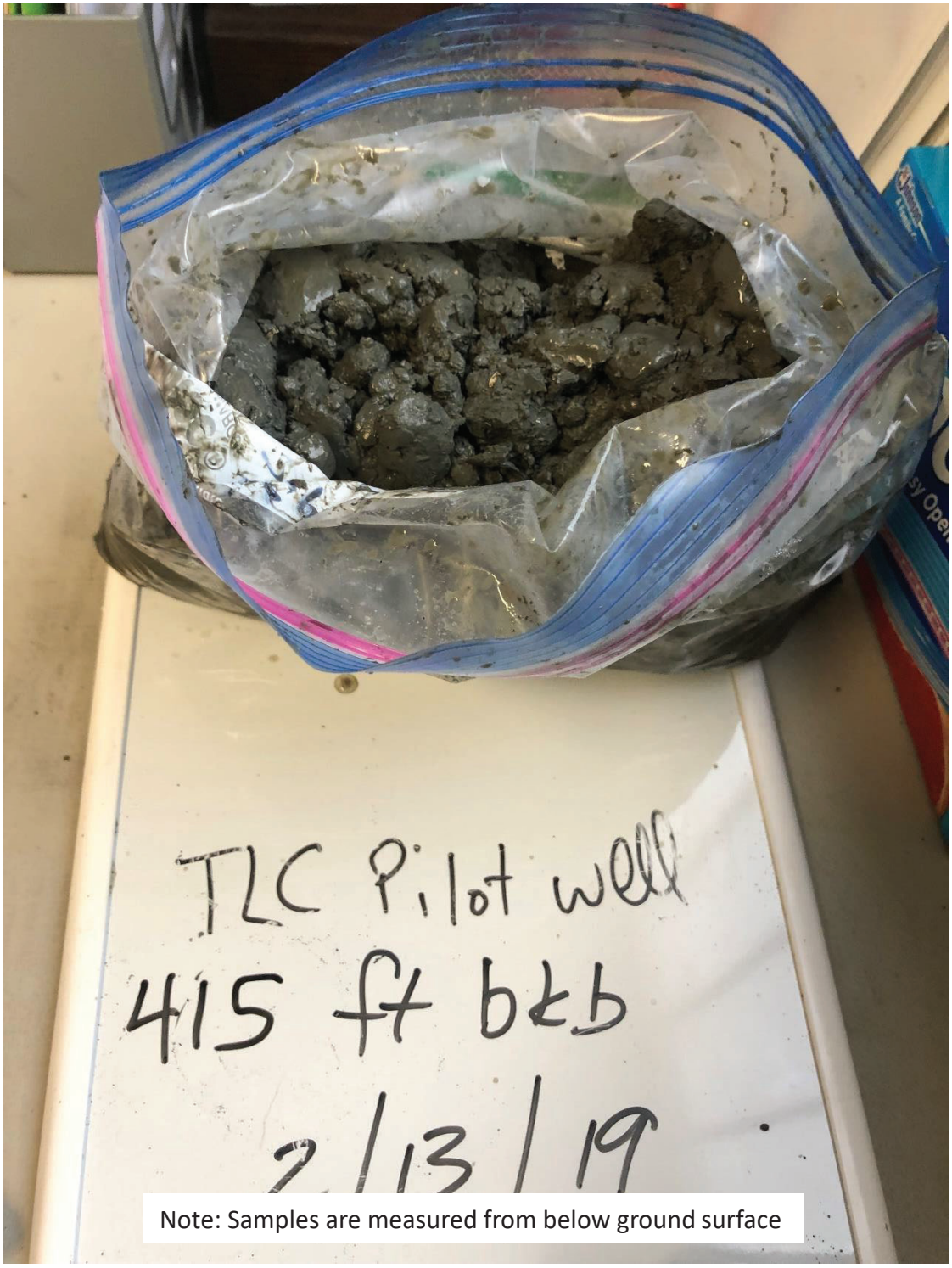
Figure C-70
Photograph of sample TLC Pilot Well 405 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-71
Photograph of sample TLC Pilot Well 410 ft



Note: Samples are measured from below ground surface

Figure C-72
Photograph of sample TLC Pilot Well 415 ft

Brown AND Caldwell

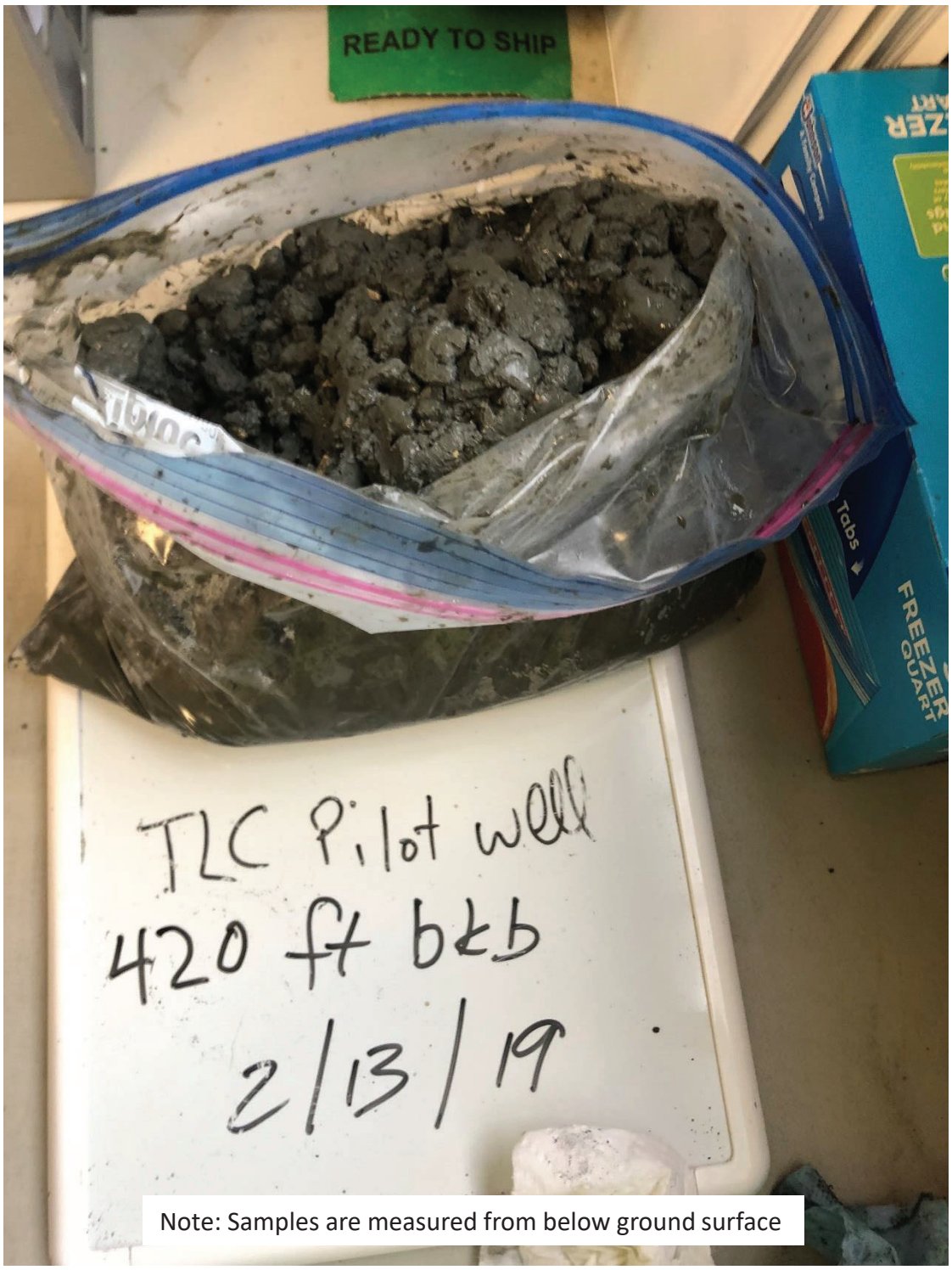


Figure C-73
Photograph of sample TLC Pilot Well 420 ft

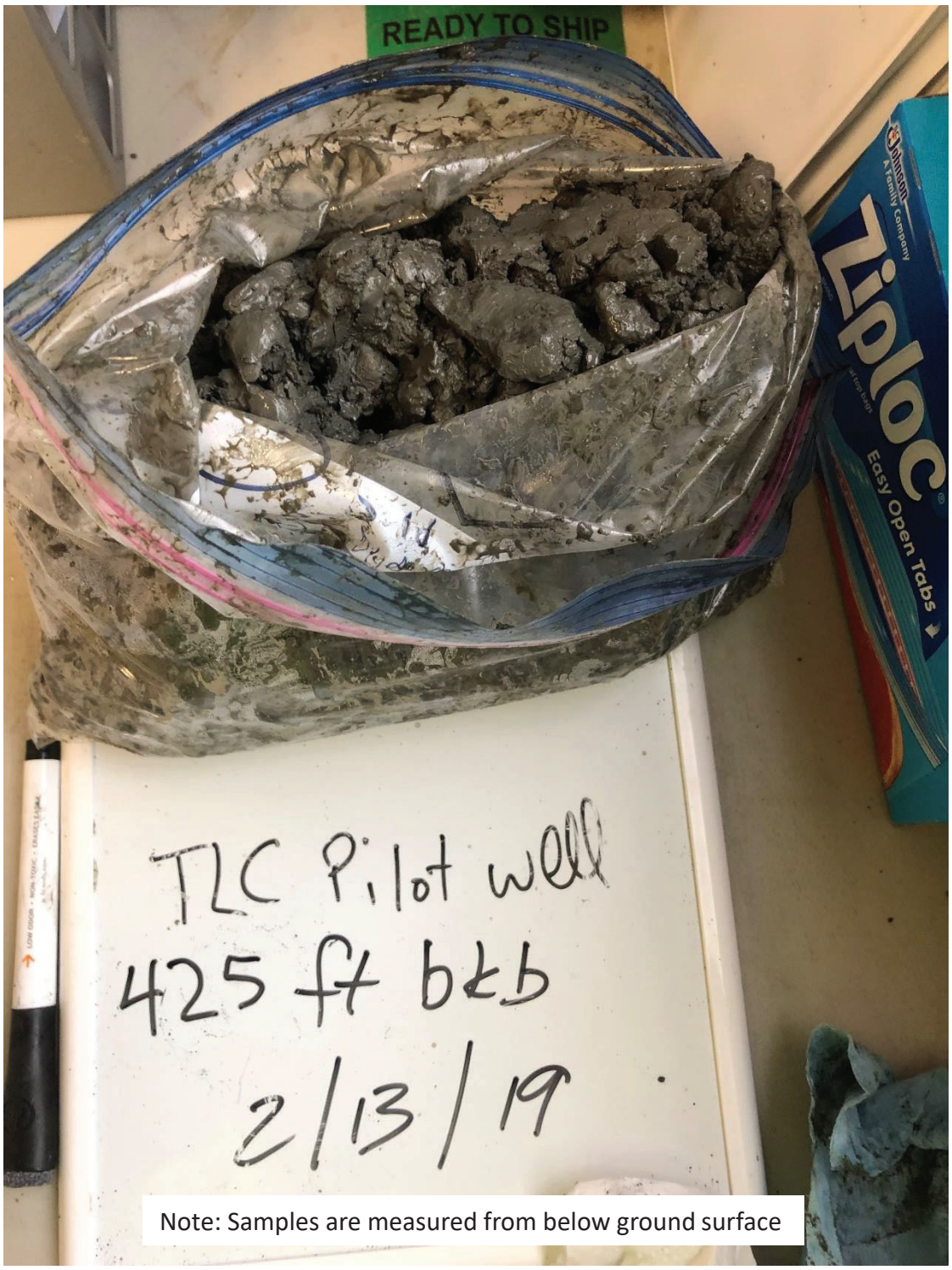
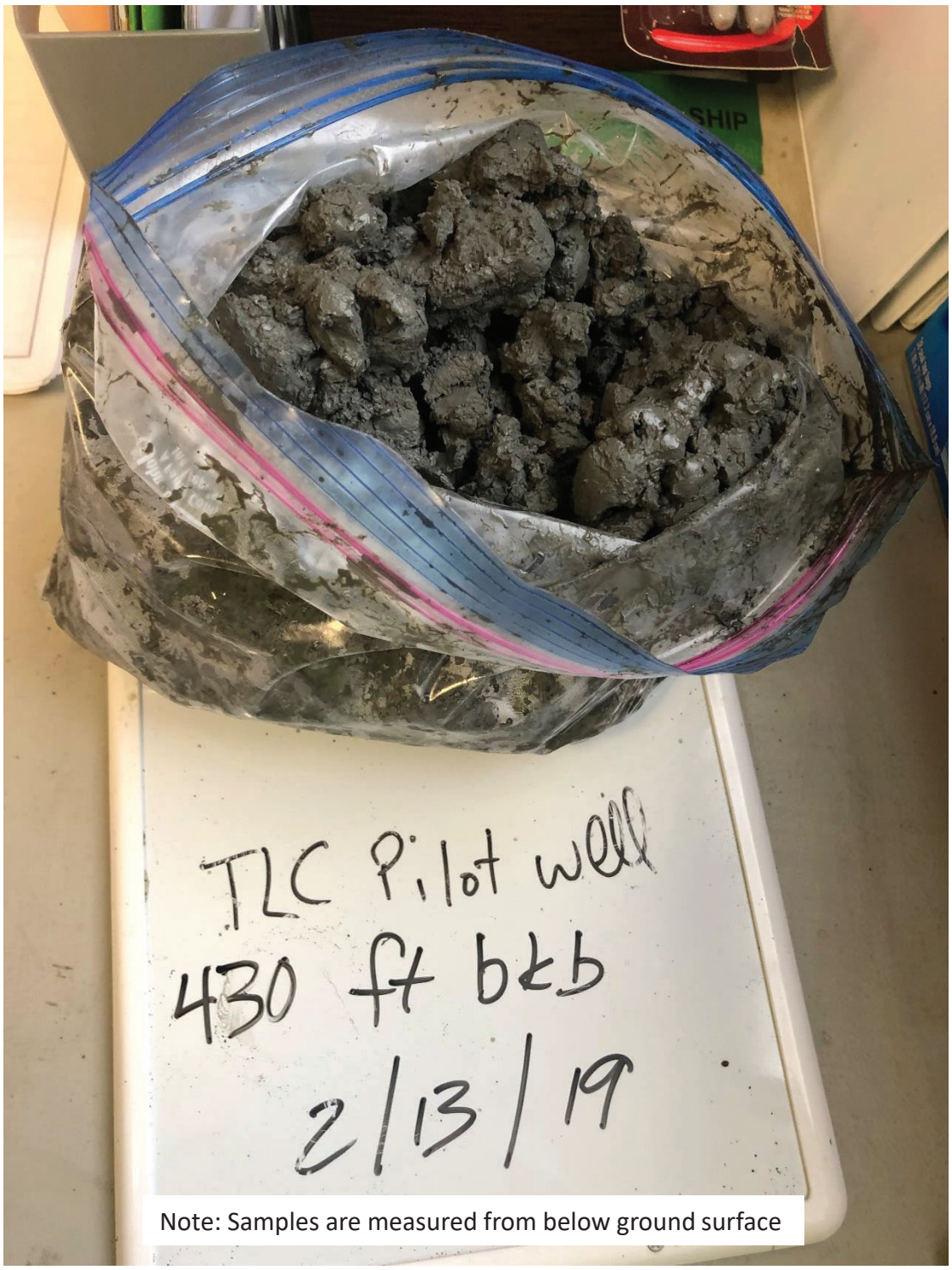


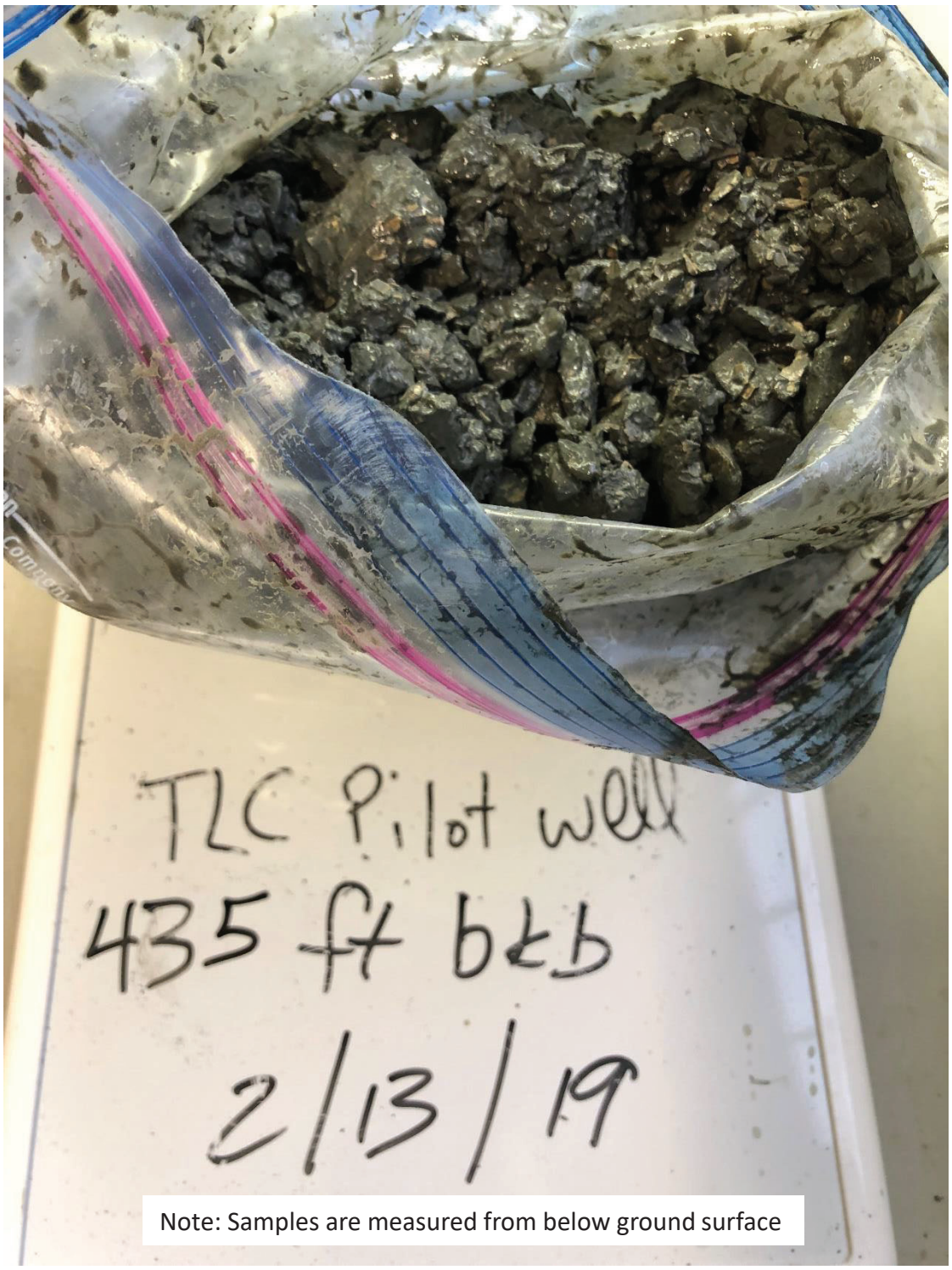
Figure C-74
Photograph of sample TLC Pilot Well 425 ft



Note: Samples are measured from below ground surface

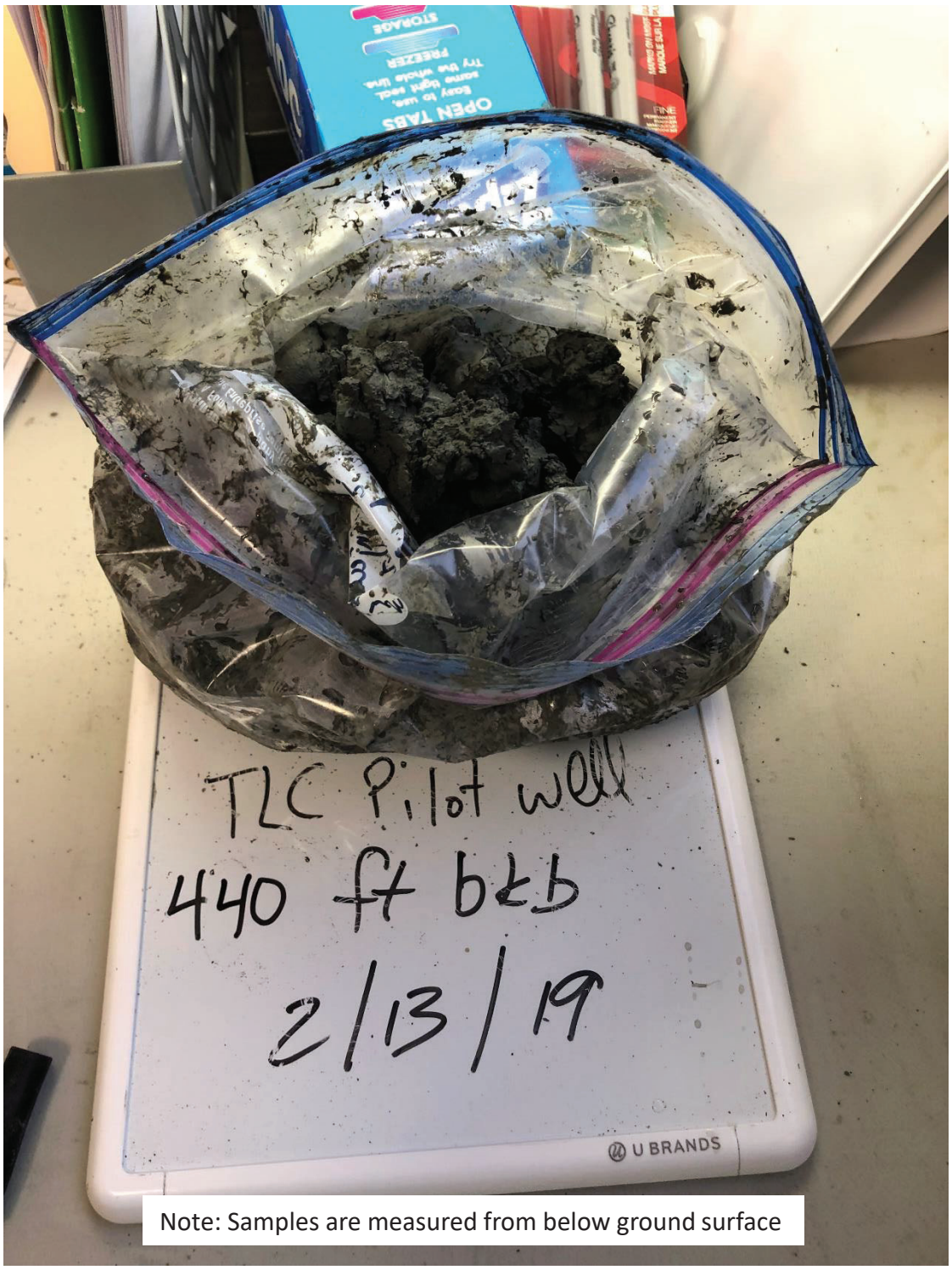
Figure C-75
Photograph of sample TLC Pilot Well 430 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-76
Photograph of sample TLC Pilot Well 435 ft



Note: Samples are measured from below ground surface

Figure C-77
Photograph of sample TLC Pilot Well 440 ft

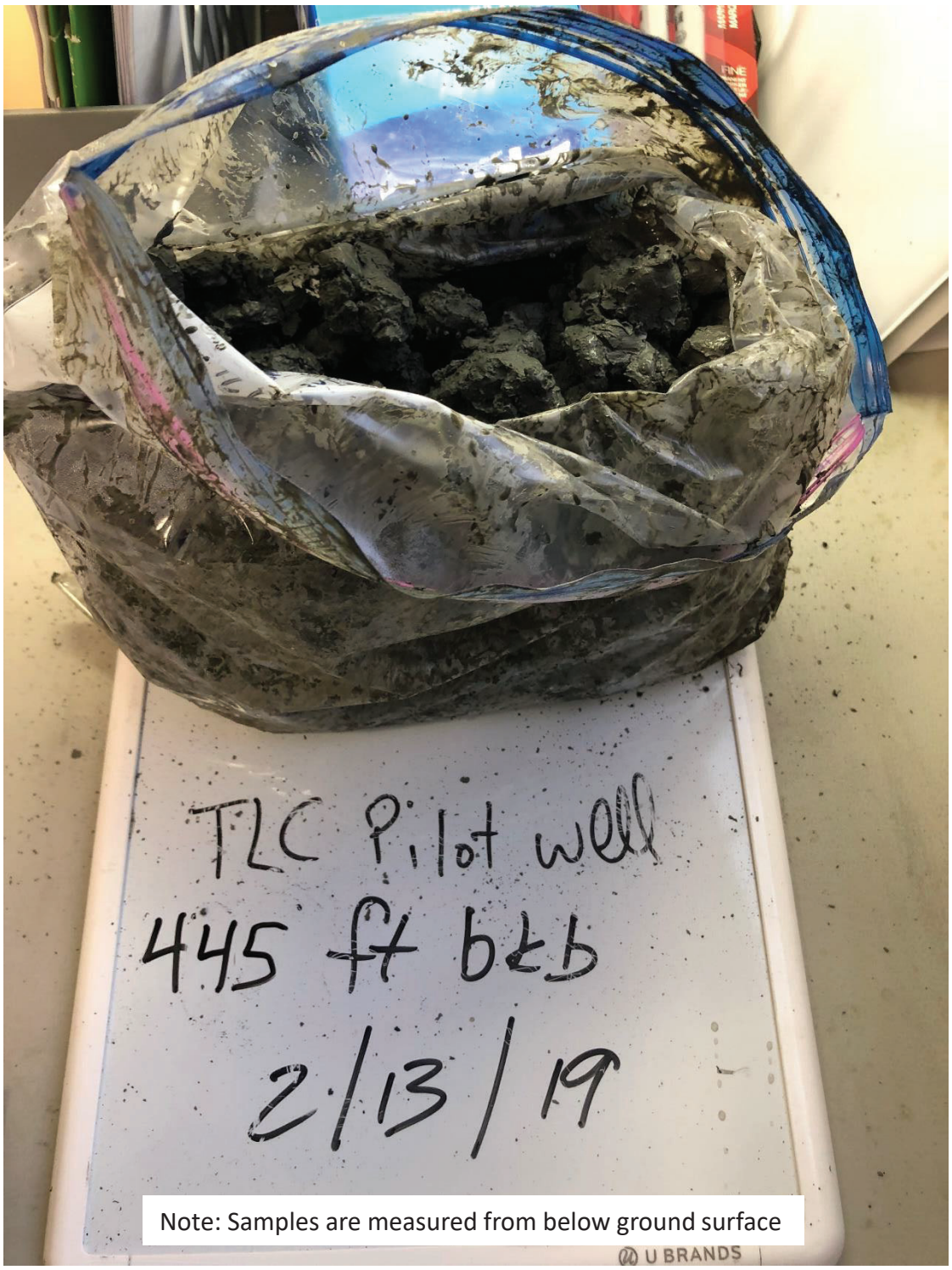


Figure C-78
Photograph of sample TLC Pilot Well 445 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

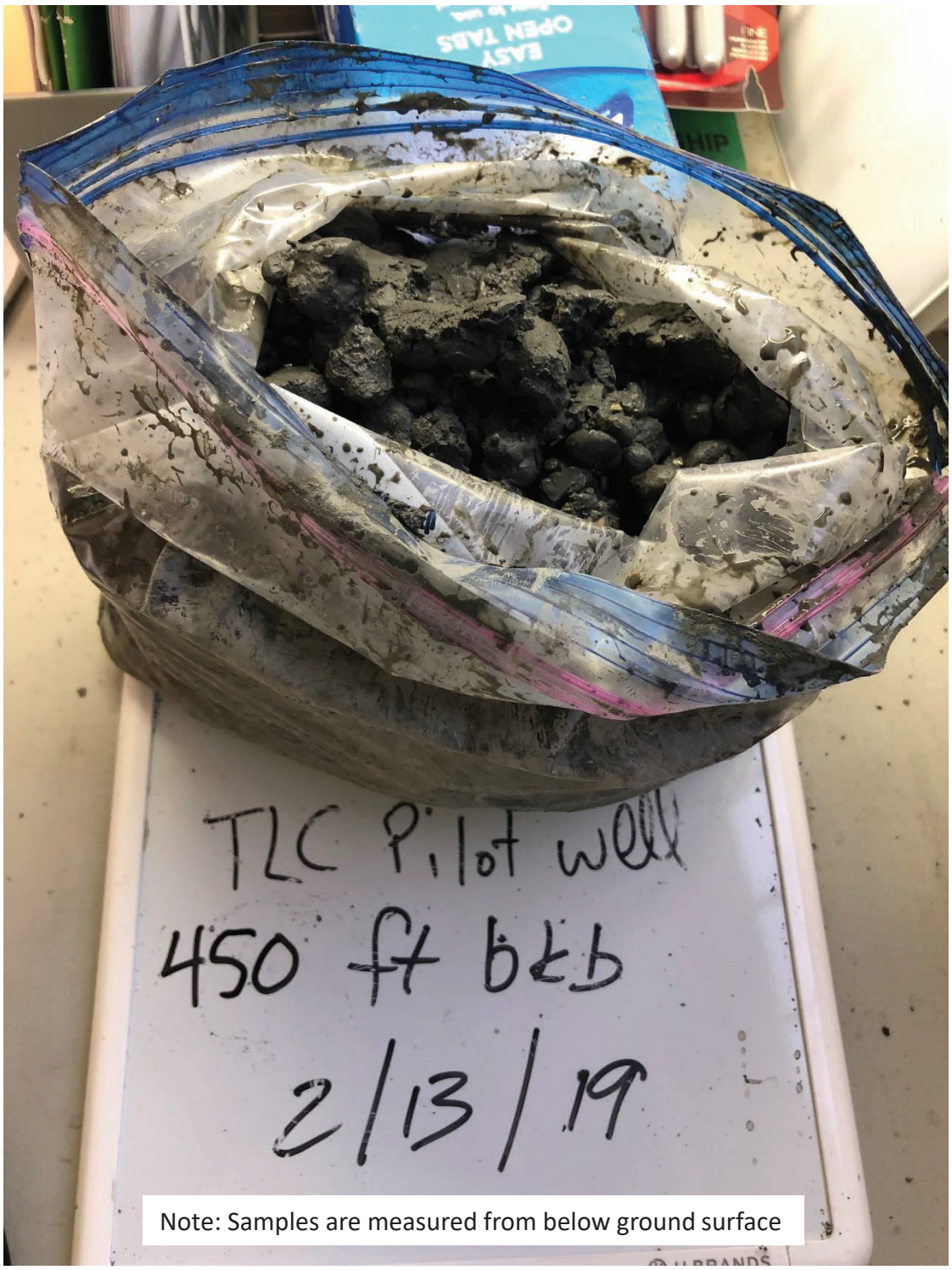
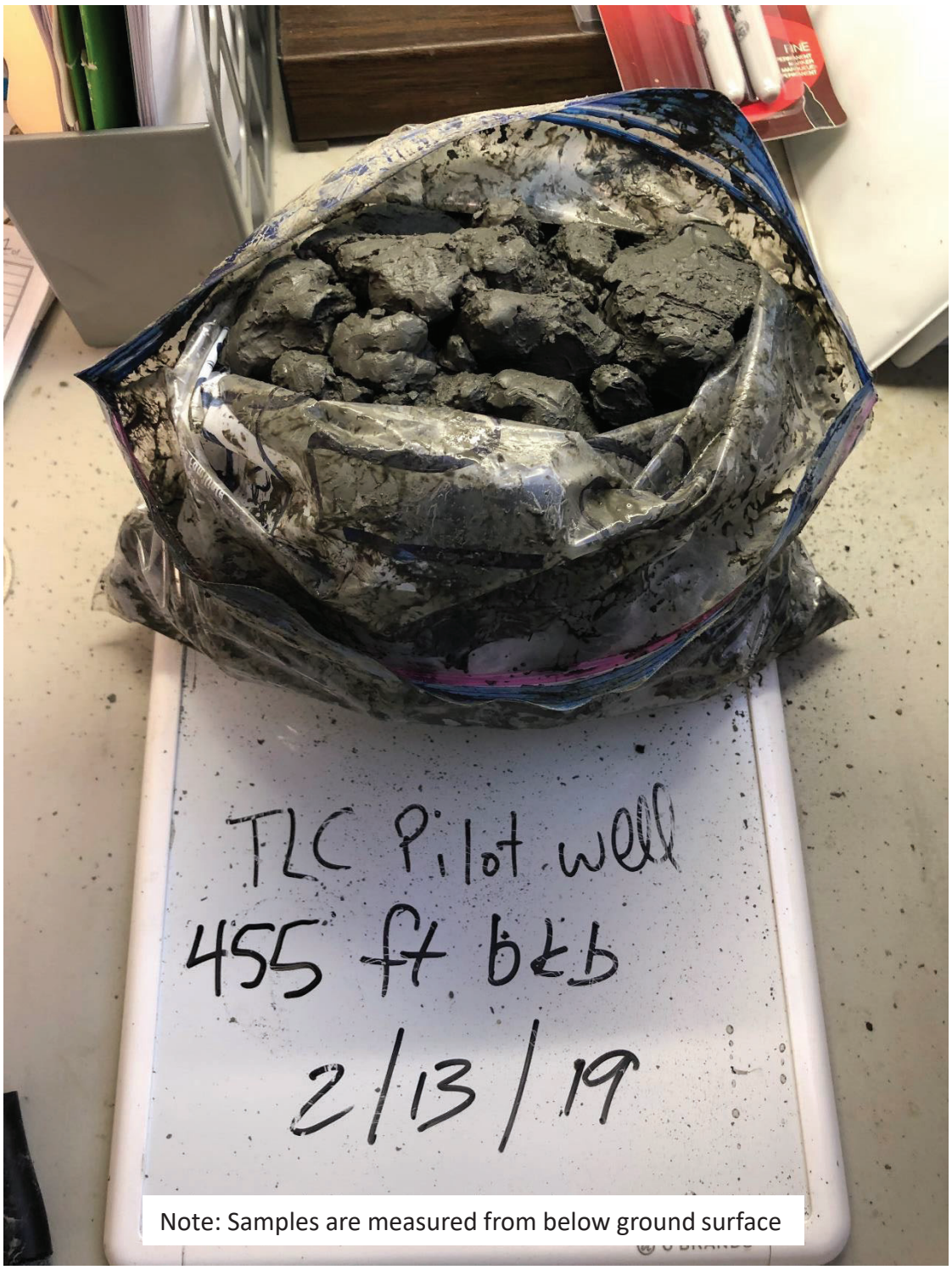


Figure C-79
Photograph of sample TLC Pilot Well 450 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

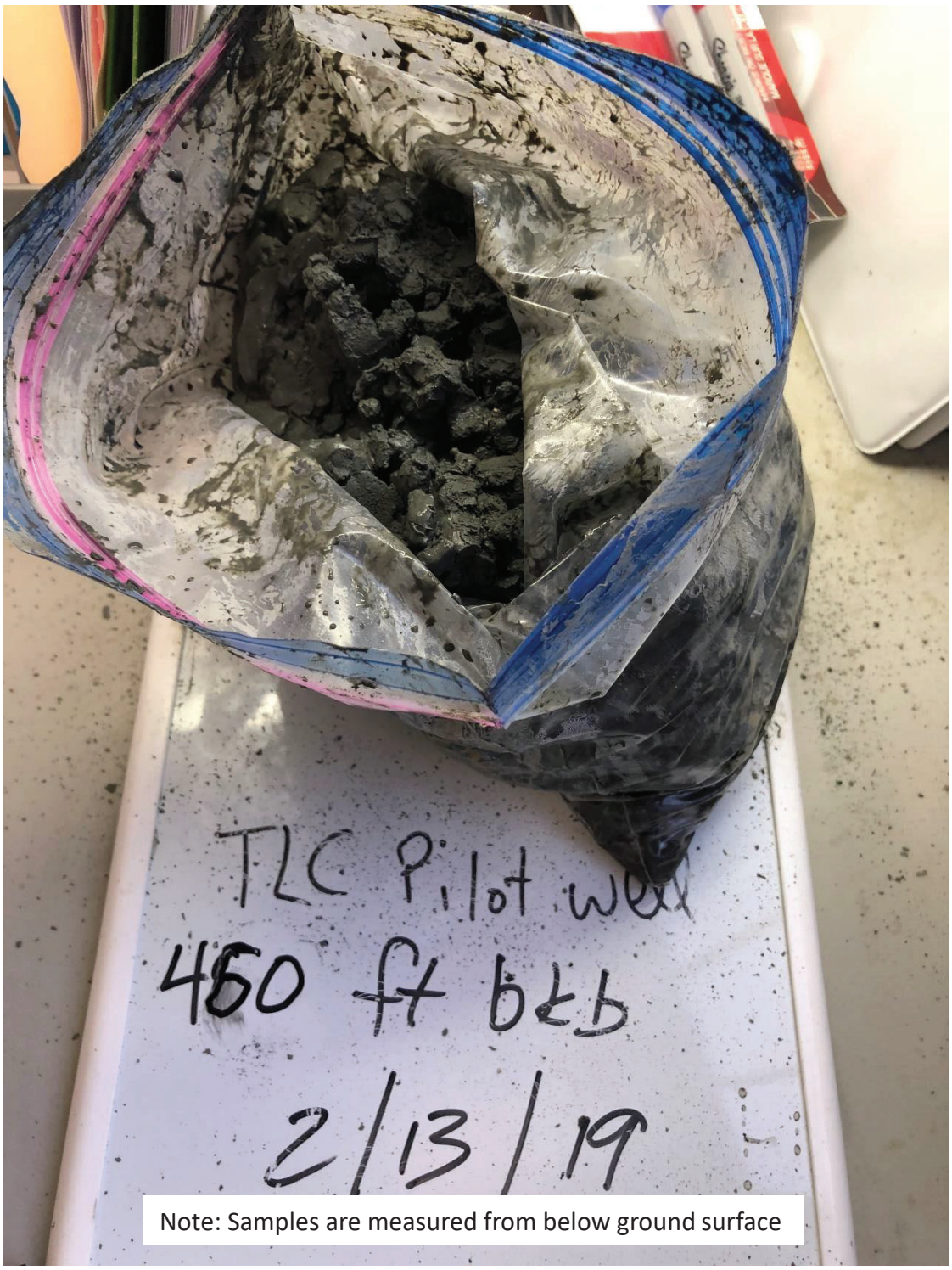


Note: Samples are measured from below ground surface

Figure C-80
Photograph of sample TLC Pilot Well 455 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



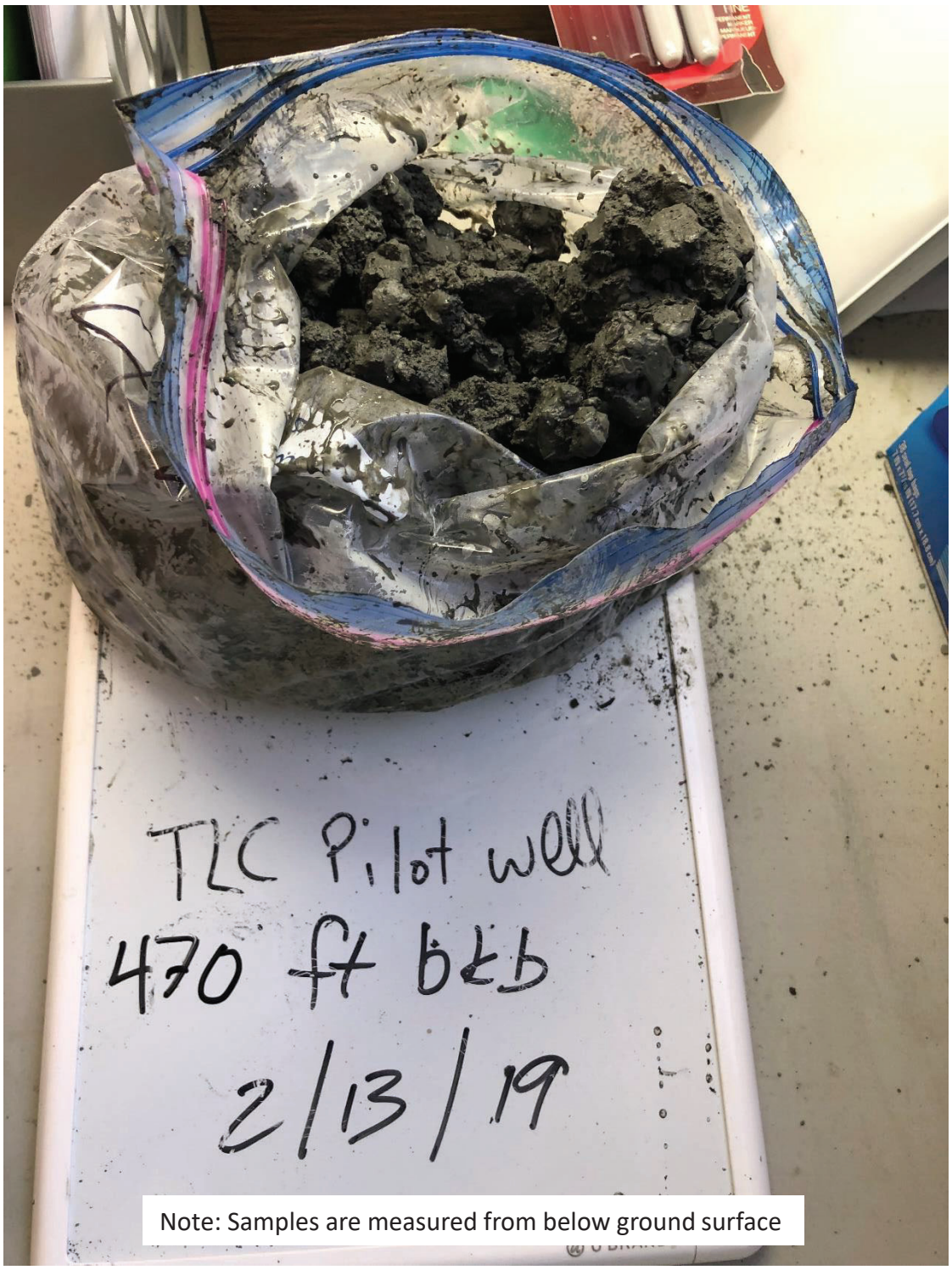
Note: Samples are measured from below ground surface

Figure C-81
Photograph of sample TLC Pilot Well 460 ft



Note: Samples are measured from below ground surface

Figure C-82
Photograph of sample TLC Pilot Well 465 ft



Note: Samples are measured from below ground surface

Figure C-83
Photograph of sample TLC Pilot Well 470 ft

Brown AND Caldwell

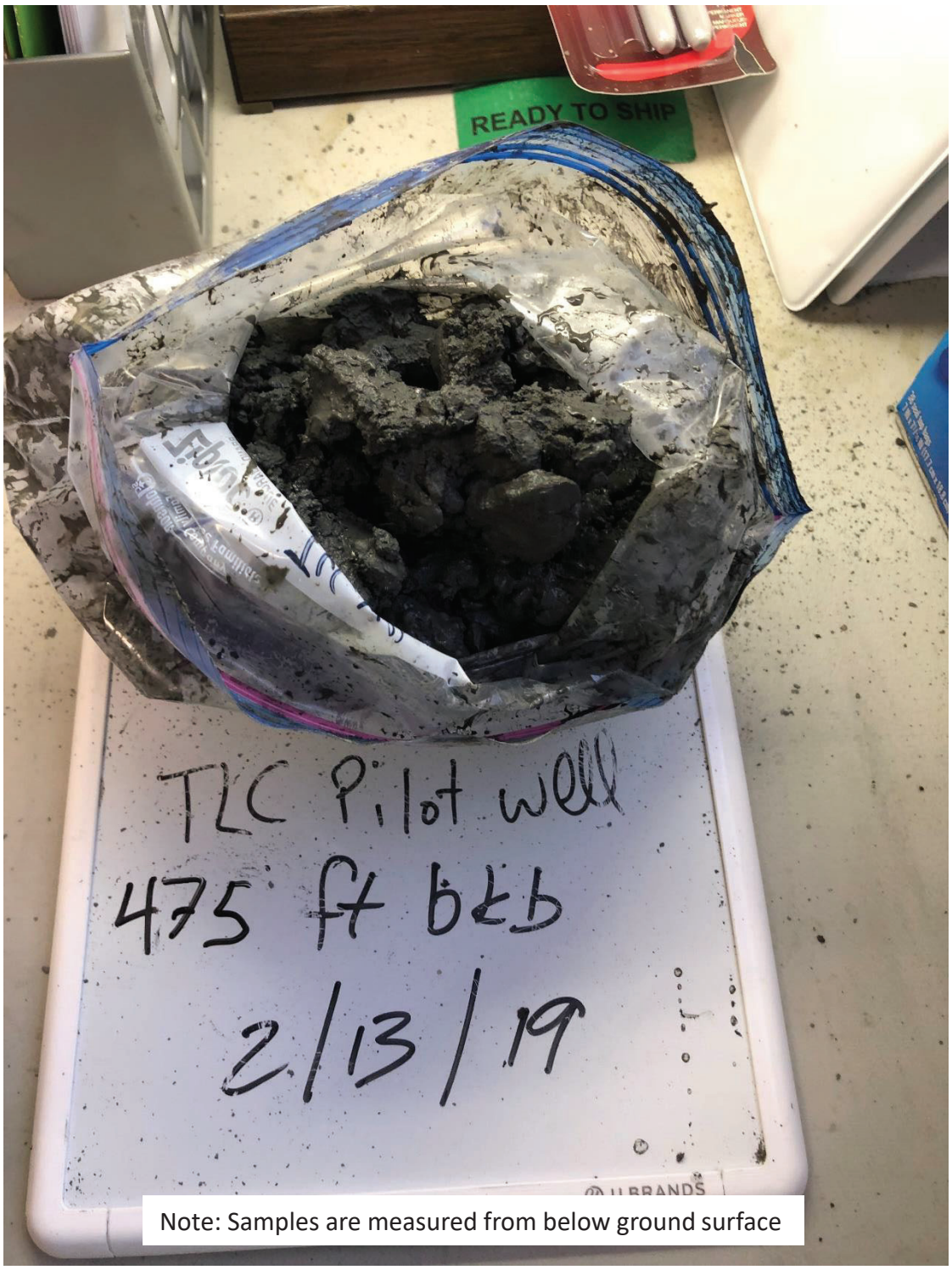


Figure C-84
Photograph of sample TLC Pilot Well 475 ft

Brown AND Caldwell

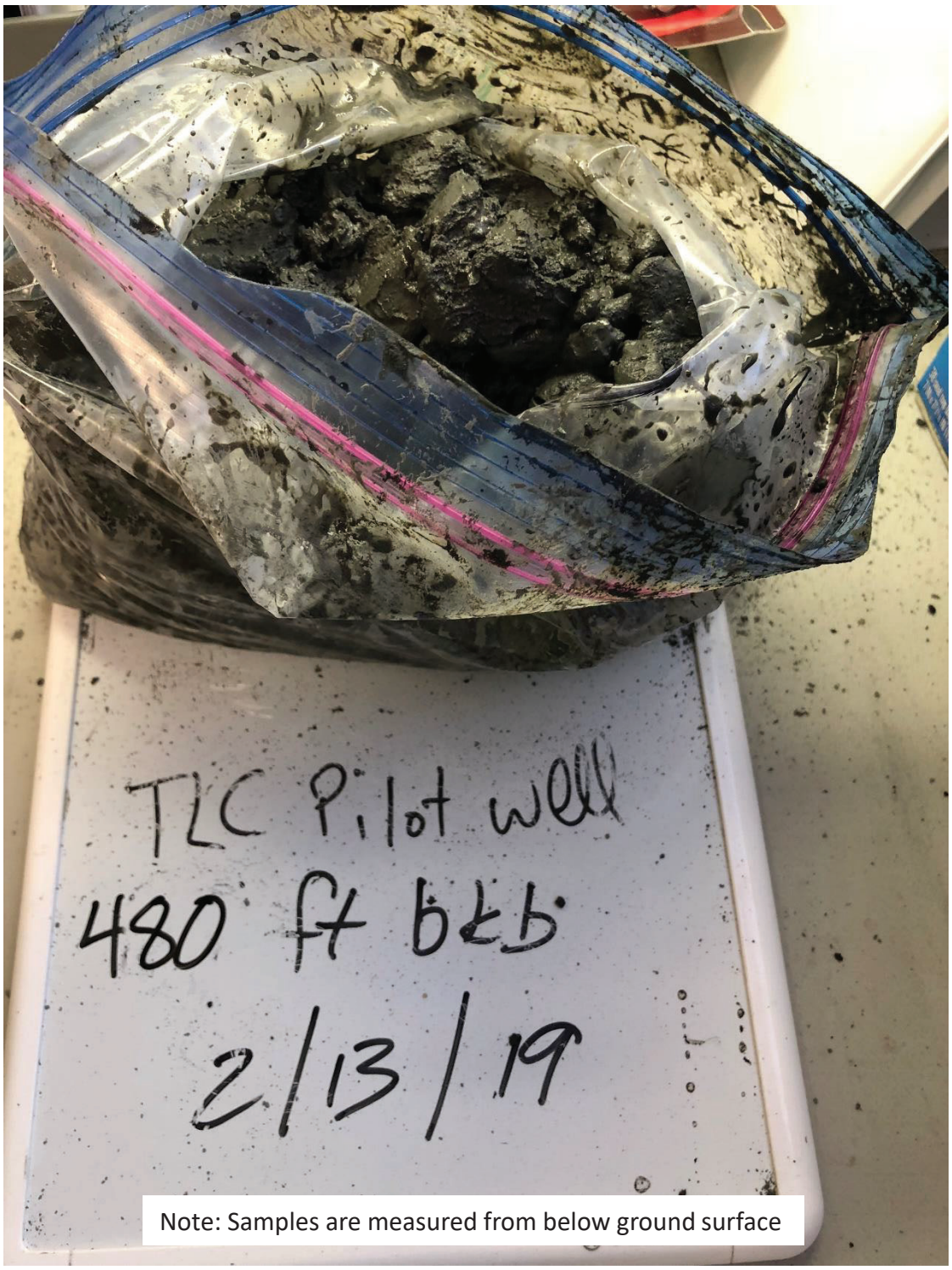
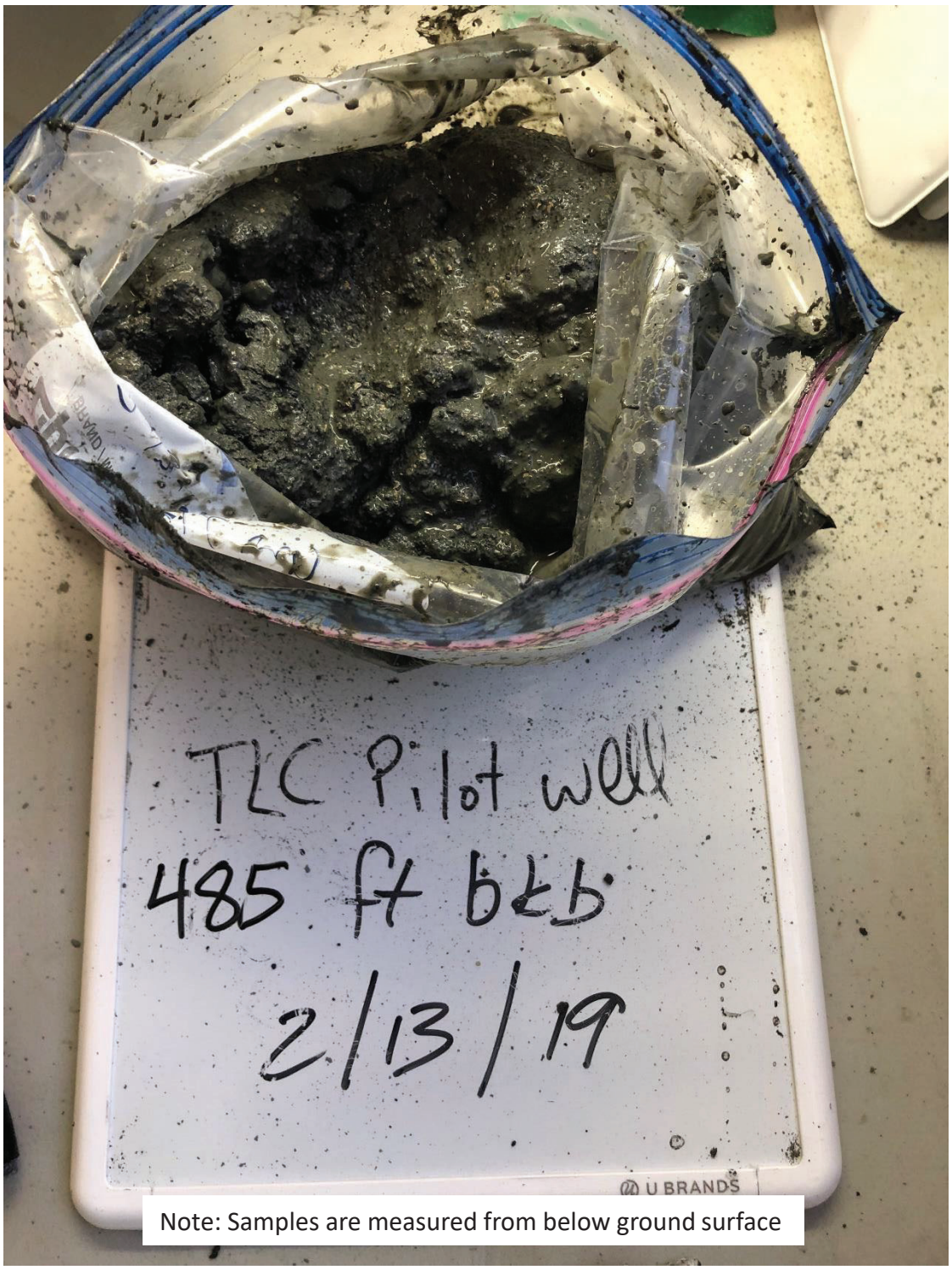


Figure C-85
Photograph of sample TLC Pilot Well 480 ft



Note: Samples are measured from below ground surface

Figure C-86
Photograph of sample TLC Pilot Well 485 ft

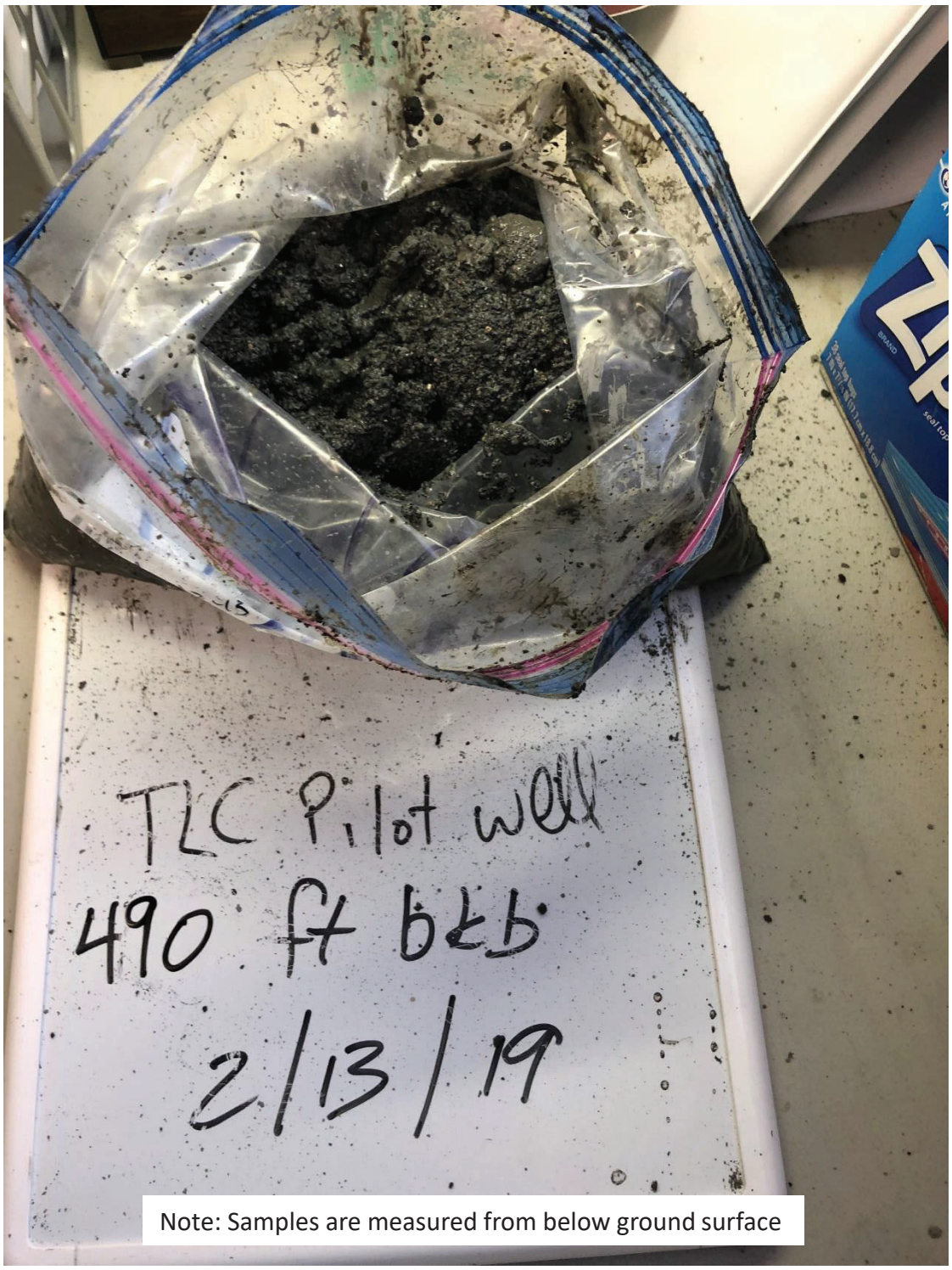


Figure C-87
Photograph of sample TLC Pilot Well 490 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

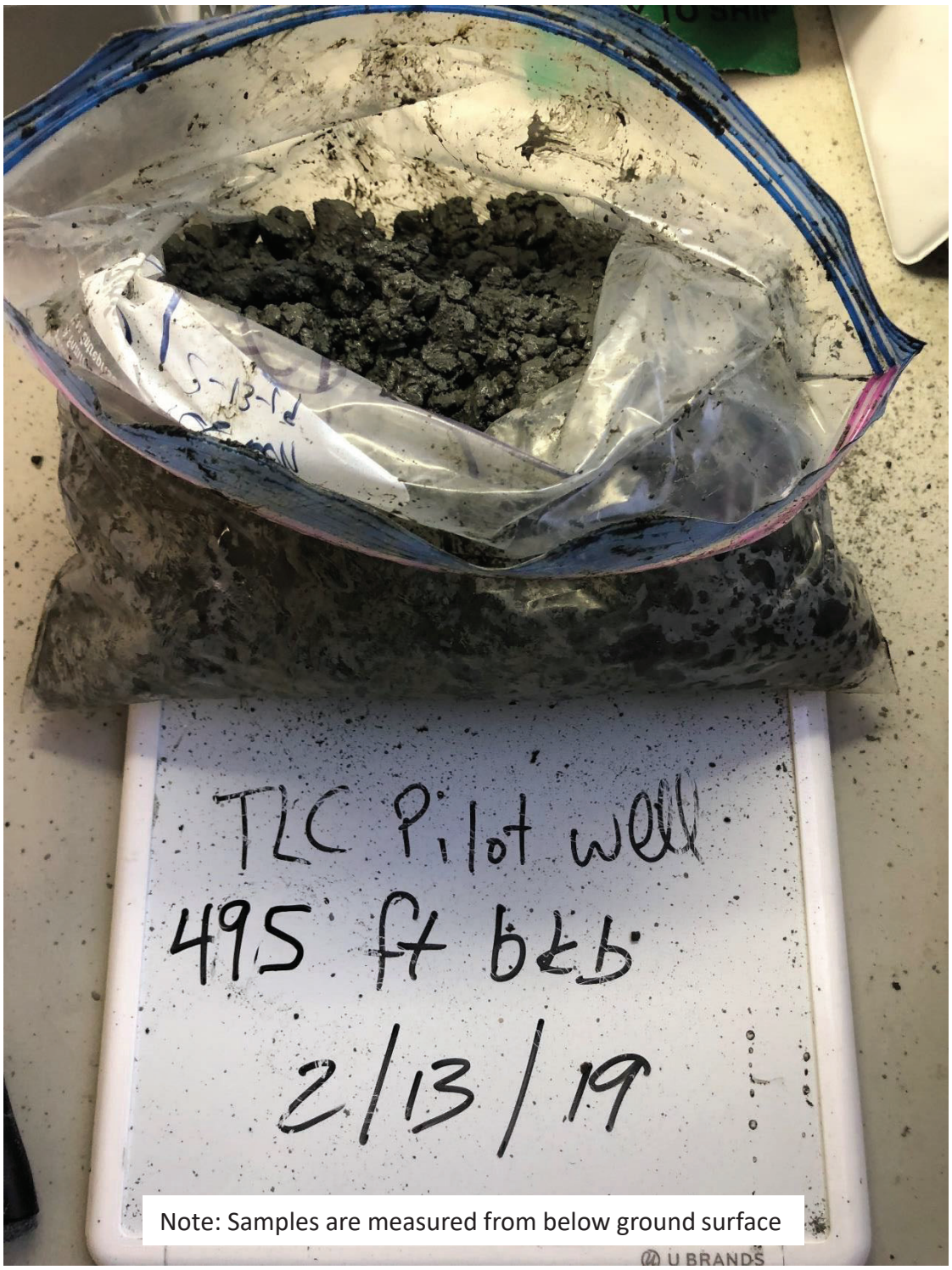
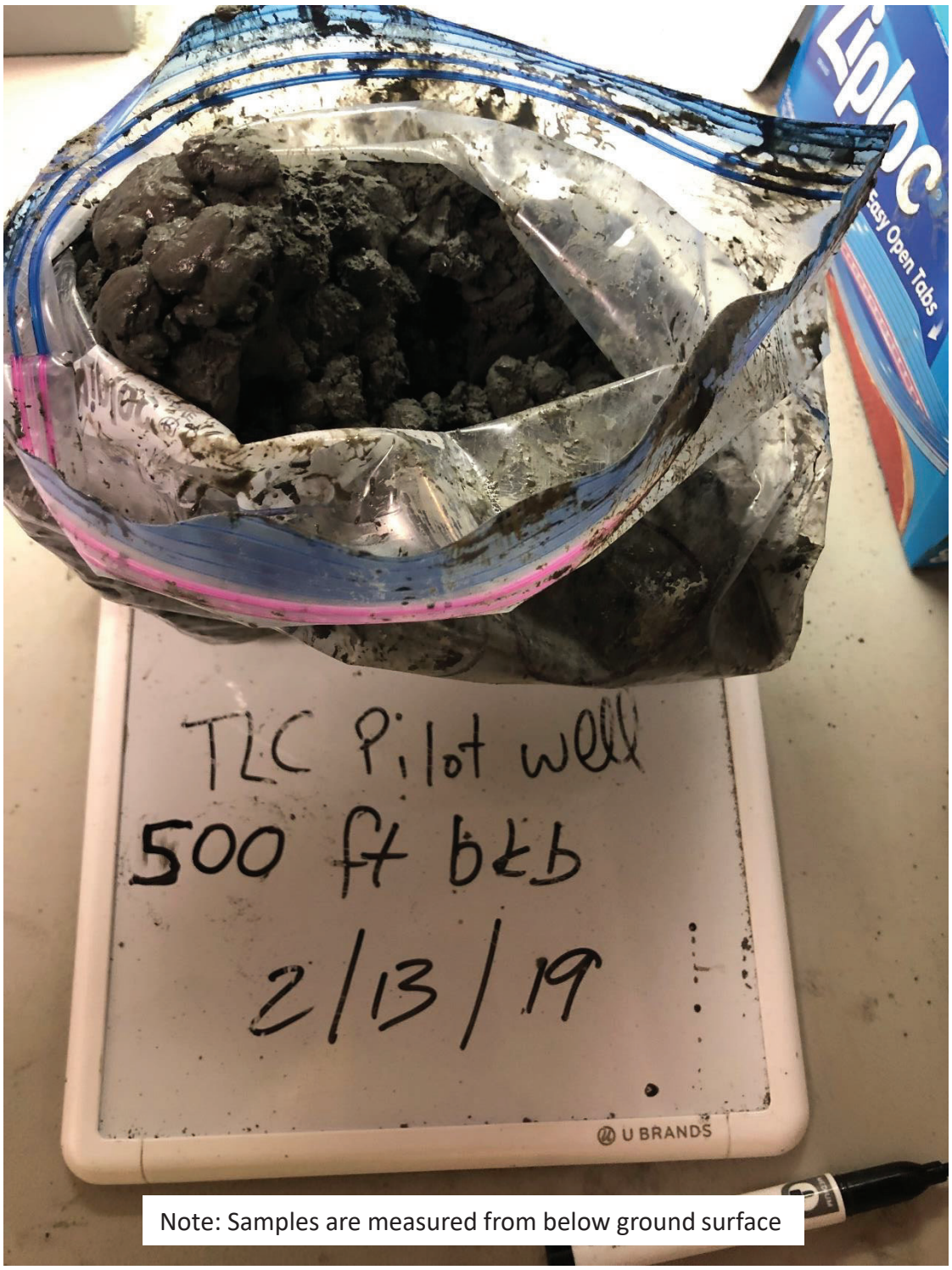


Figure C-88
Photograph of sample TLC Pilot Well 495 ft



Note: Samples are measured from below ground surface

Figure C-89
Photograph of sample TLC Pilot Well 500 ft

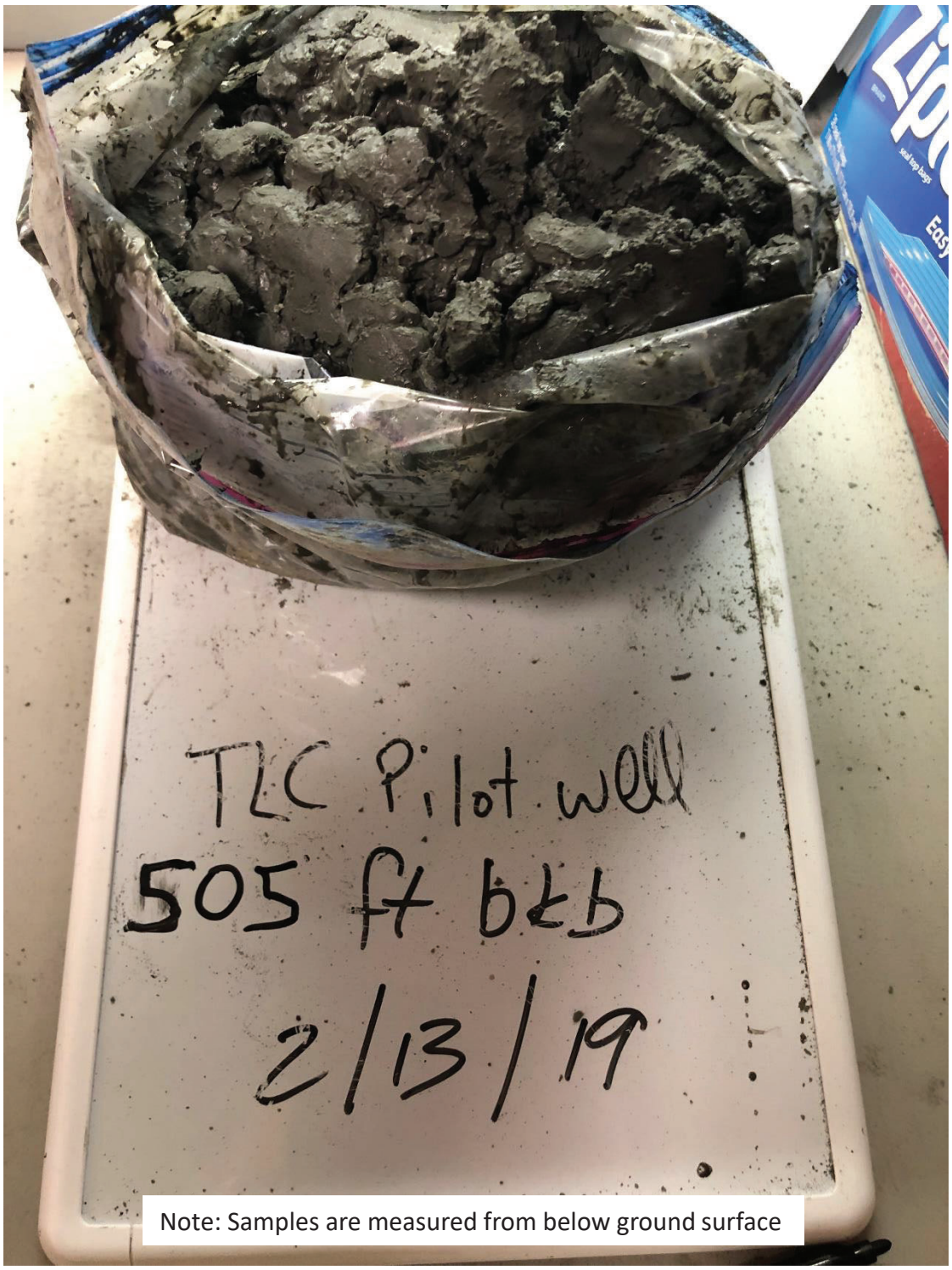


Figure C-90
Photograph of sample TLC Pilot Well 505 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

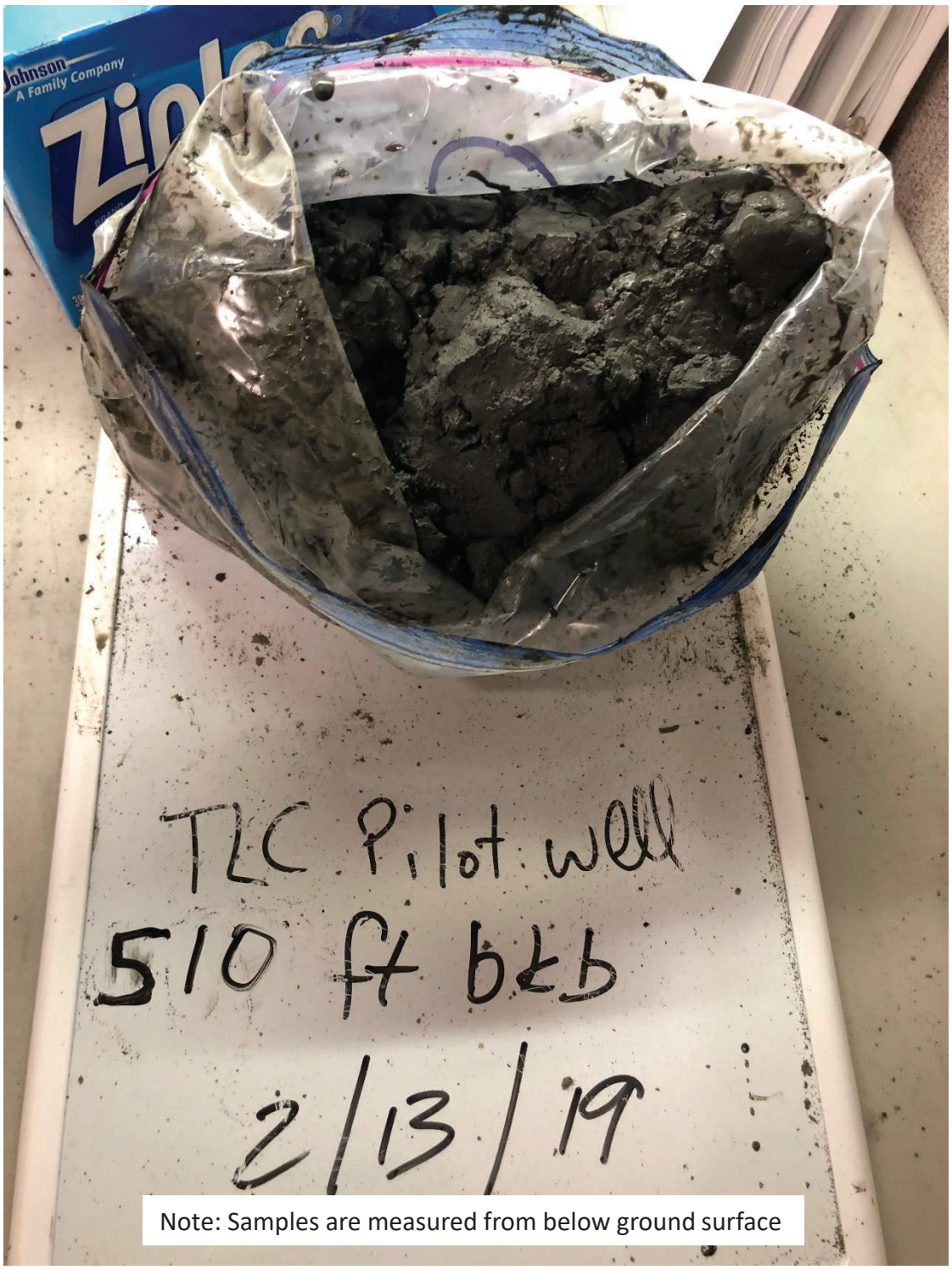
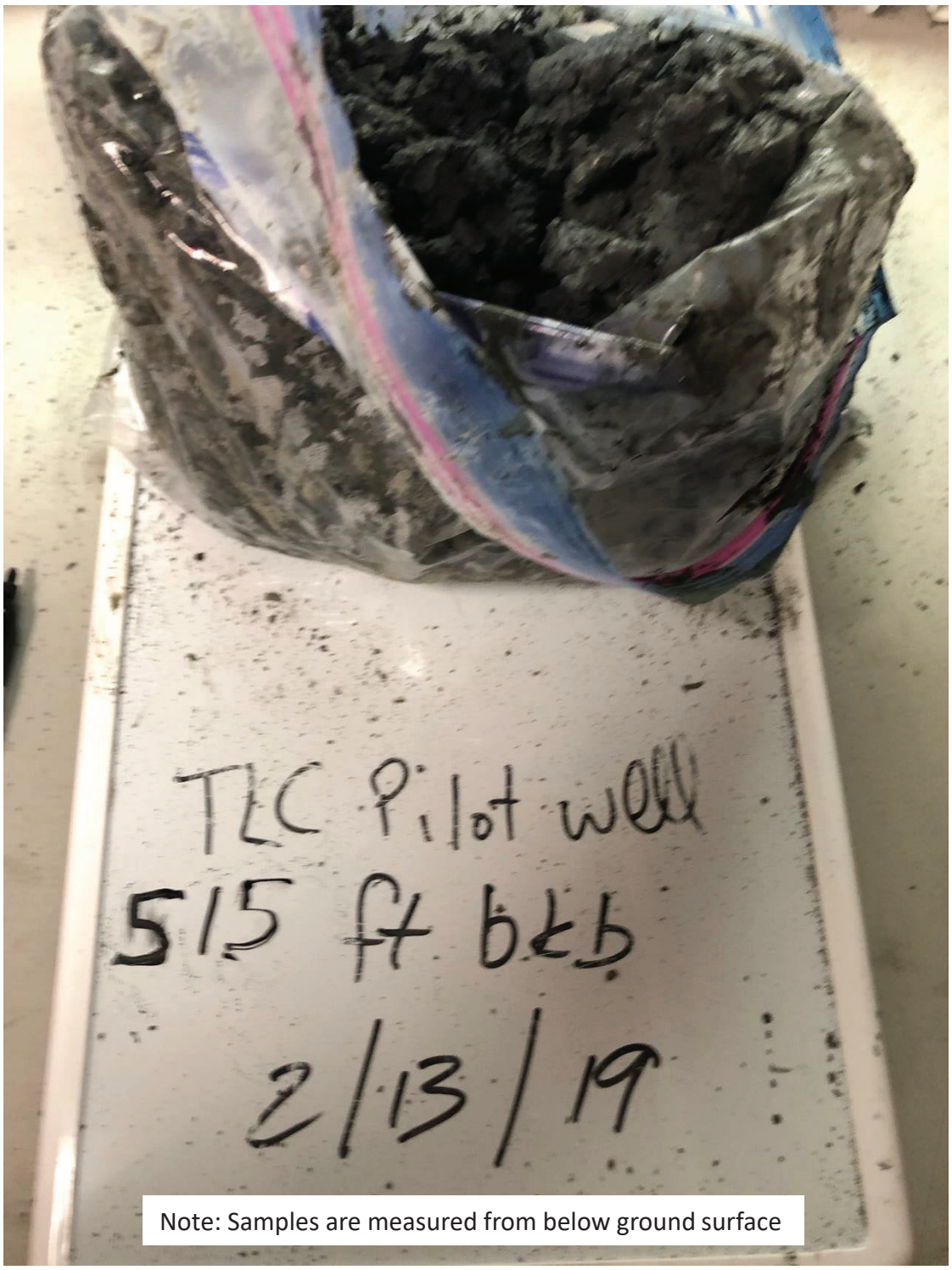
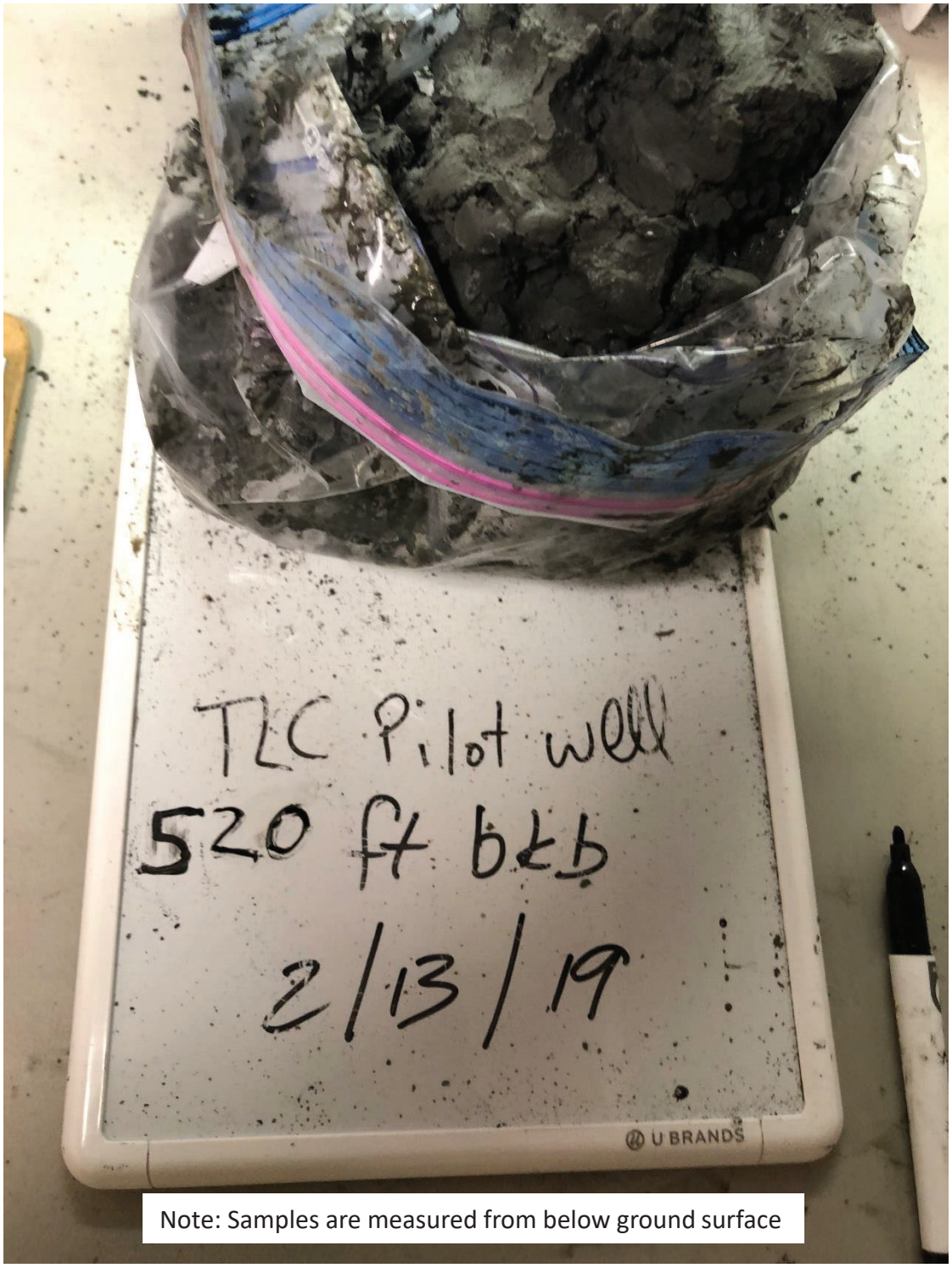


Figure C-91
Photograph of sample TLC Pilot Well 510 ft



Note: Samples are measured from below ground surface

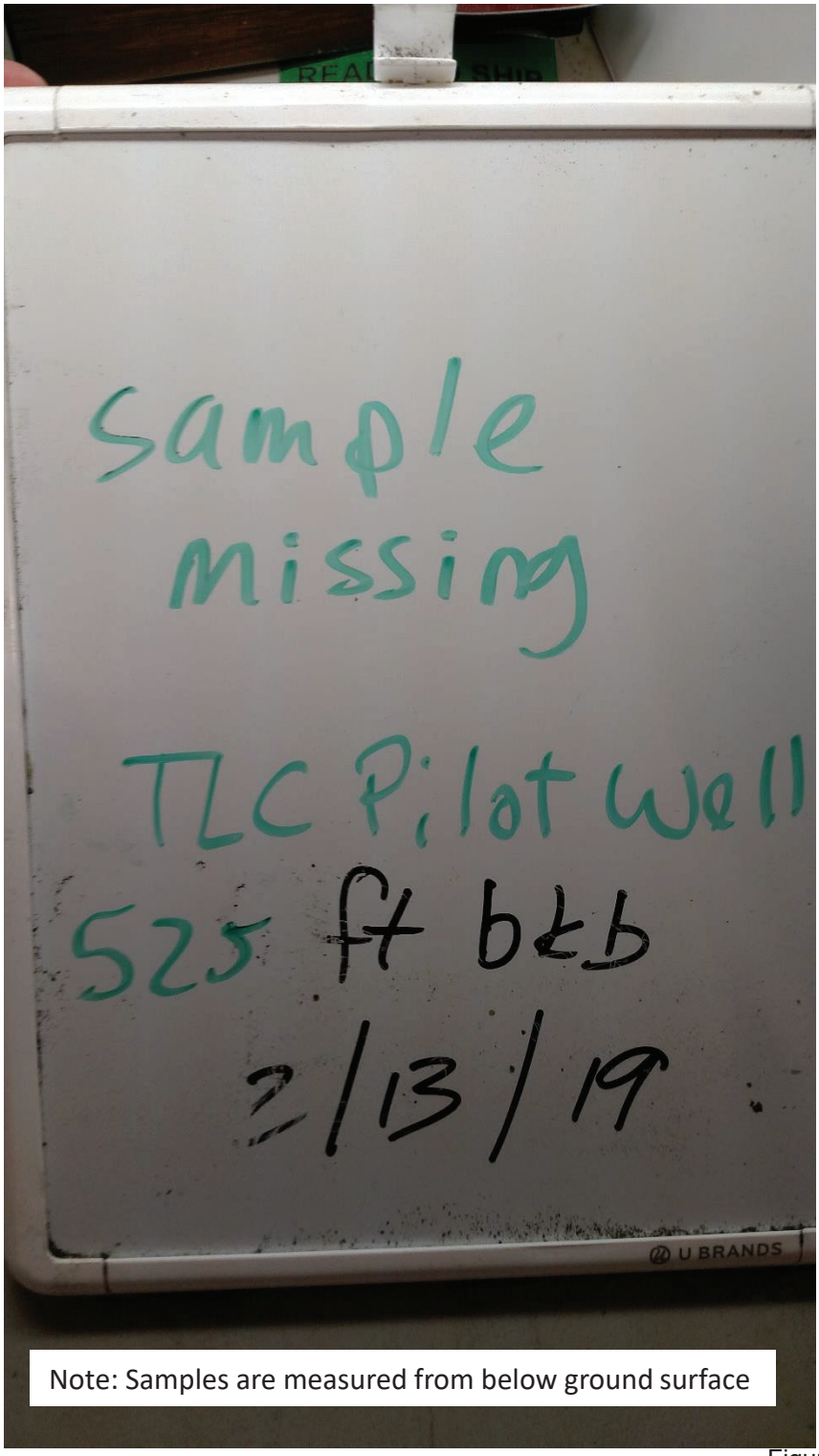
Figure C-92
Photograph of sample TLC Pilot Well 515 ft



Note: Samples are measured from below ground surface

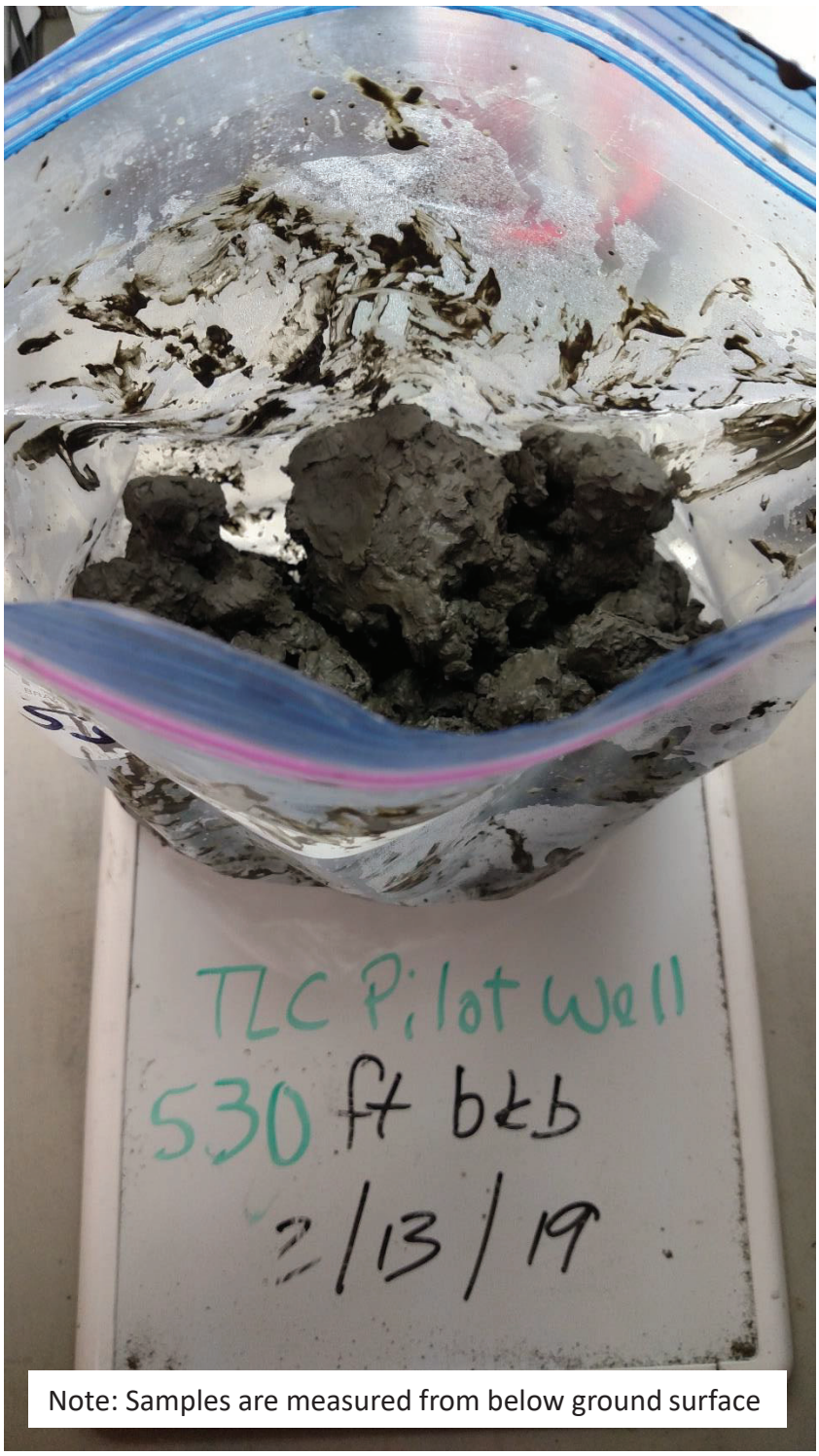
Figure C-93
Photograph of sample TLC Pilot Well 520 ft

Brown AND Caldwell



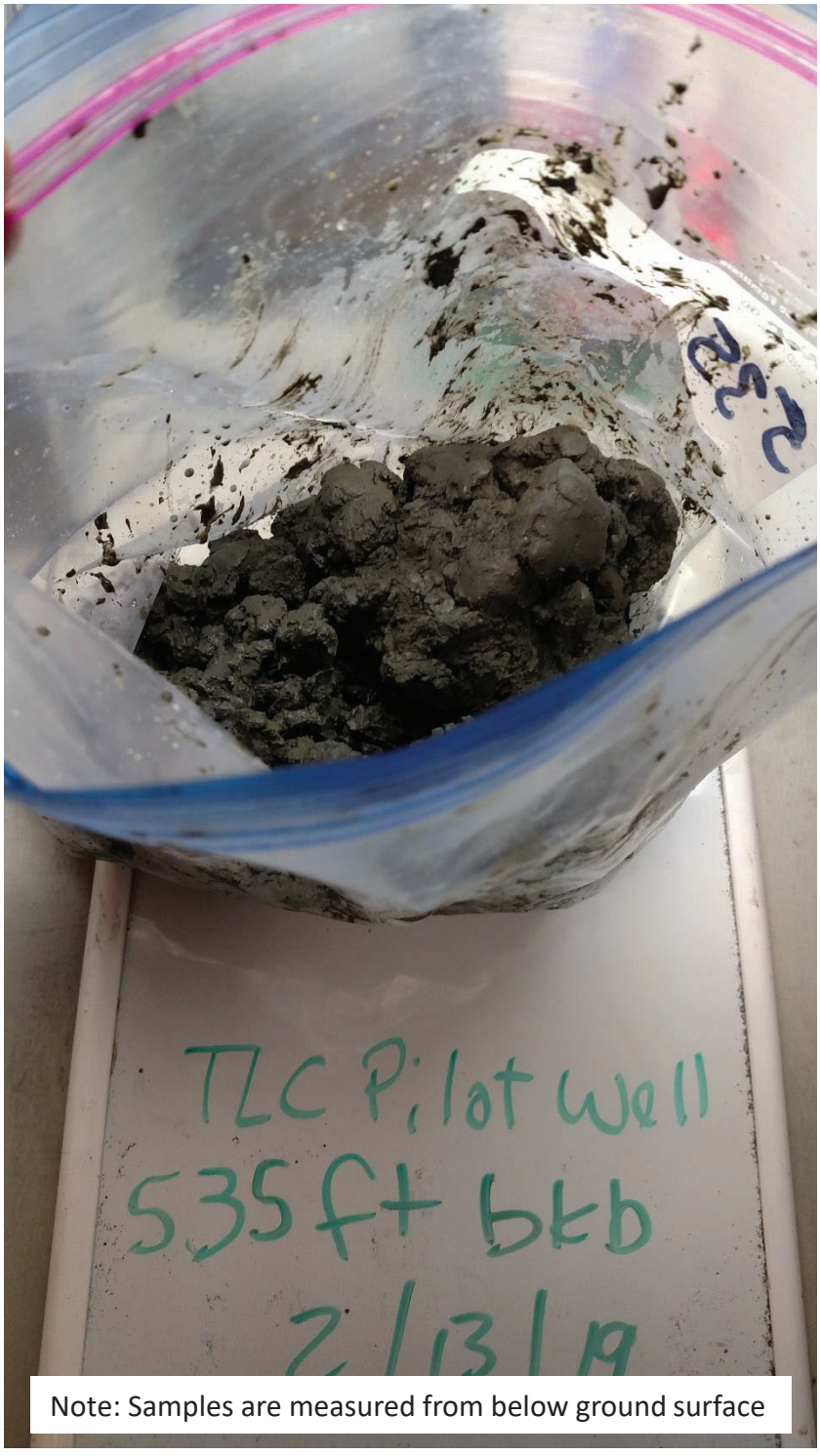
Note: Samples are measured from below ground surface

Figure C-94
Photograph of sample TLC Pilot Well 525 ft



Note: Samples are measured from below ground surface

Figure C-95
Photograph of sample TLC Pilot Well 530 ft



Note: Samples are measured from below ground surface

Figure C-96
Photograph of sample TLC Pilot Well 535 ft

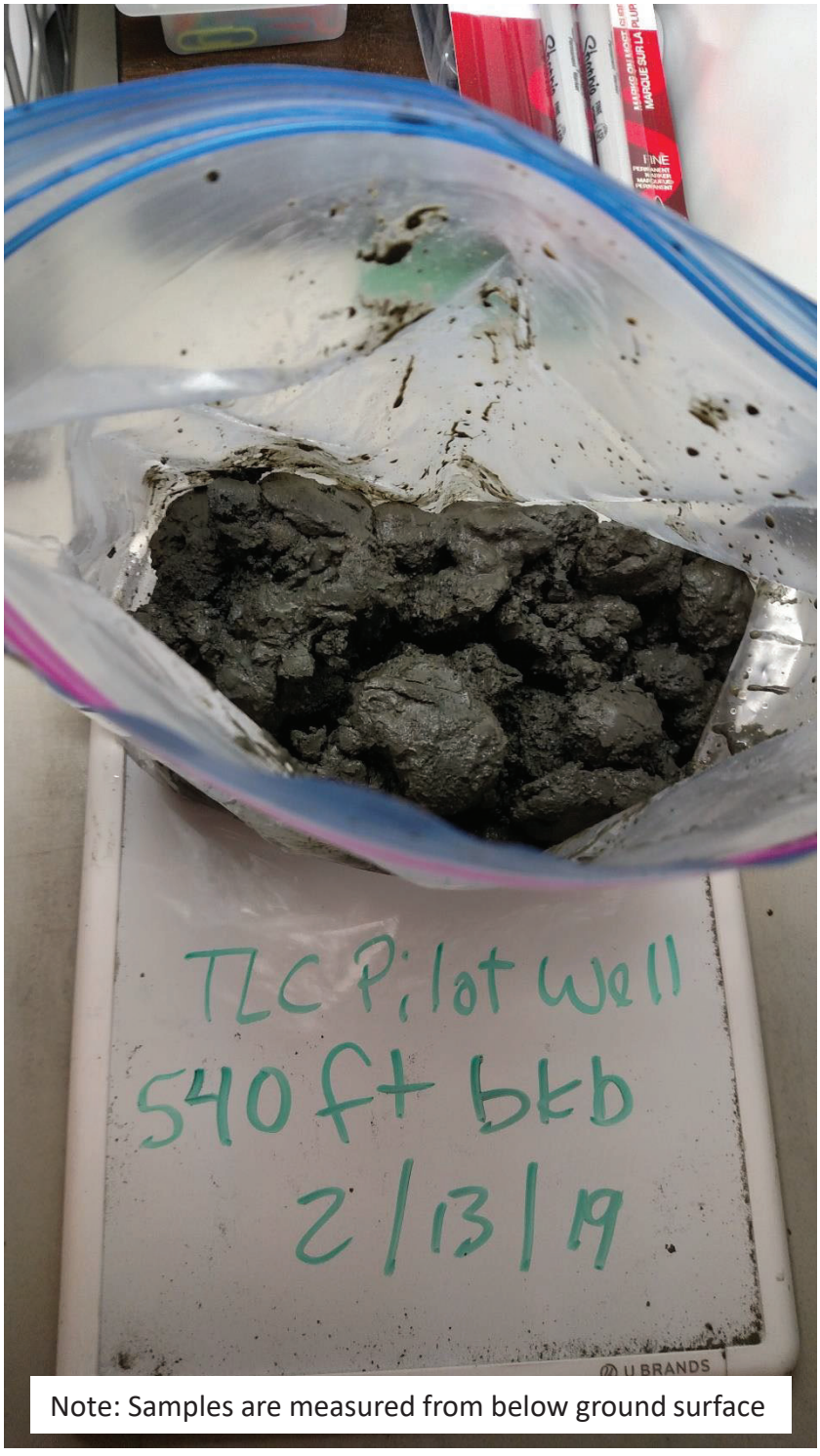
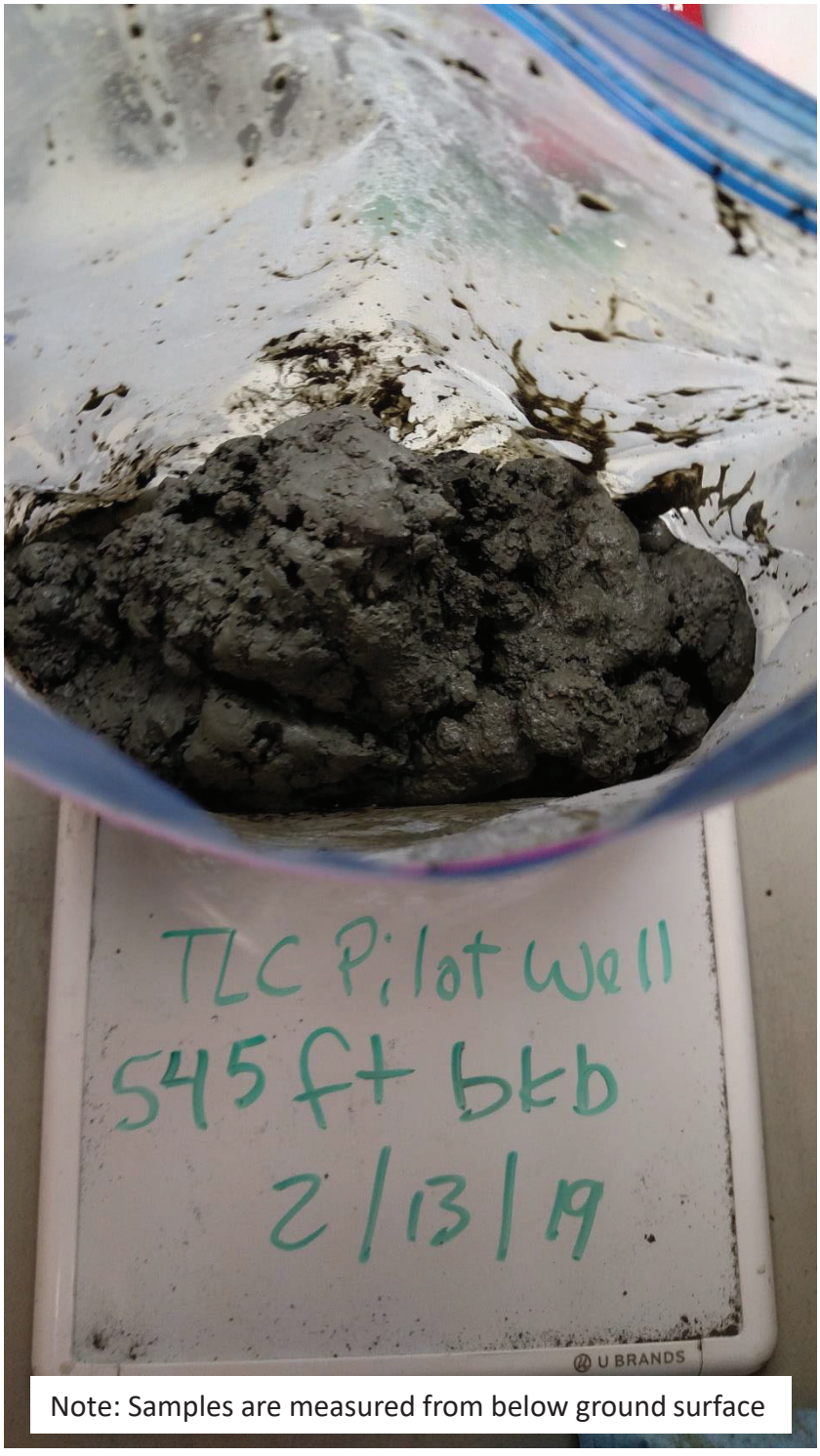


Figure C-97
Photograph of sample TLC Pilot Well 540 ft

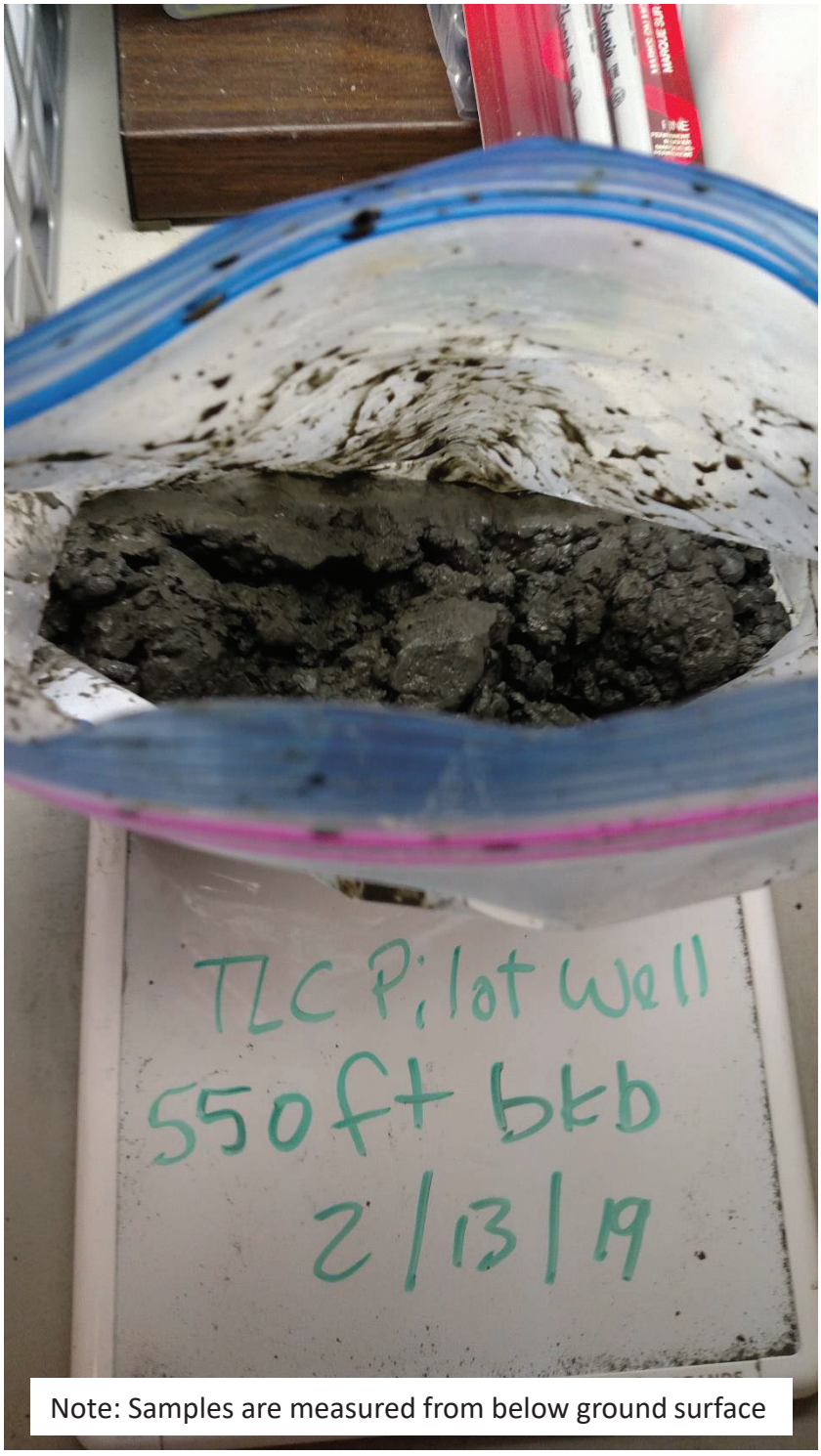
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-98
Photograph of sample TLC Pilot Well 545 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

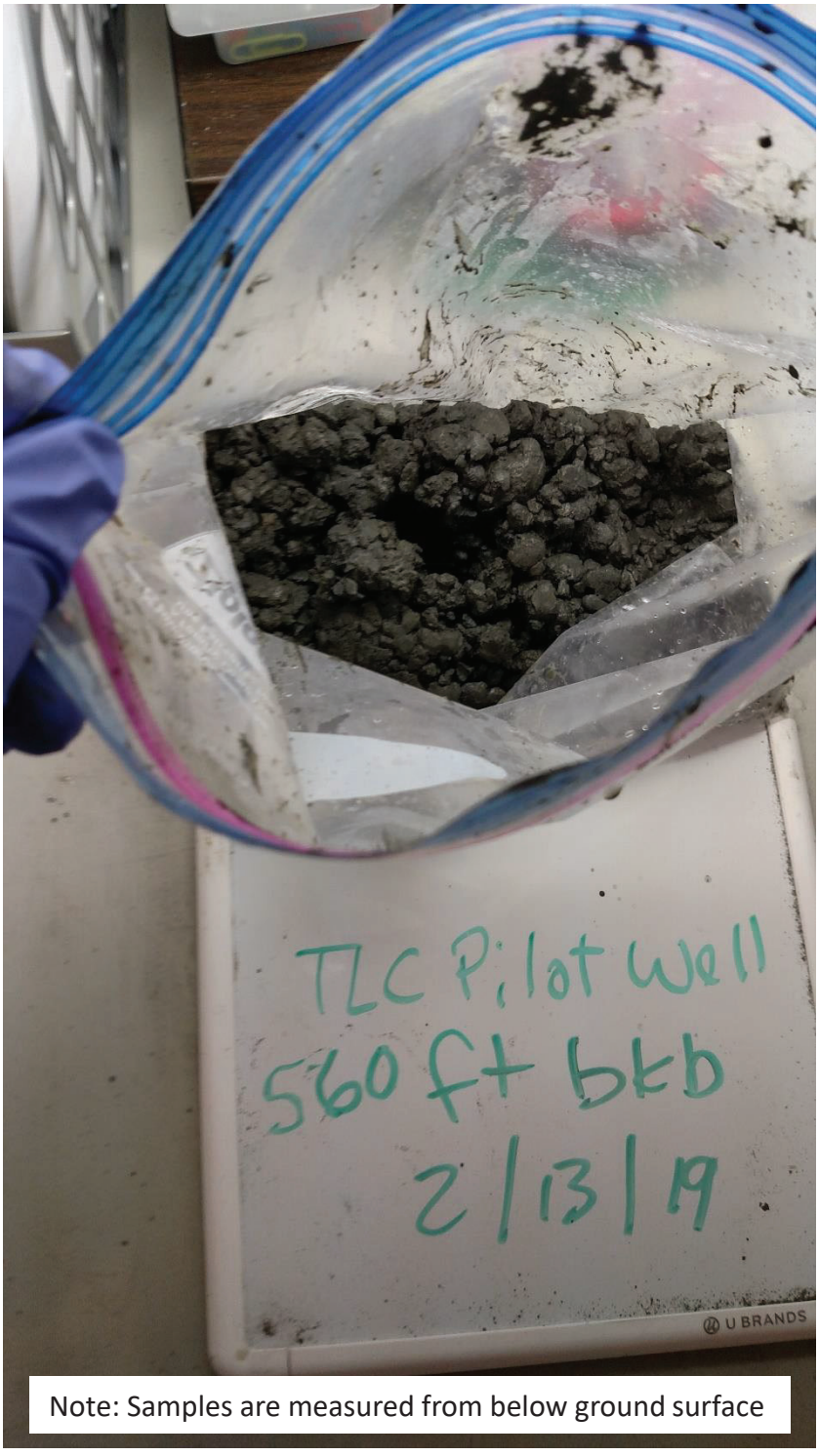
Figure C-99
Photograph of sample TLC Pilot Well 550 ft



Note: Samples are measured from below ground surface

Figure C-100
Photograph of sample TLC Pilot Well 555 ft

Brown AND Caldwell

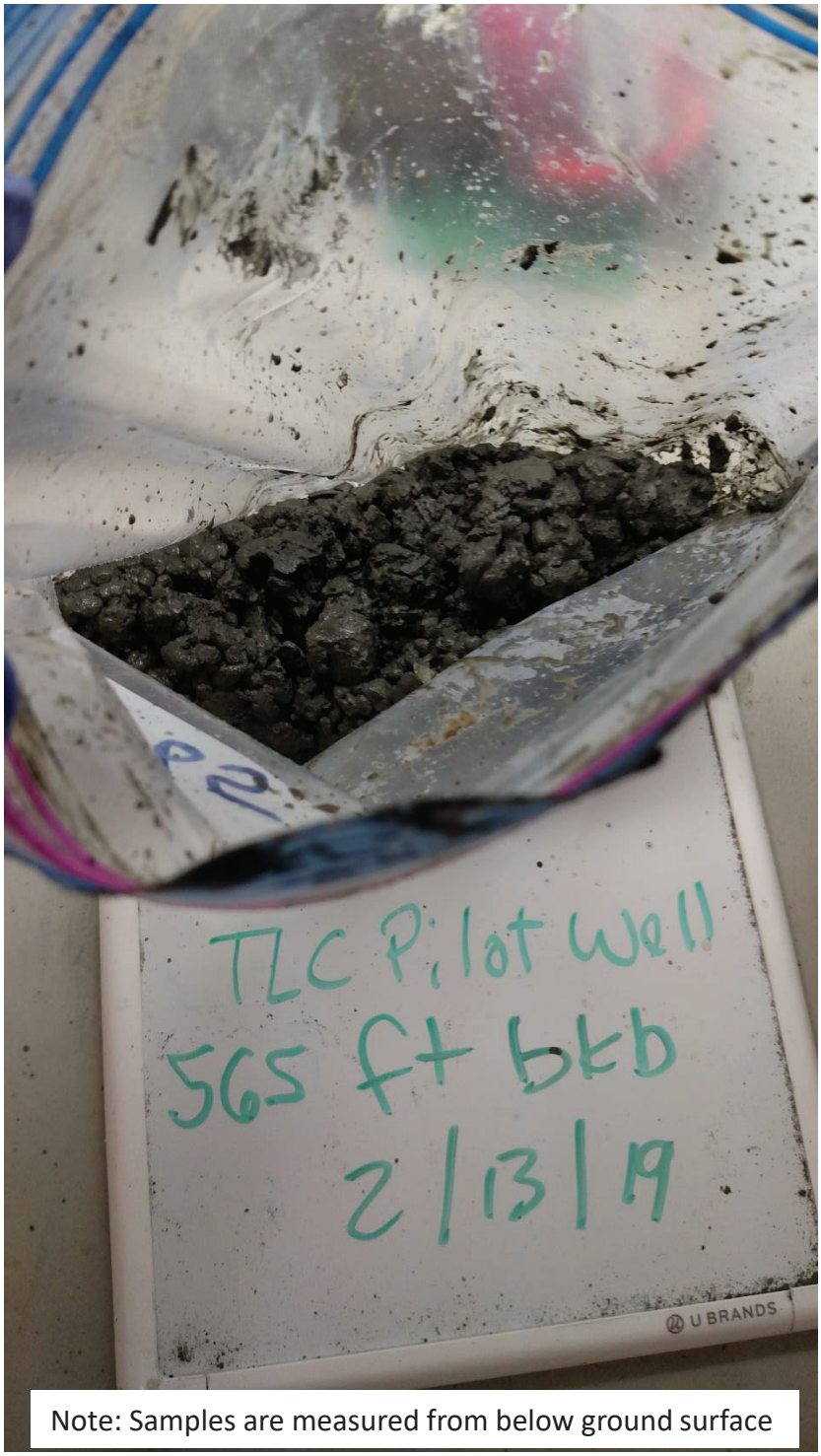


Note: Samples are measured from below ground surface

Figure C-101
Photograph of sample TLC Pilot Well 560 ft

Brown AND Caldwell

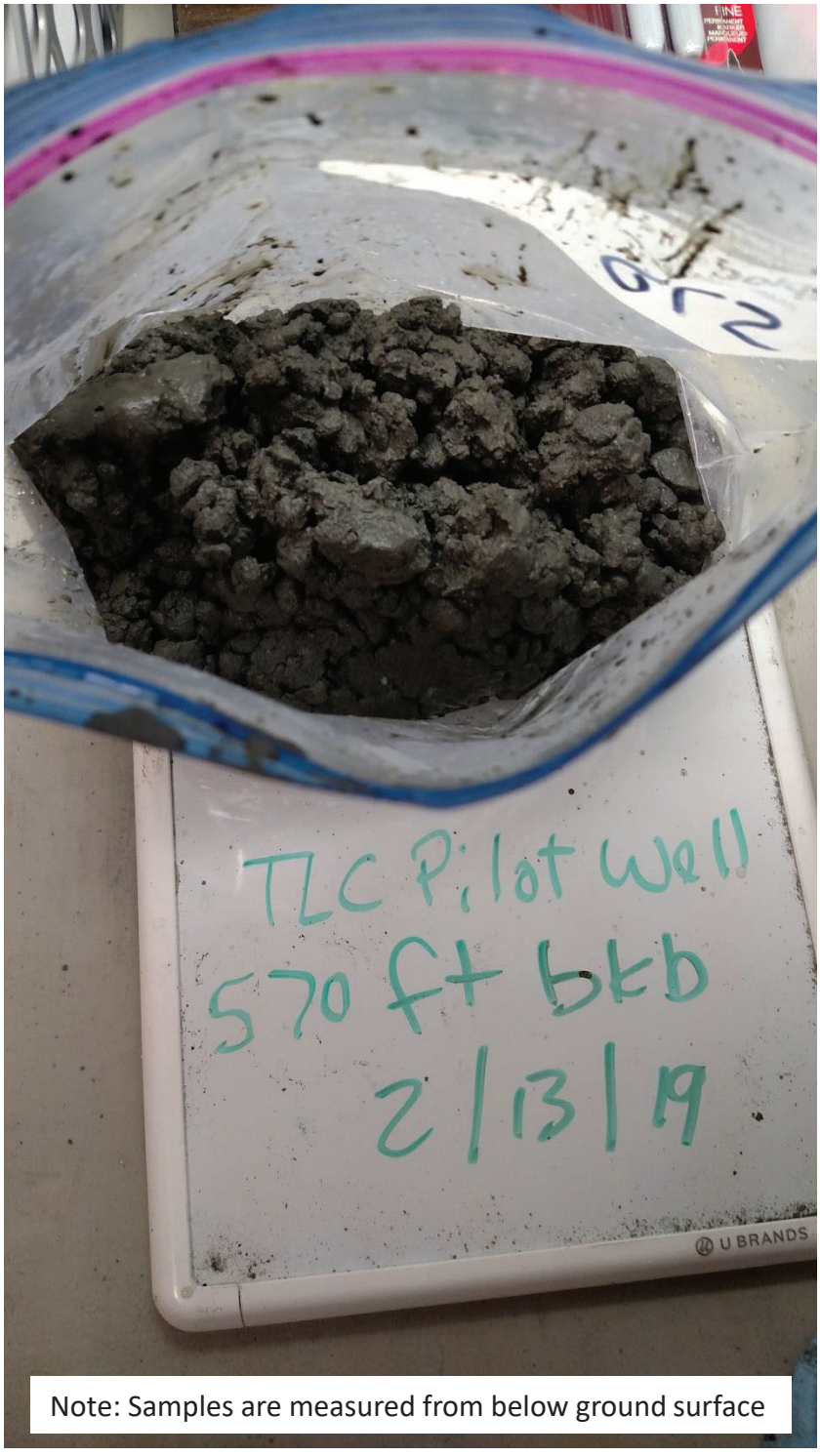
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-102
Photograph of sample TLC Pilot Well 565 ft

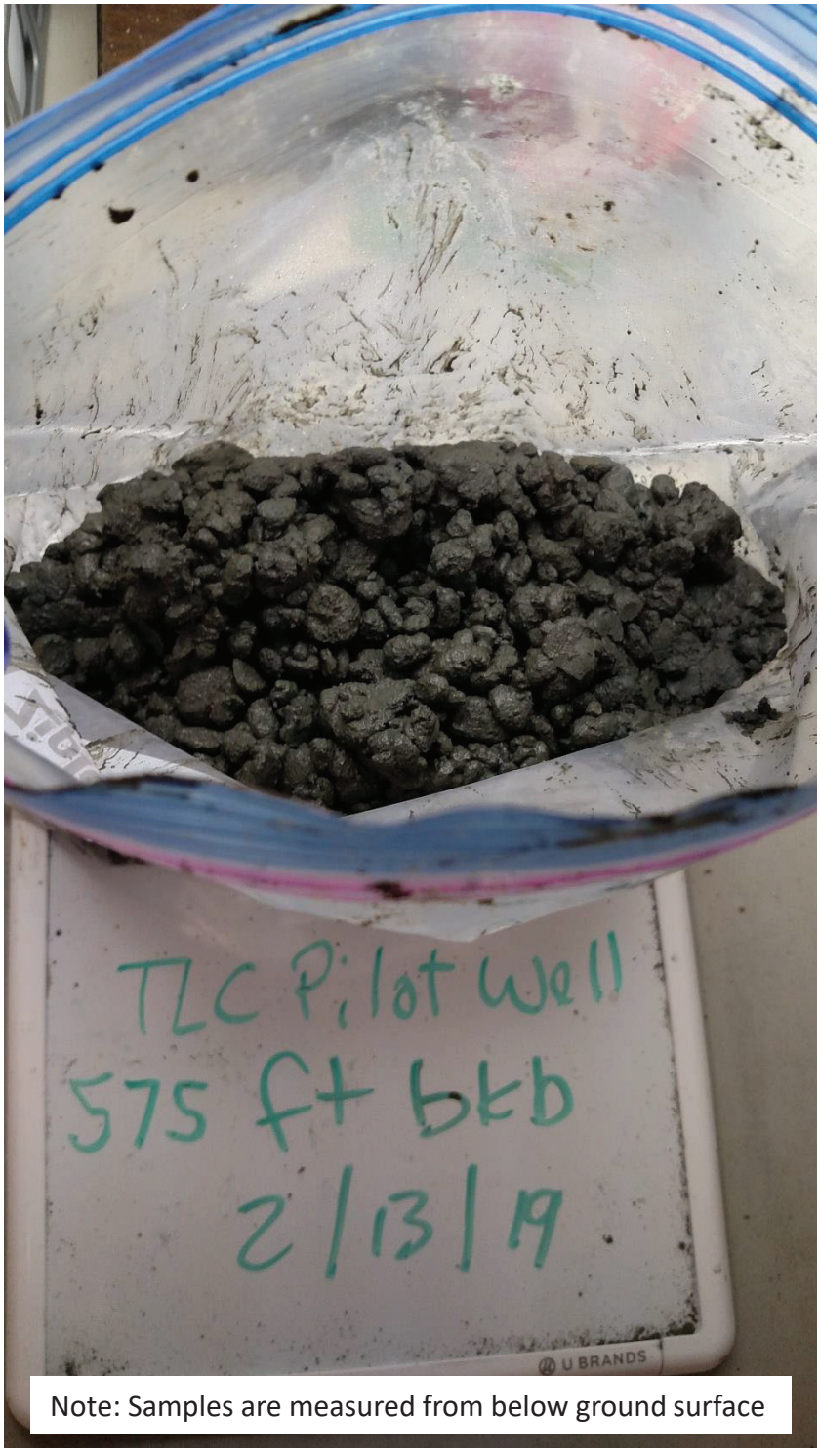
Brown AND Caldwell



Note: Samples are measured from below ground surface

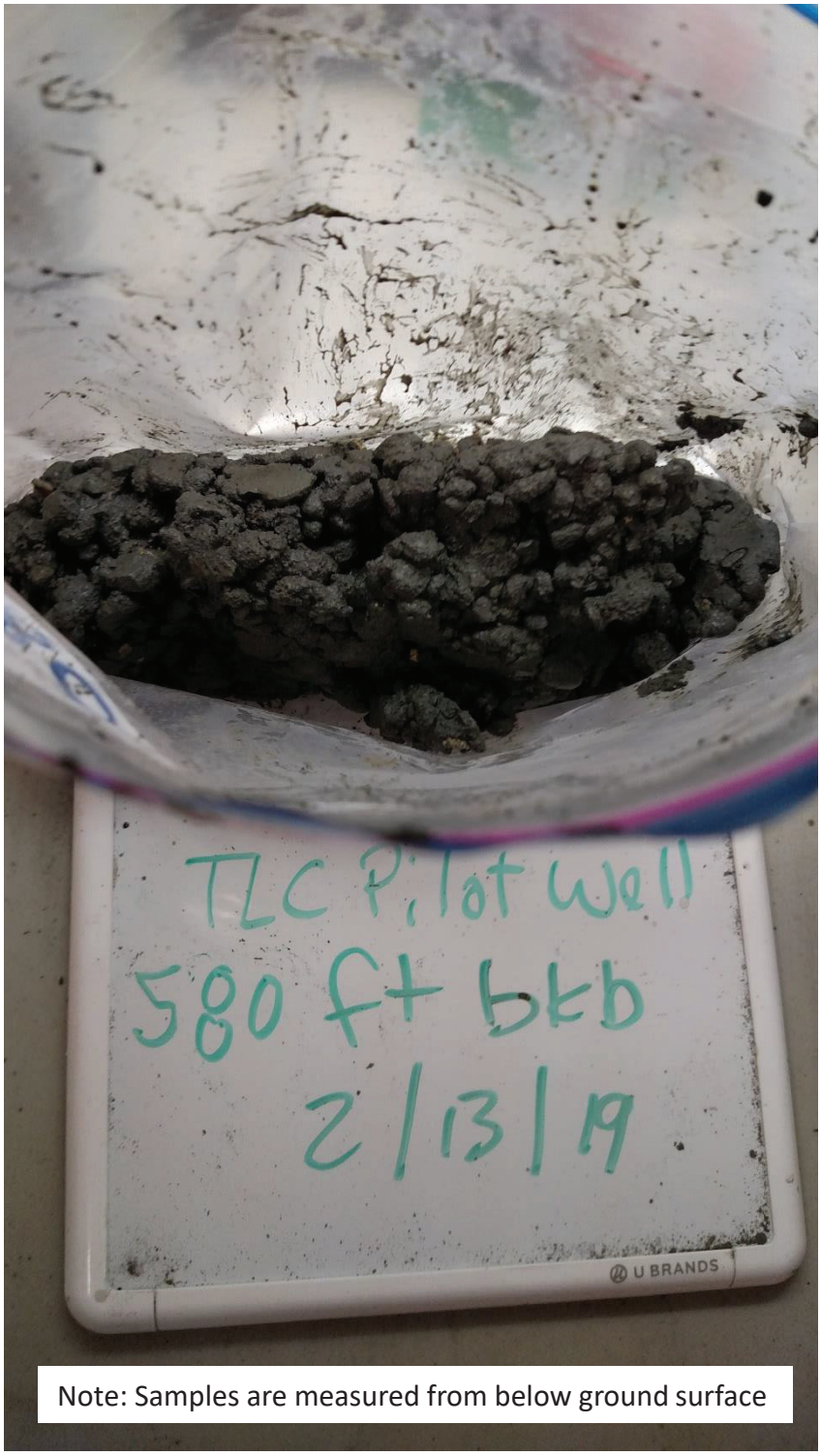
Figure C-103
Photograph of sample TLC Pilot Well 570 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-104
Photograph of sample TLC Pilot Well 575 ft



Note: Samples are measured from below ground surface

Figure C-105
Photograph of sample TLC Pilot Well 580 ft

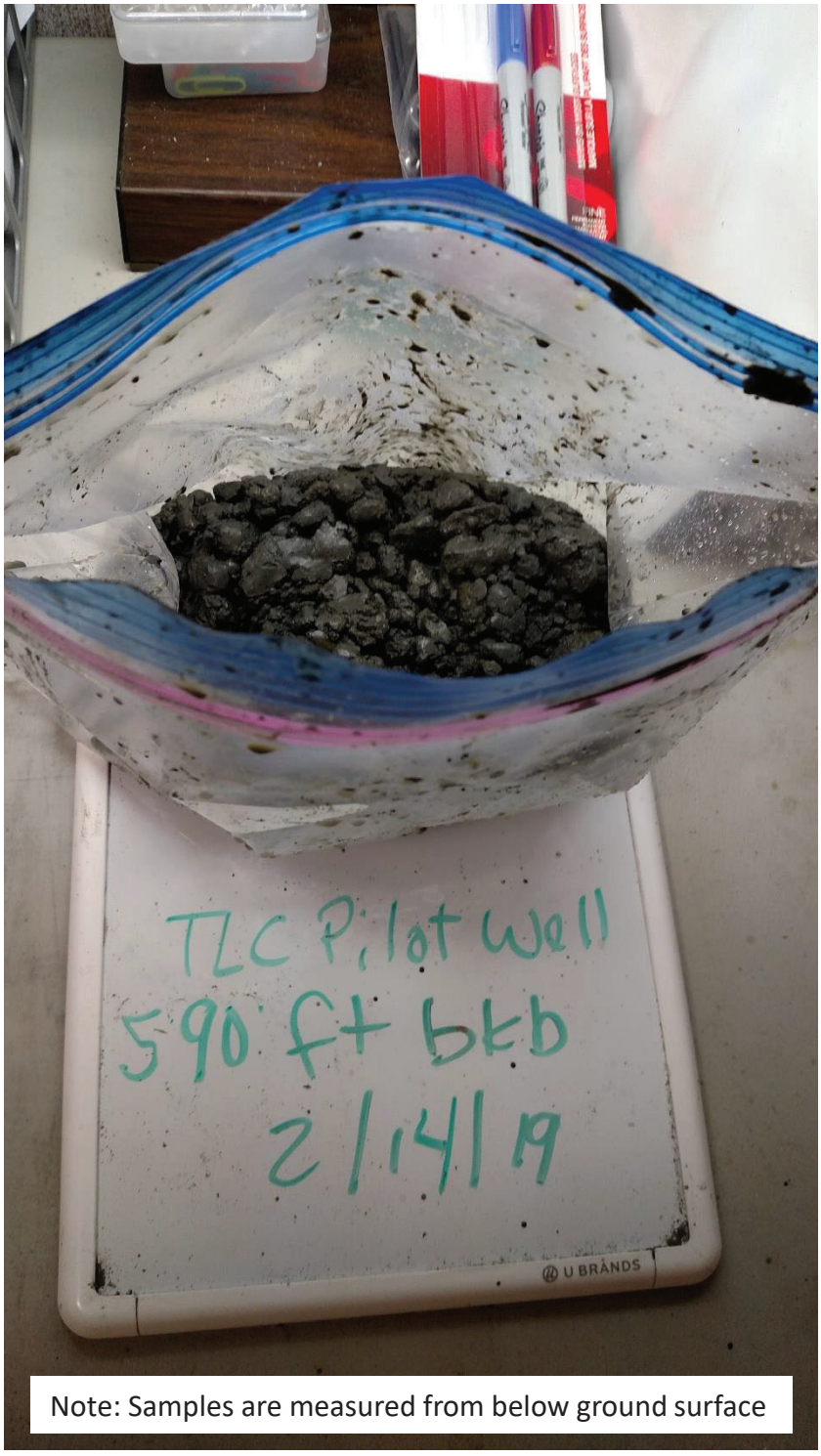
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-106
Photograph of sample TLC Pilot Well 585 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-107
Photograph of sample TLC Pilot Well 590 ft

Brown AND Caldwell

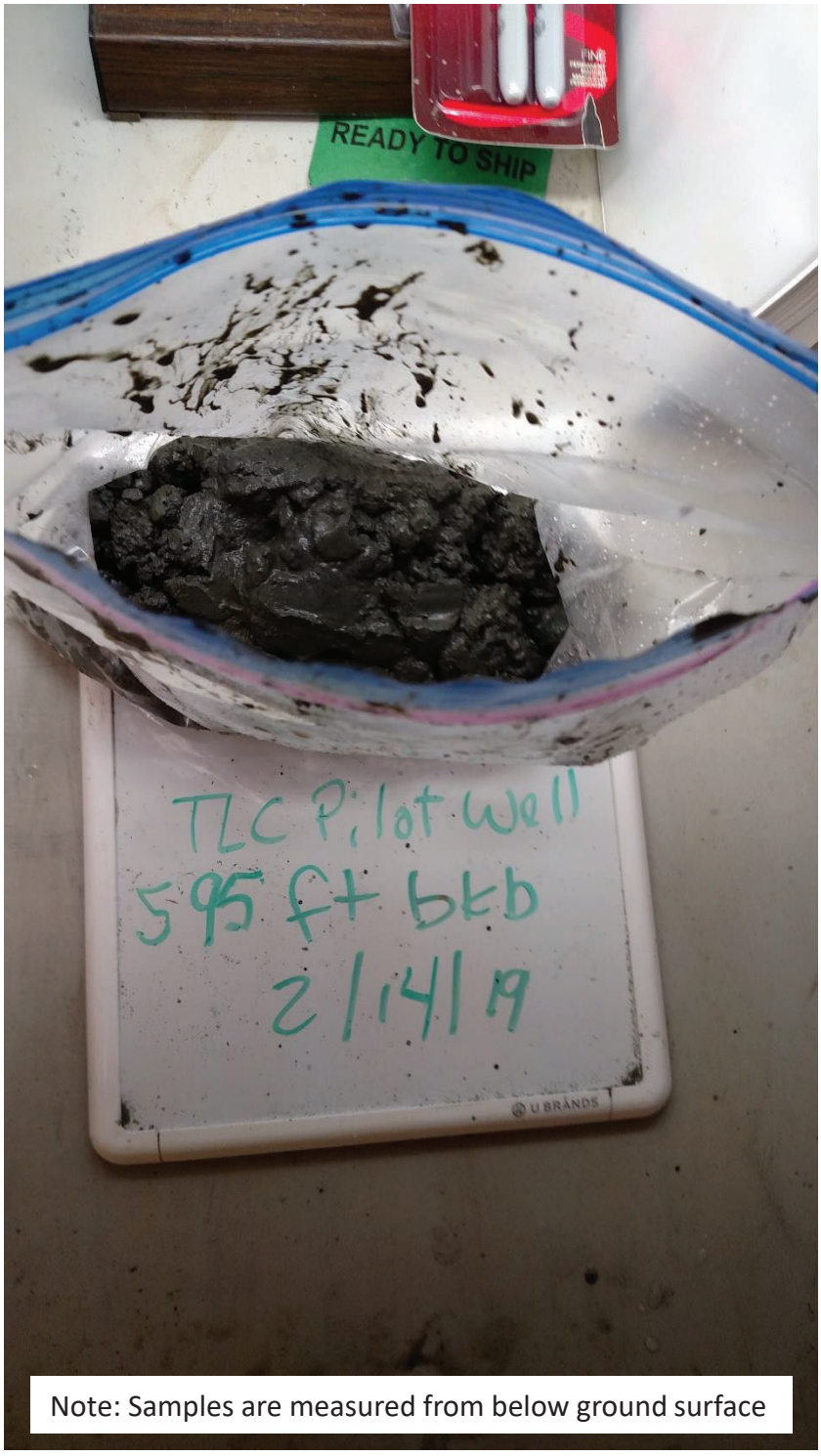


Figure C-108
Photograph of sample TLC Pilot Well 595 ft

Brown AND Caldwell

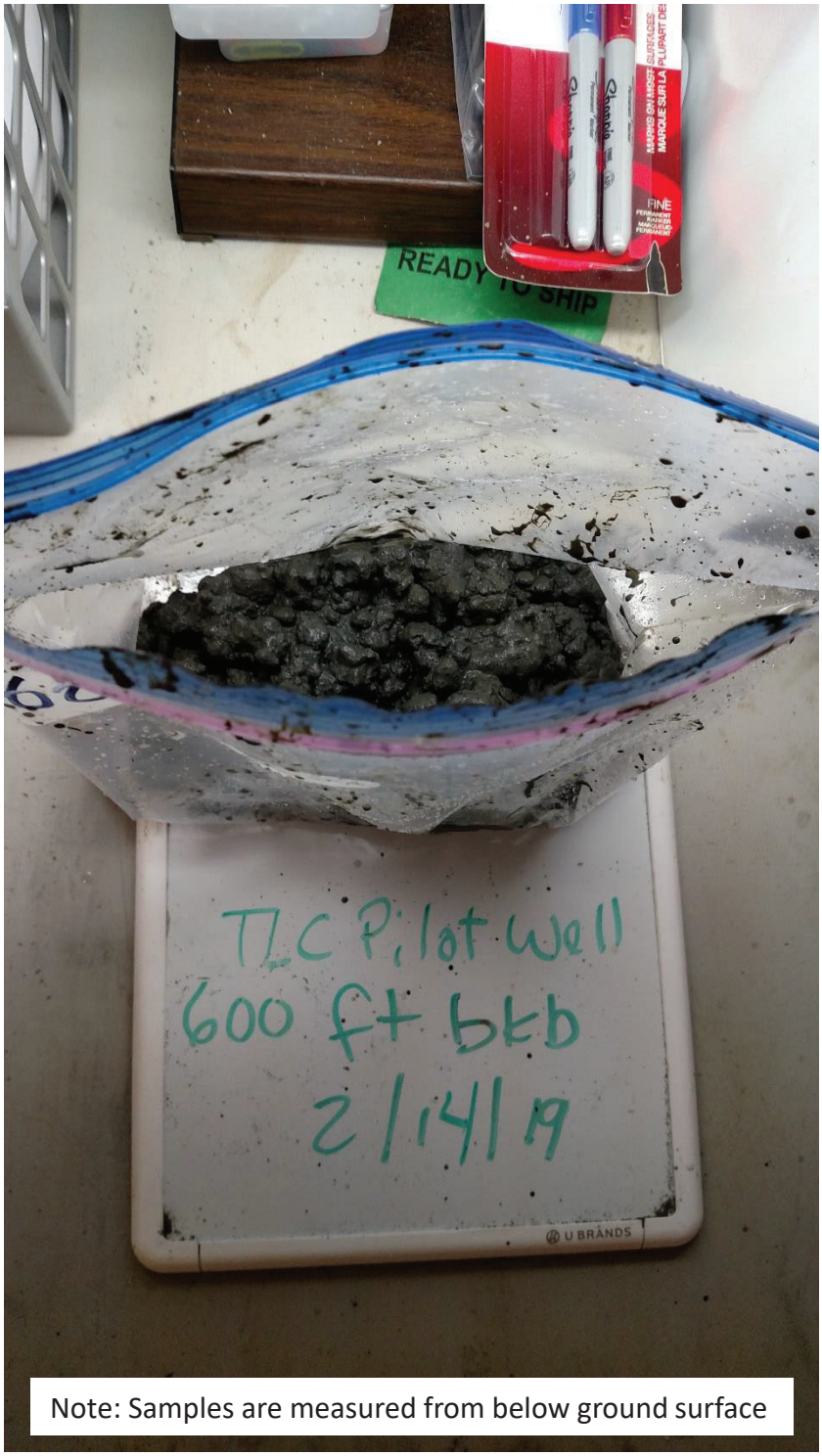


Figure C-109
Photograph of sample TLC Pilot Well 600 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

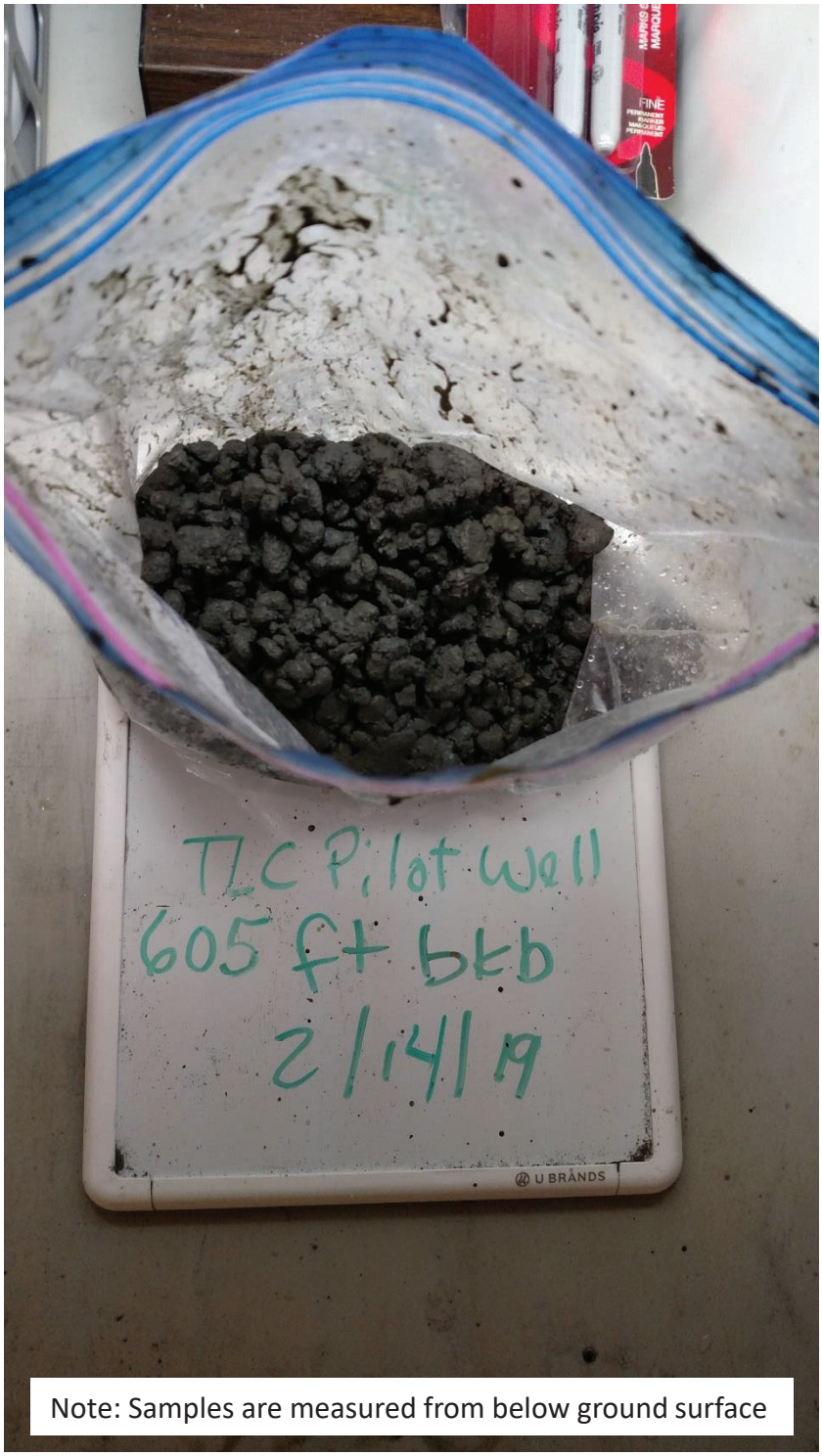
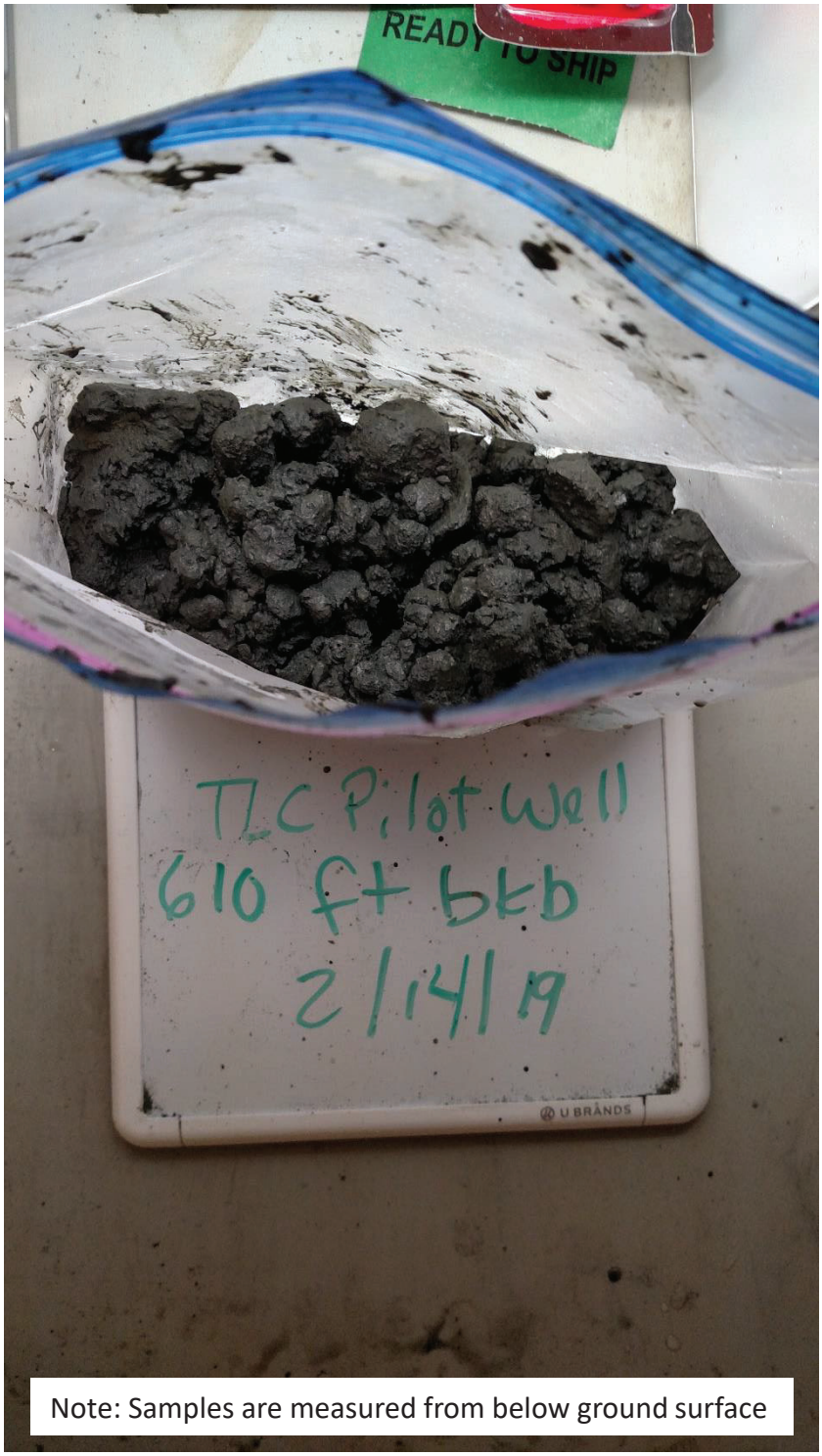


Figure C-110
Photograph of sample TLC Pilot Well 605 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

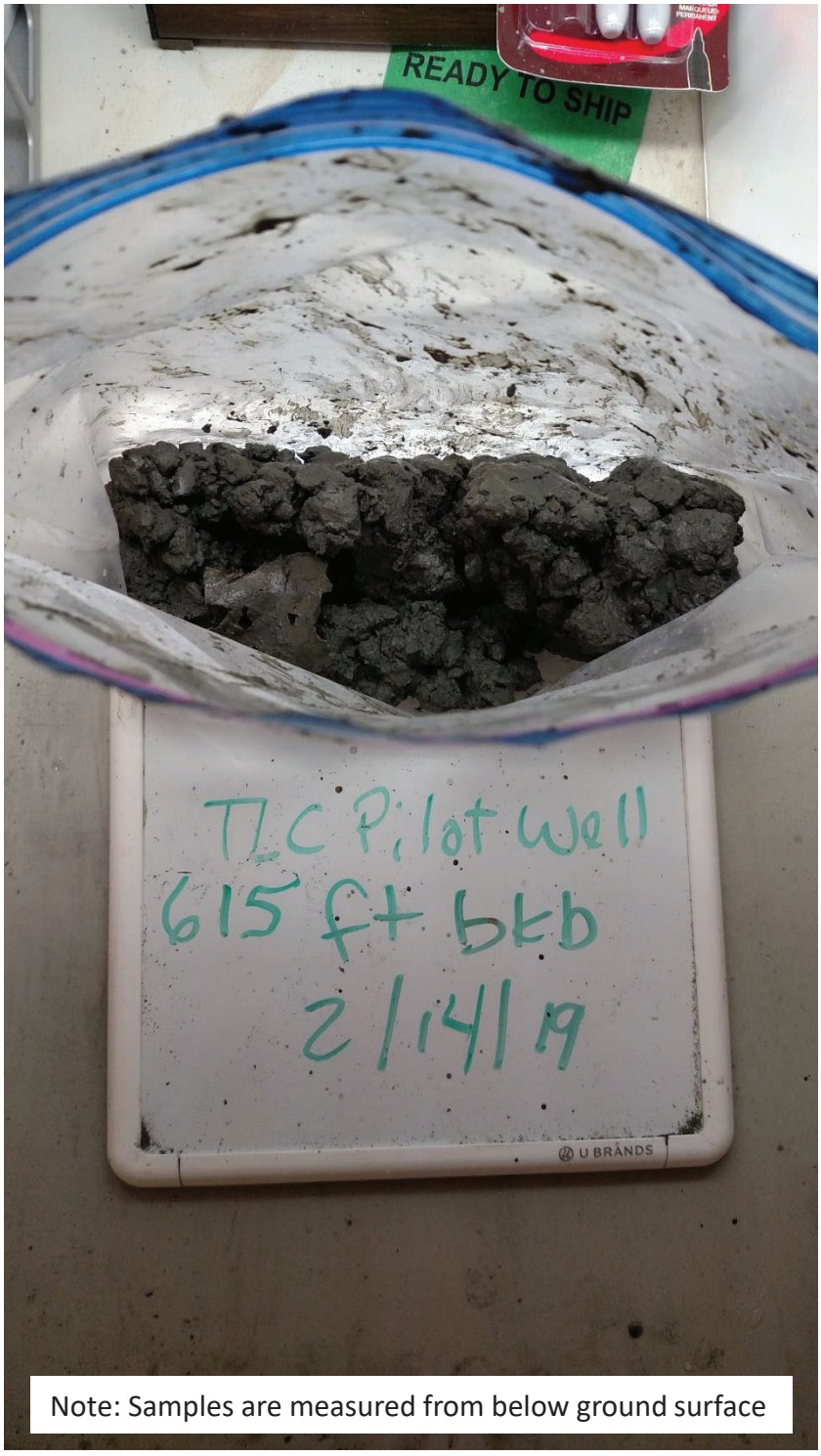


Note: Samples are measured from below ground surface

Figure C-111
Photograph of sample TLC Pilot Well 610 ft

Brown AND Caldwell

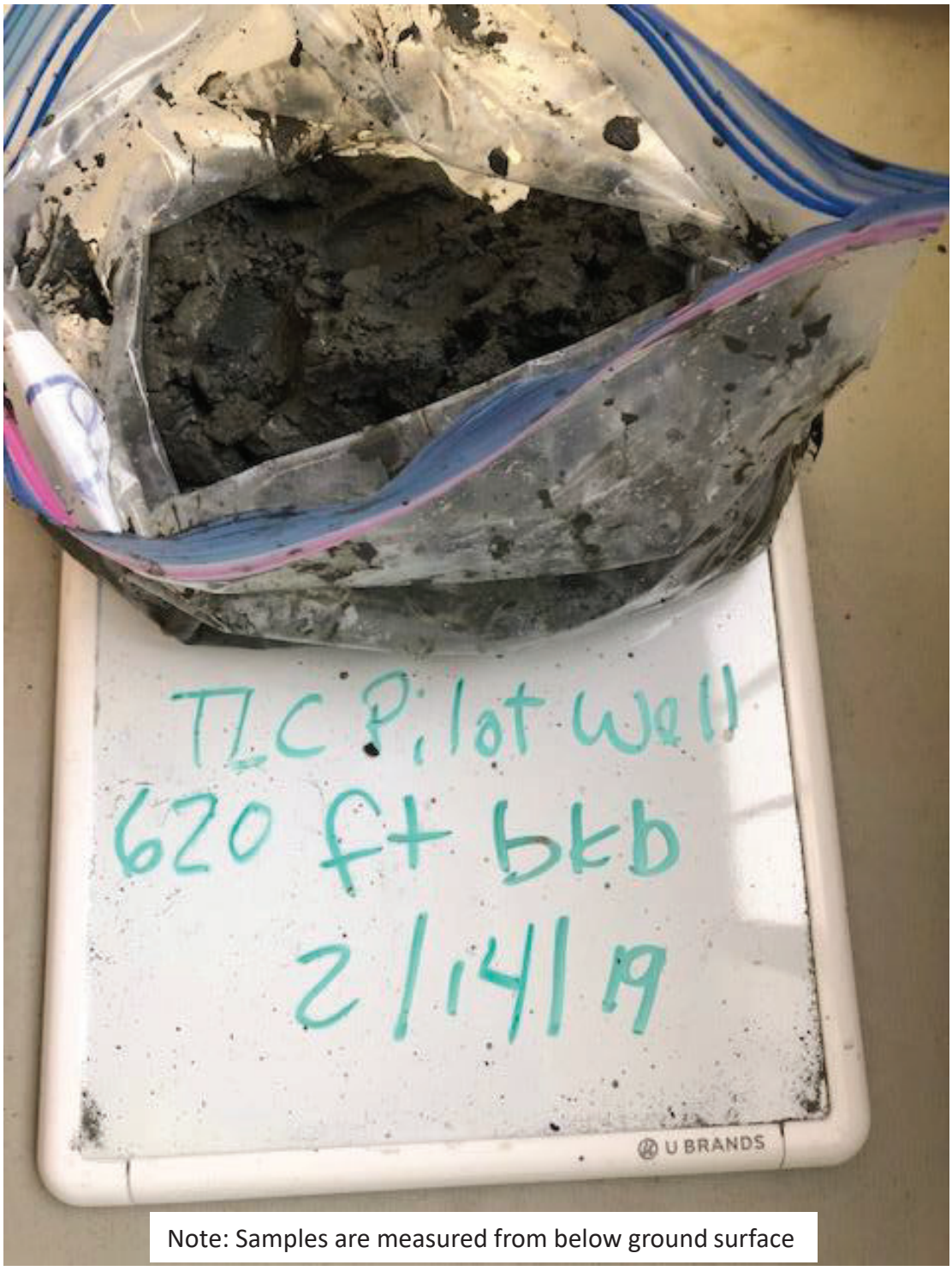
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-112
Photograph of sample TLC Pilot Well 615 ft

Brown AND Caldwell

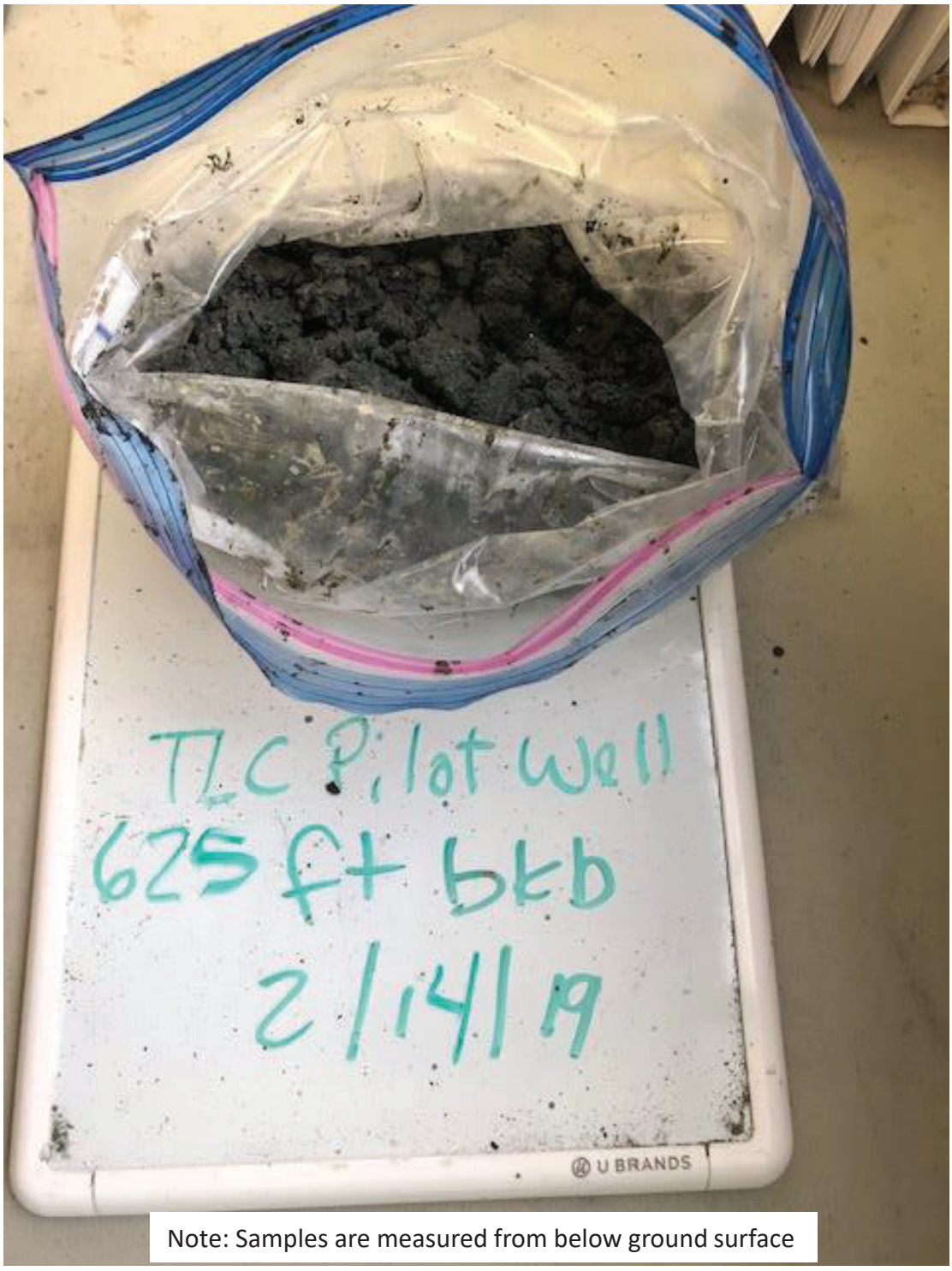


Note: Samples are measured from below ground surface

Figure C-113
Photograph of sample TLC Pilot Well 620 ft

Brown AND Caldwell

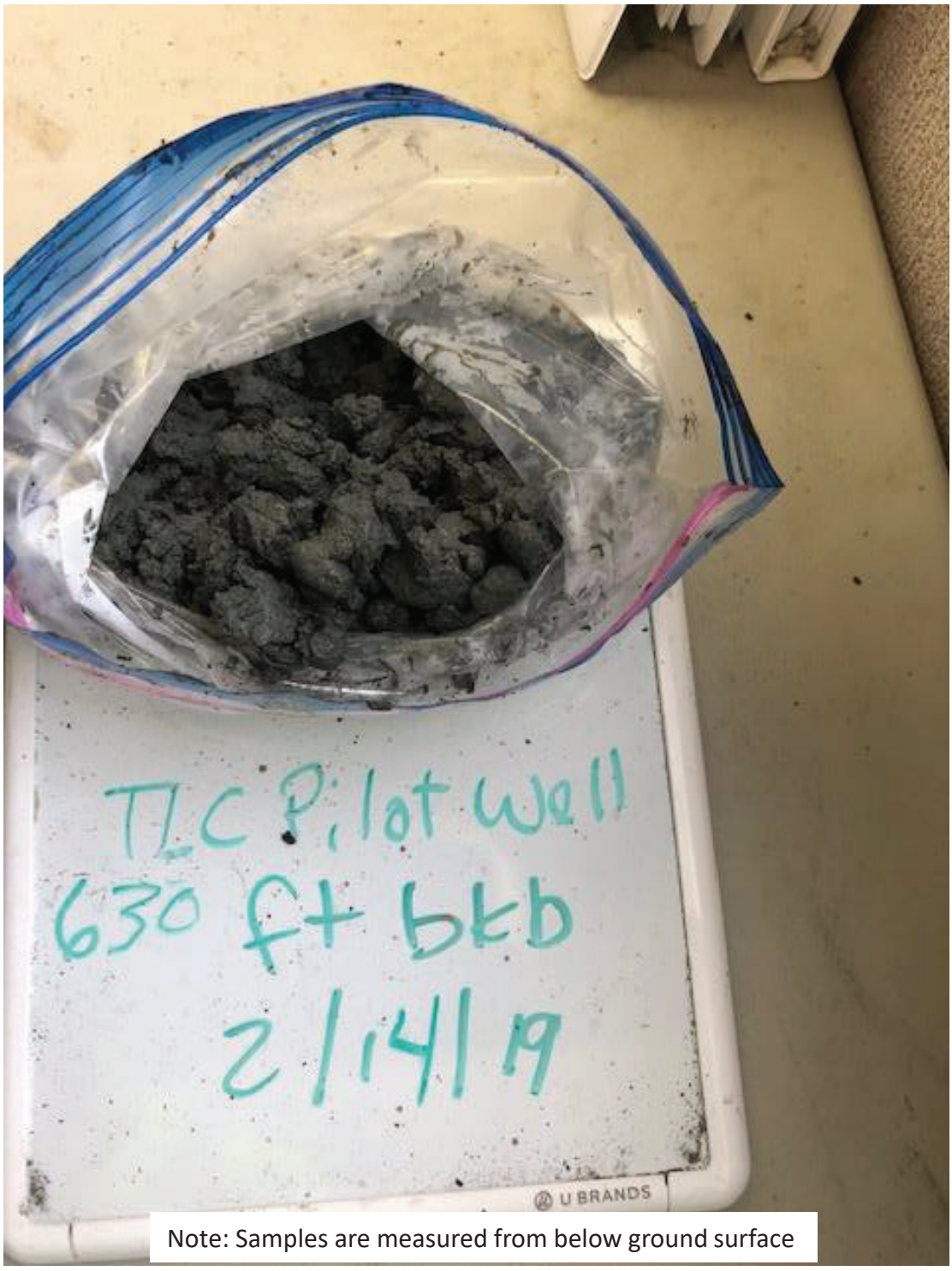
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-114
Photograph of sample TLC Pilot Well 625 ft

Brown AND Caldwell

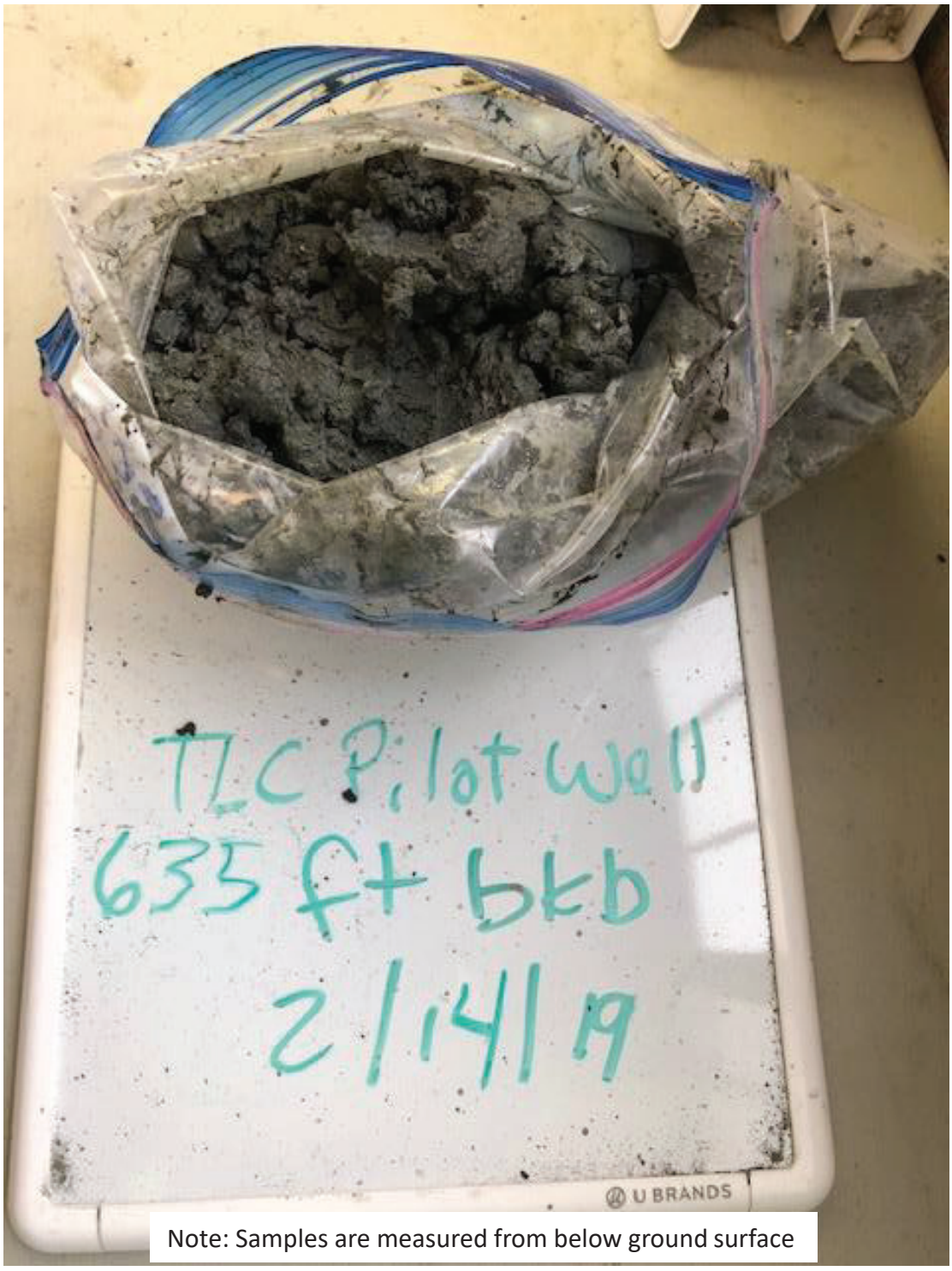


Note: Samples are measured from below ground surface

Figure C-115
Photograph of sample TLC Pilot Well 630 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

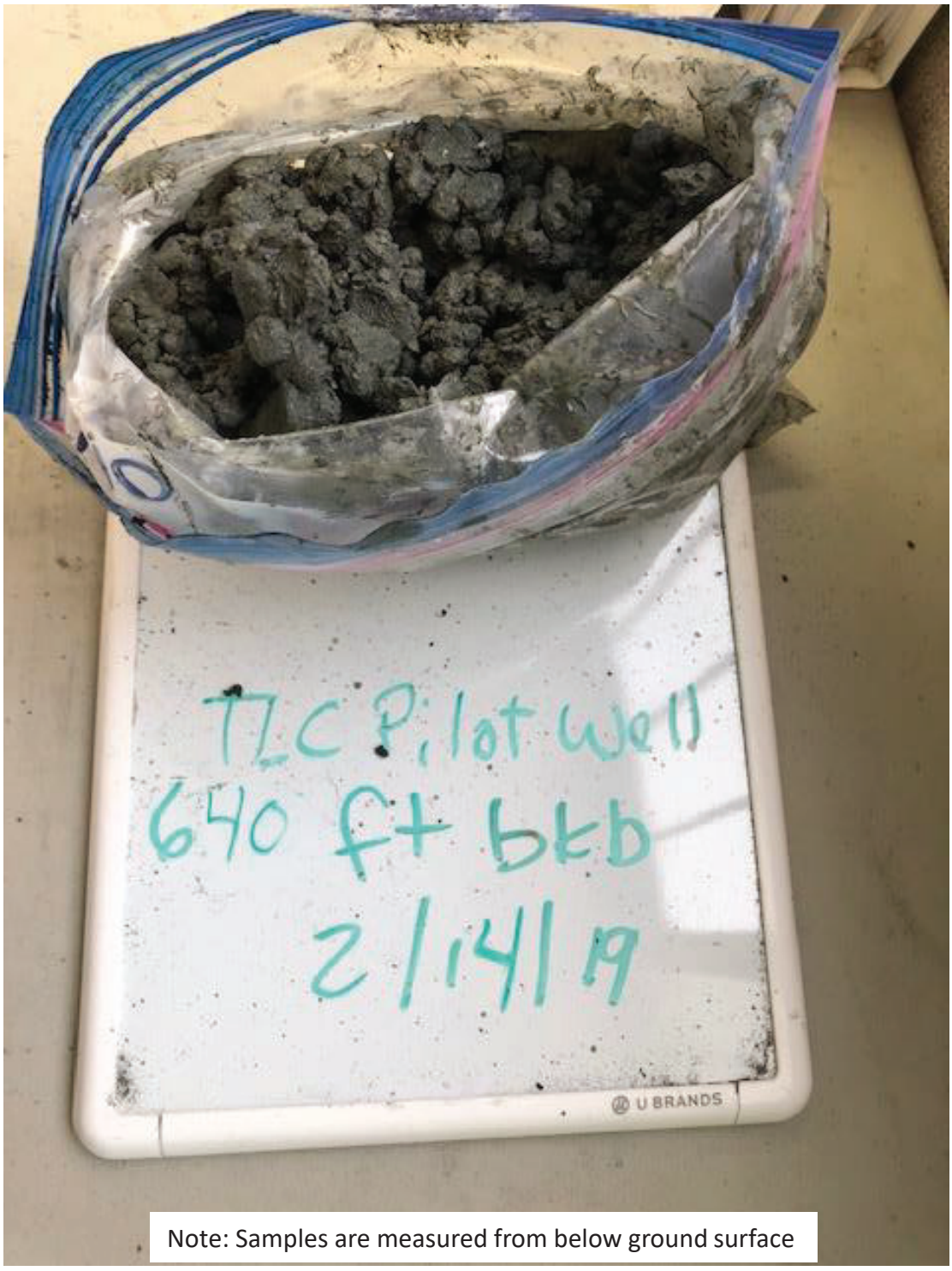


Note: Samples are measured from below ground surface

Figure C-116
Photograph of sample TLC Pilot Well 635 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

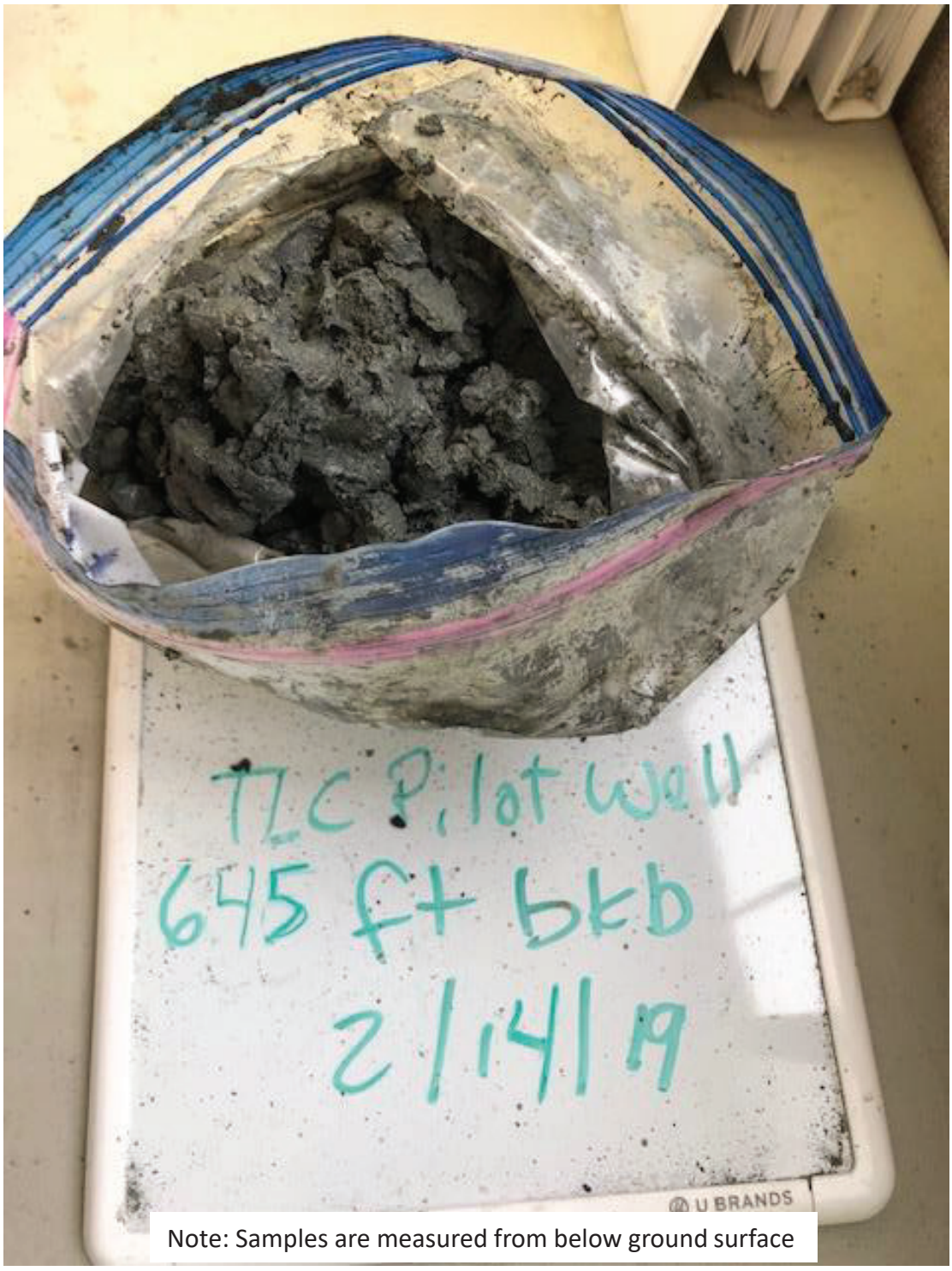


Note: Samples are measured from below ground surface

Figure C-117
Photograph of sample TLC Pilot Well 640 ft

Brown AND Caldwell

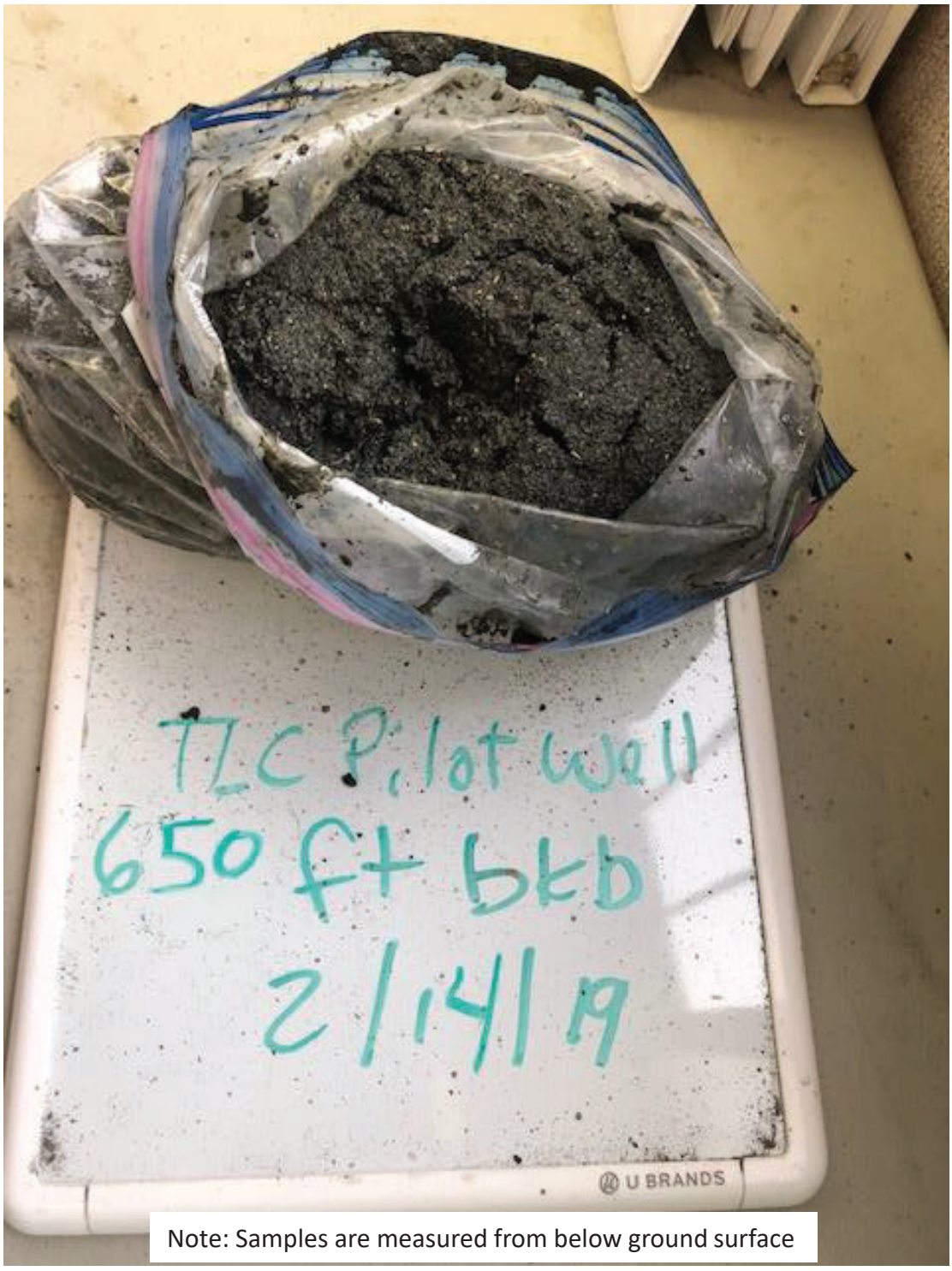
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-118
Photograph of sample TLC Pilot Well 645 ft

Brown AND Caldwell

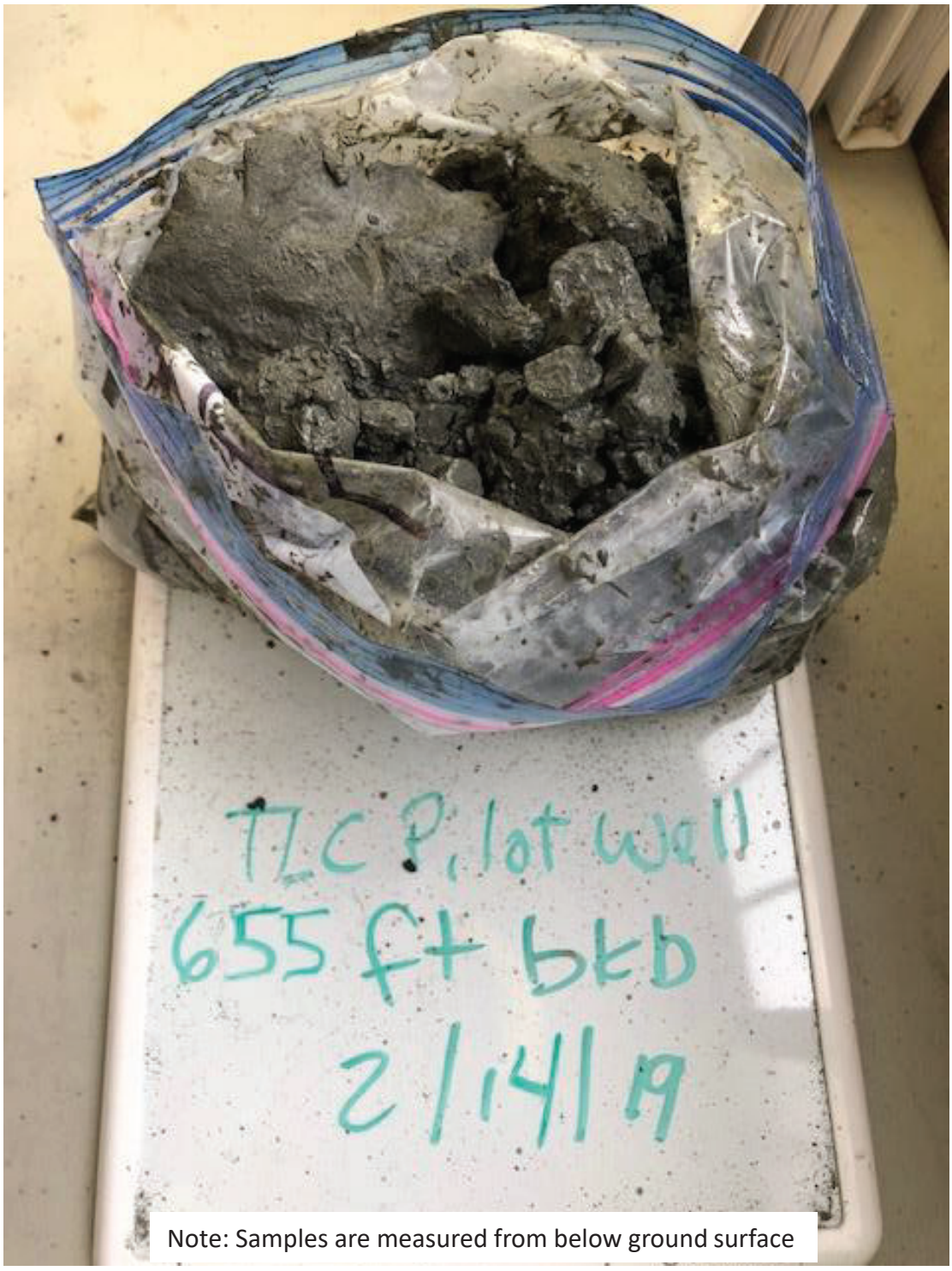


Note: Samples are measured from below ground surface

Figure C-119
Photograph of sample TLC Pilot Well 650 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

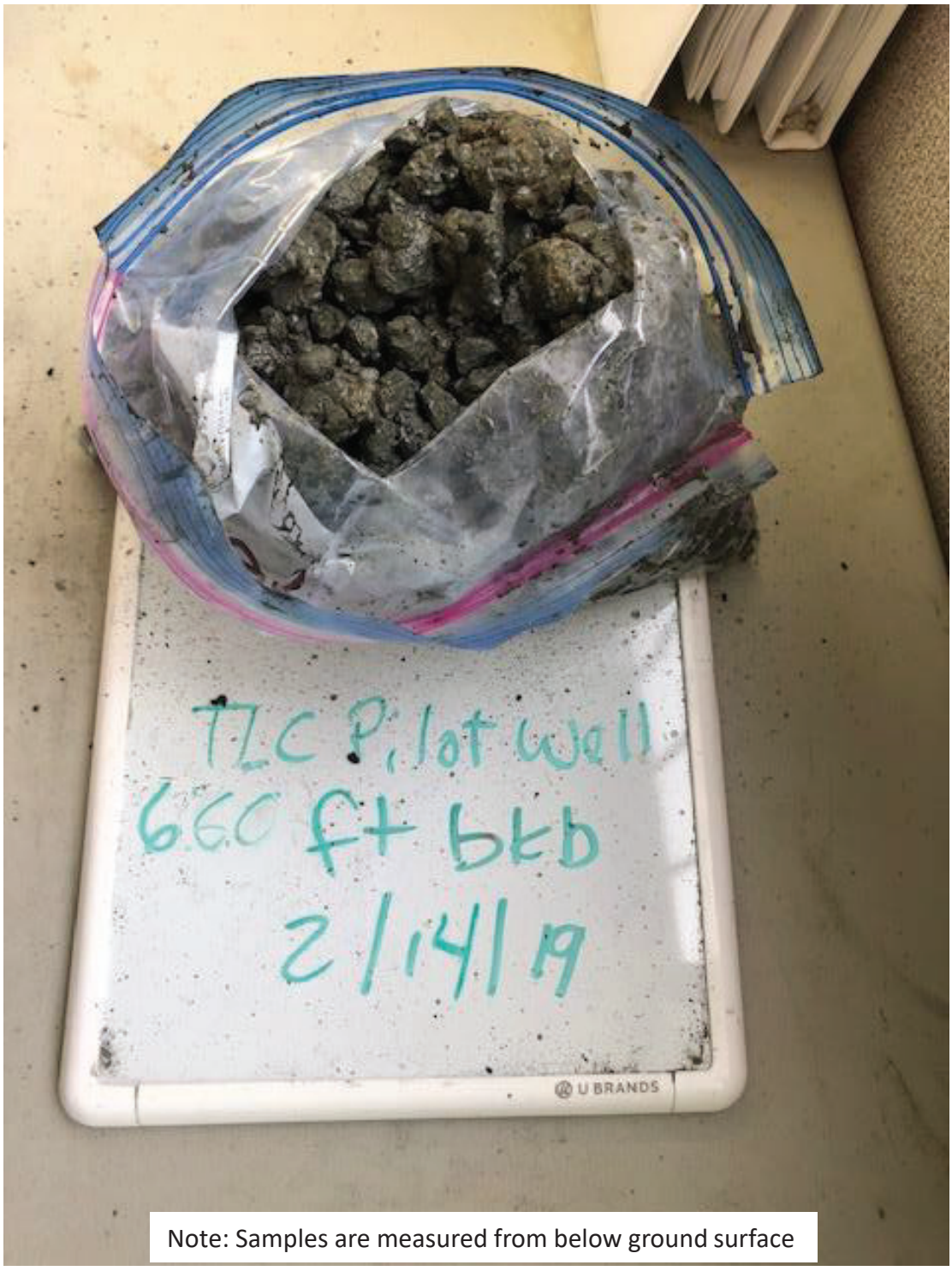


Note: Samples are measured from below ground surface

Figure C-120
Photograph of sample TLC Pilot Well 655 ft

Brown AND Caldwell

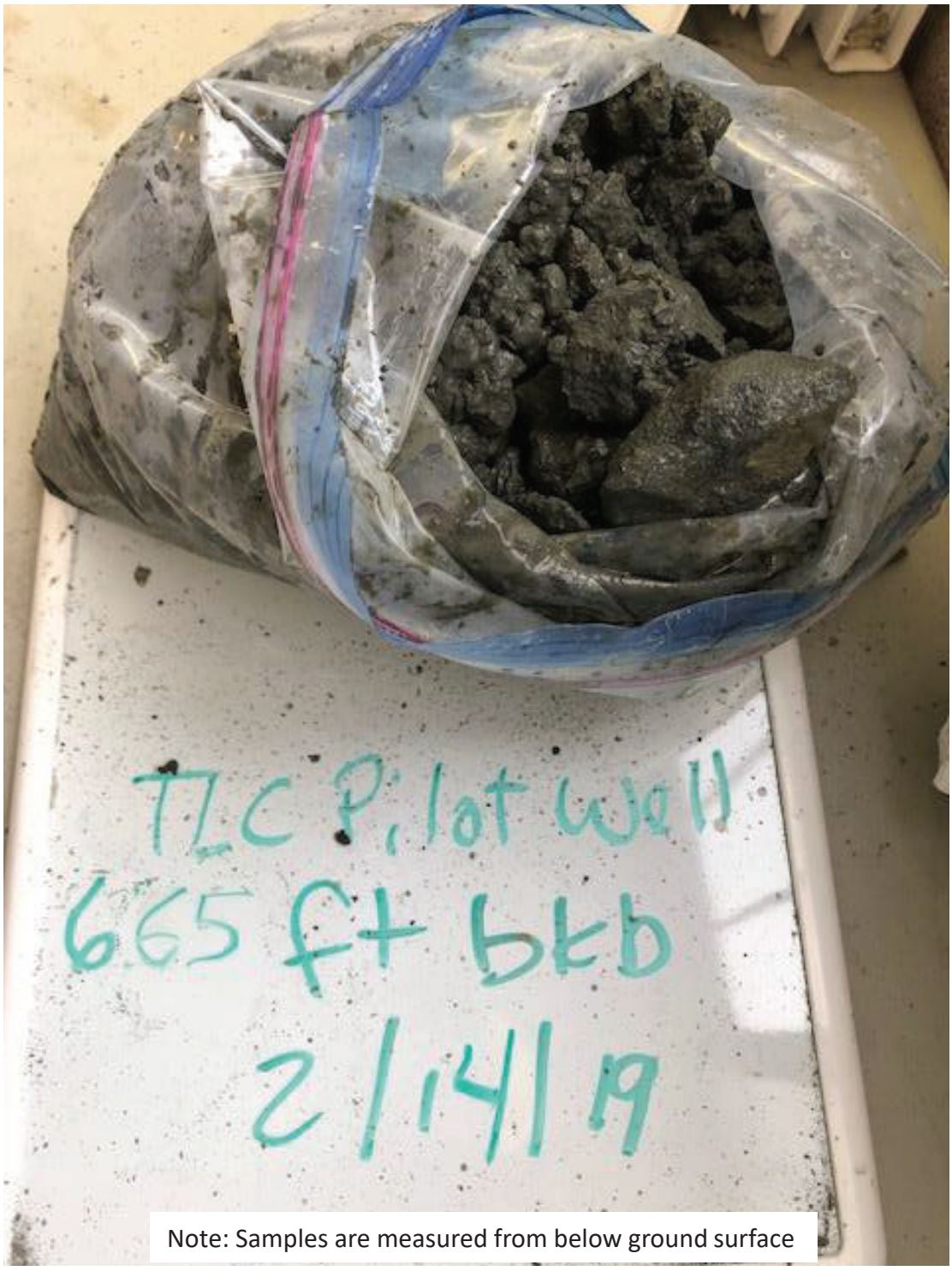
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-121
Photograph of sample TLC Pilot Well 660 ft

Brown AND Caldwell

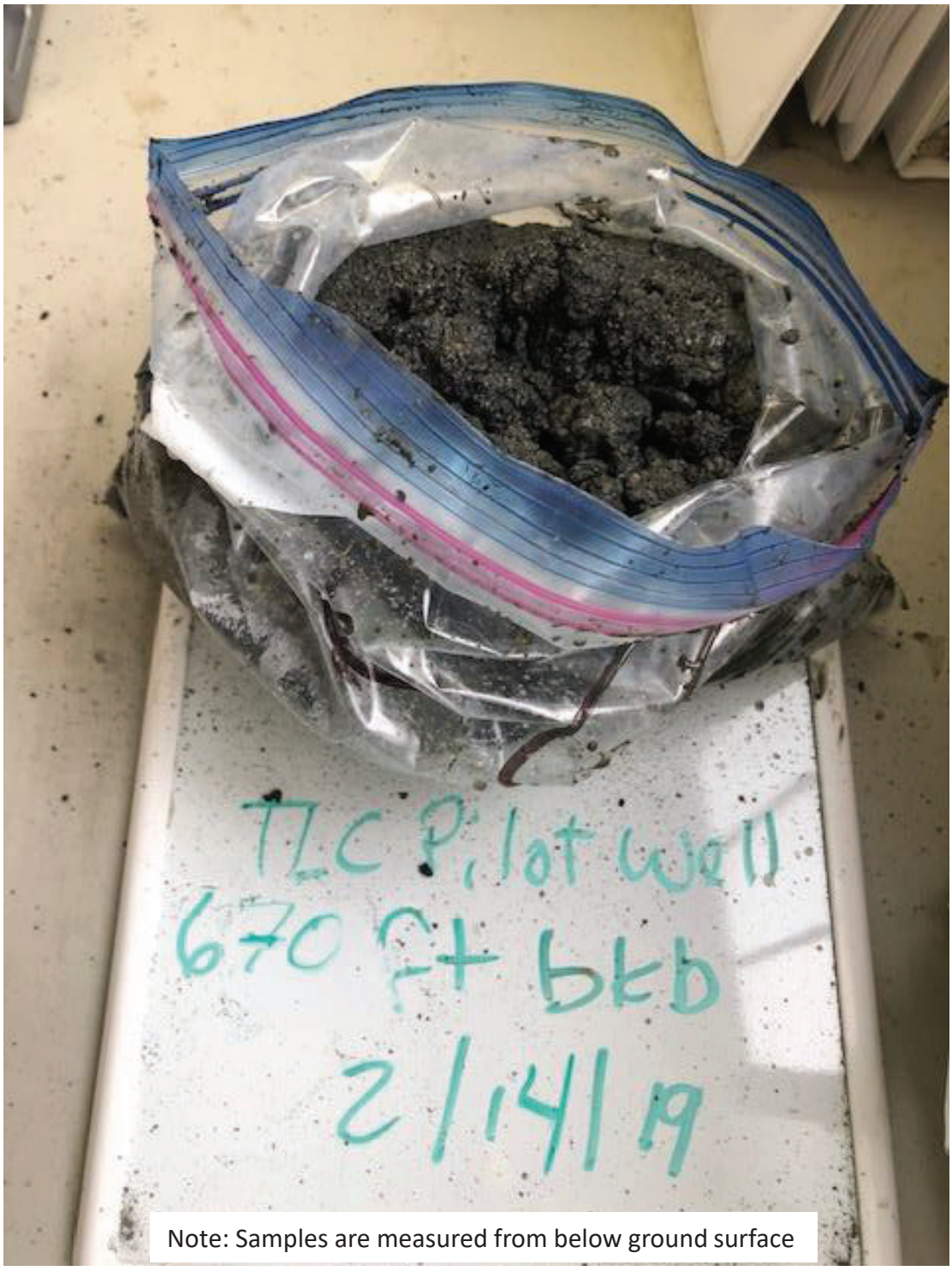


Note: Samples are measured from below ground surface

Figure C-122
Photograph of sample TLC Pilot Well 665 ft

Brown AND Caldwell

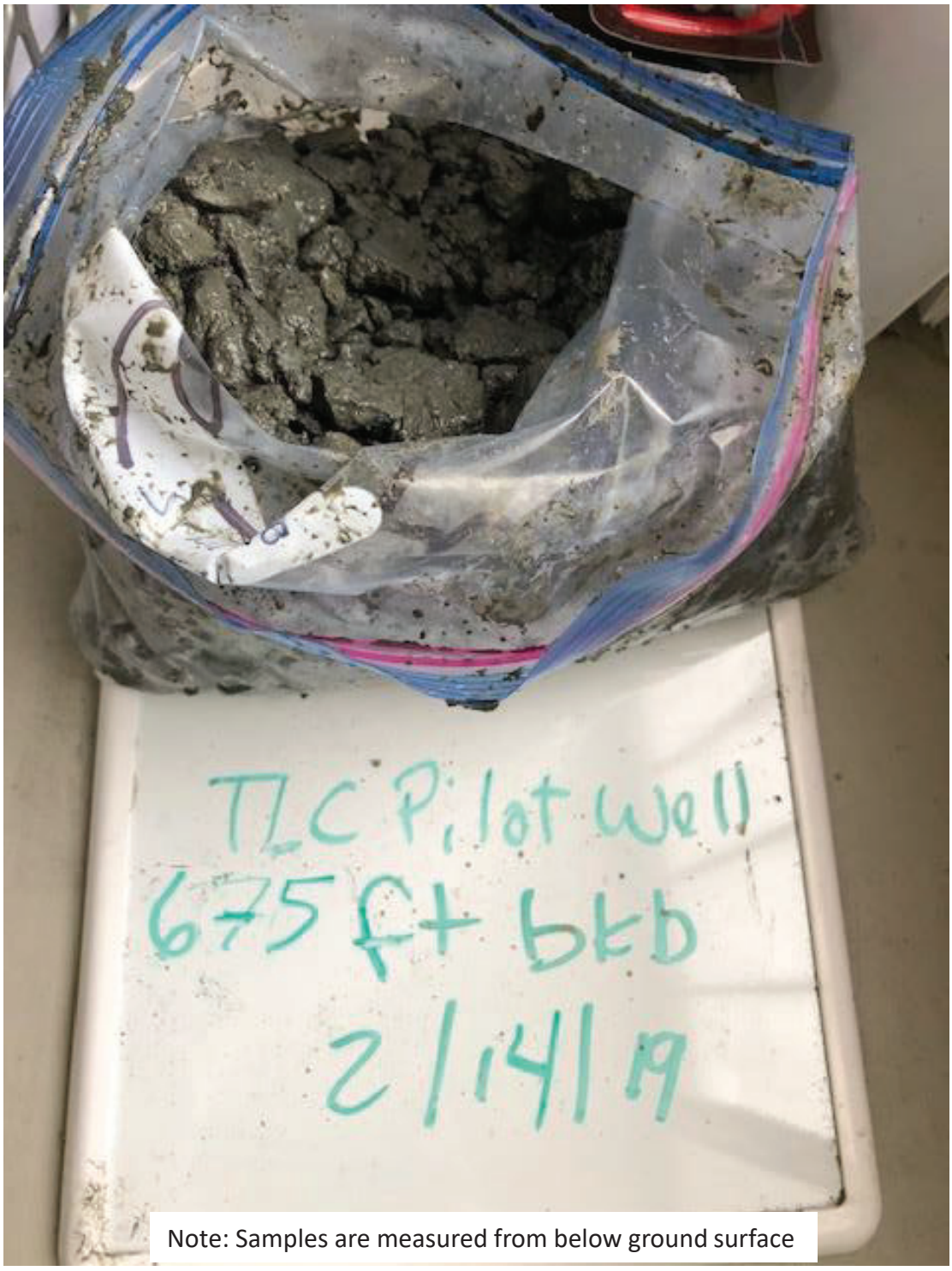
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-123
Photograph of sample TLC Pilot Well 670 ft

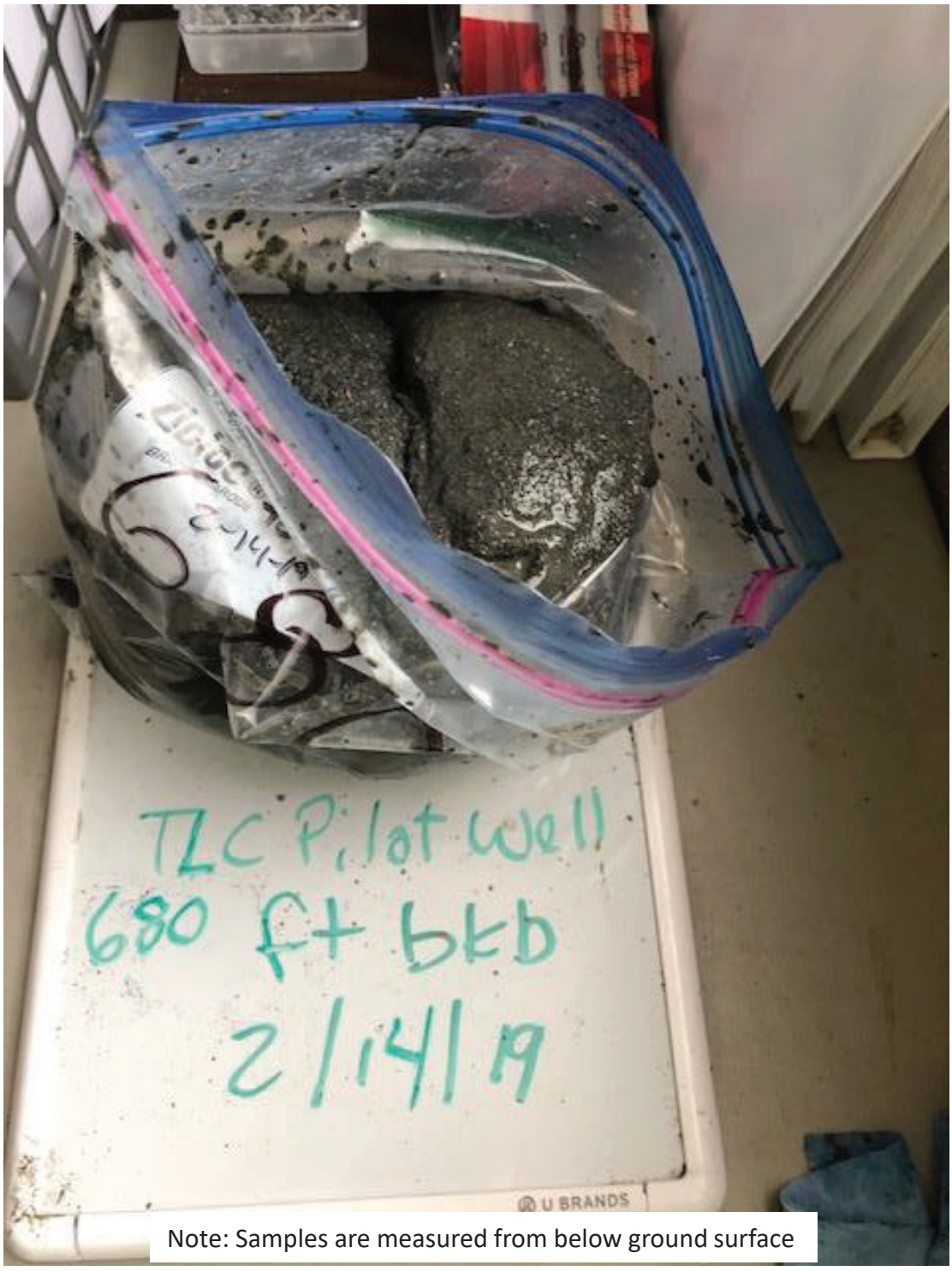
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-124
Photograph of sample TLC Pilot Well 675 ft

Brown AND Caldwell

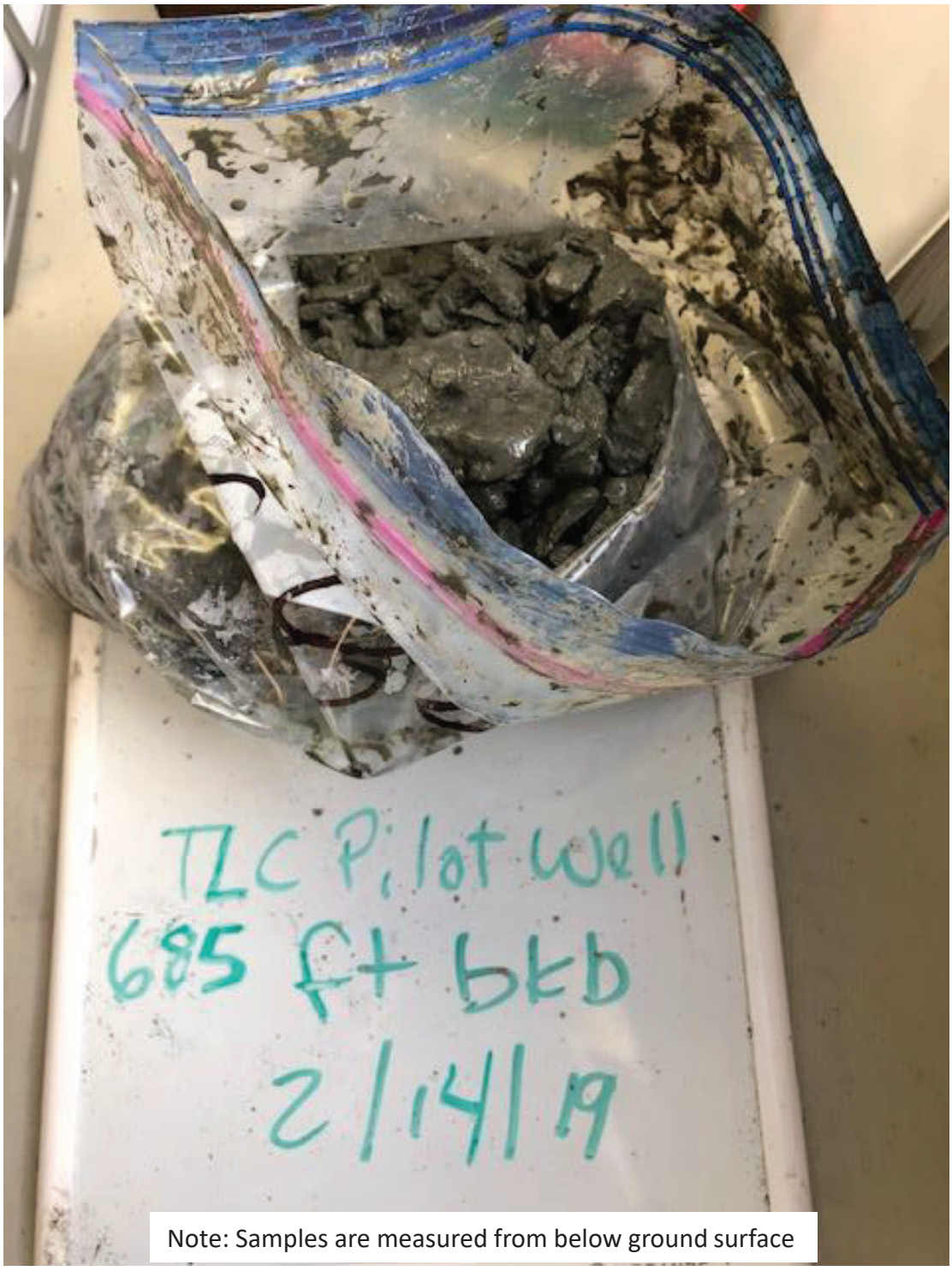


Note: Samples are measured from below ground surface

Figure C-125
Photograph of sample TLC Pilot Well 680 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

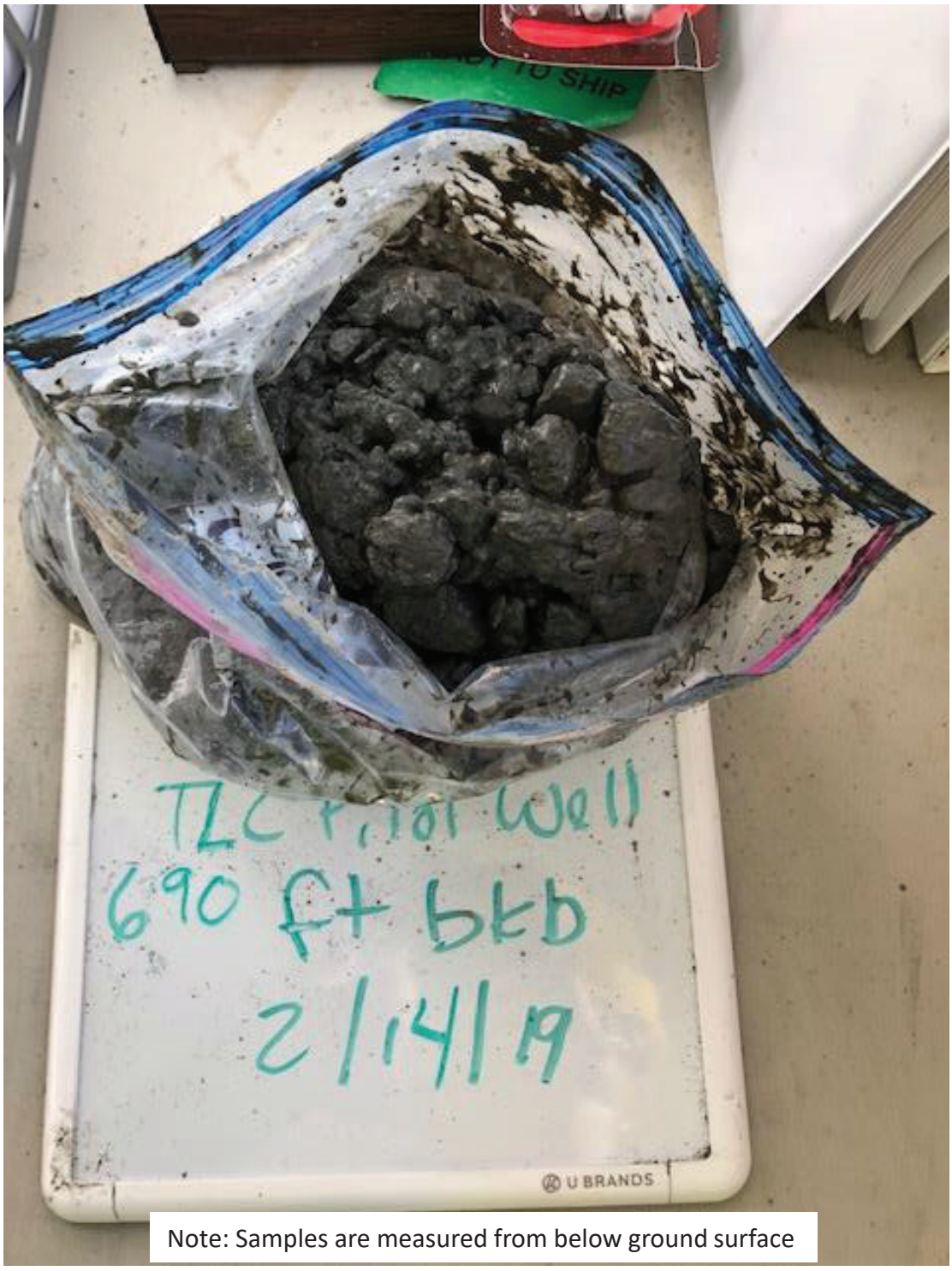


Note: Samples are measured from below ground surface

Figure C-126
Photograph of sample TLC Pilot Well 685 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

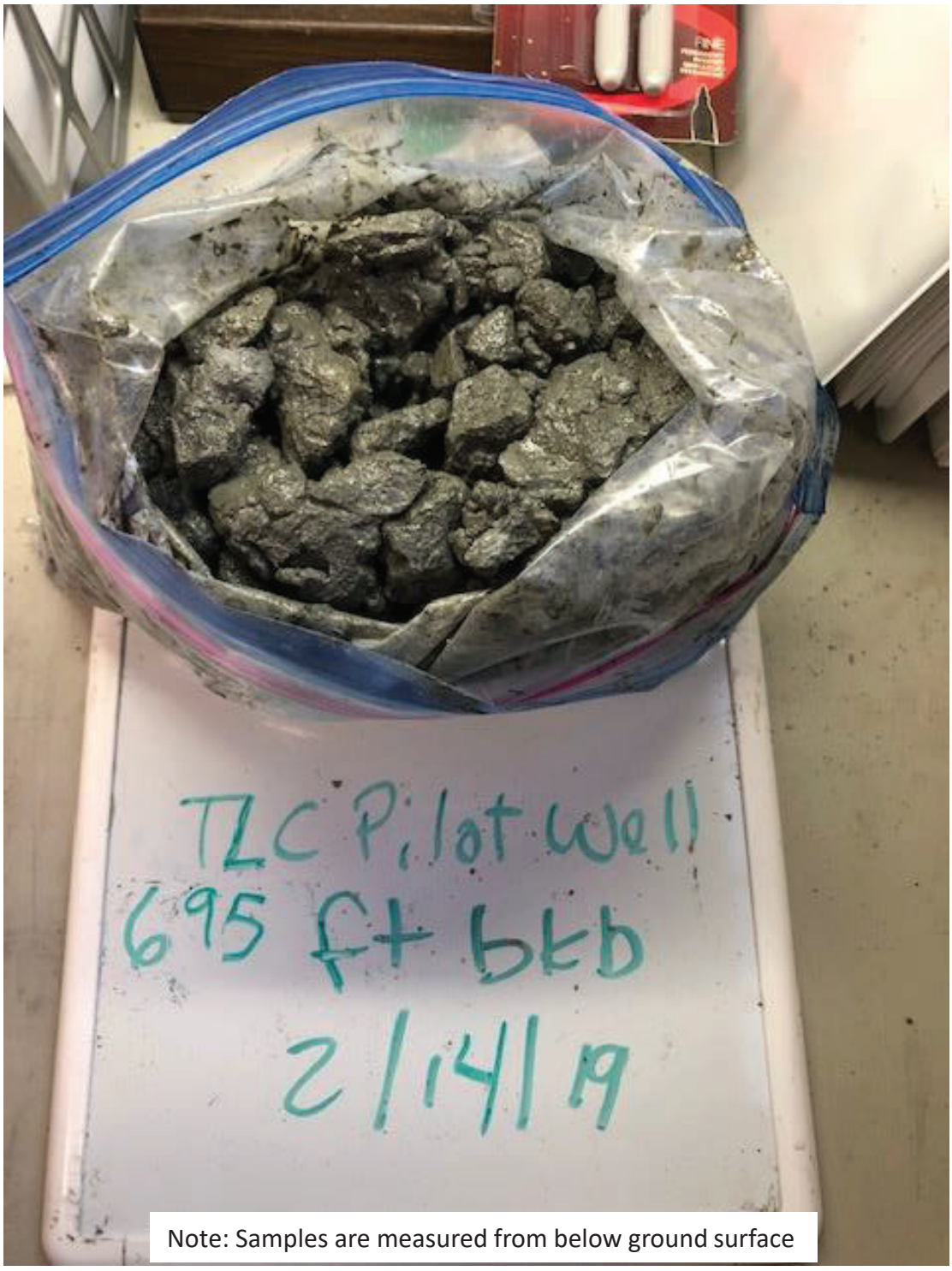


Note: Samples are measured from below ground surface

Figure C-127
Photograph of sample TLC Pilot Well 690 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

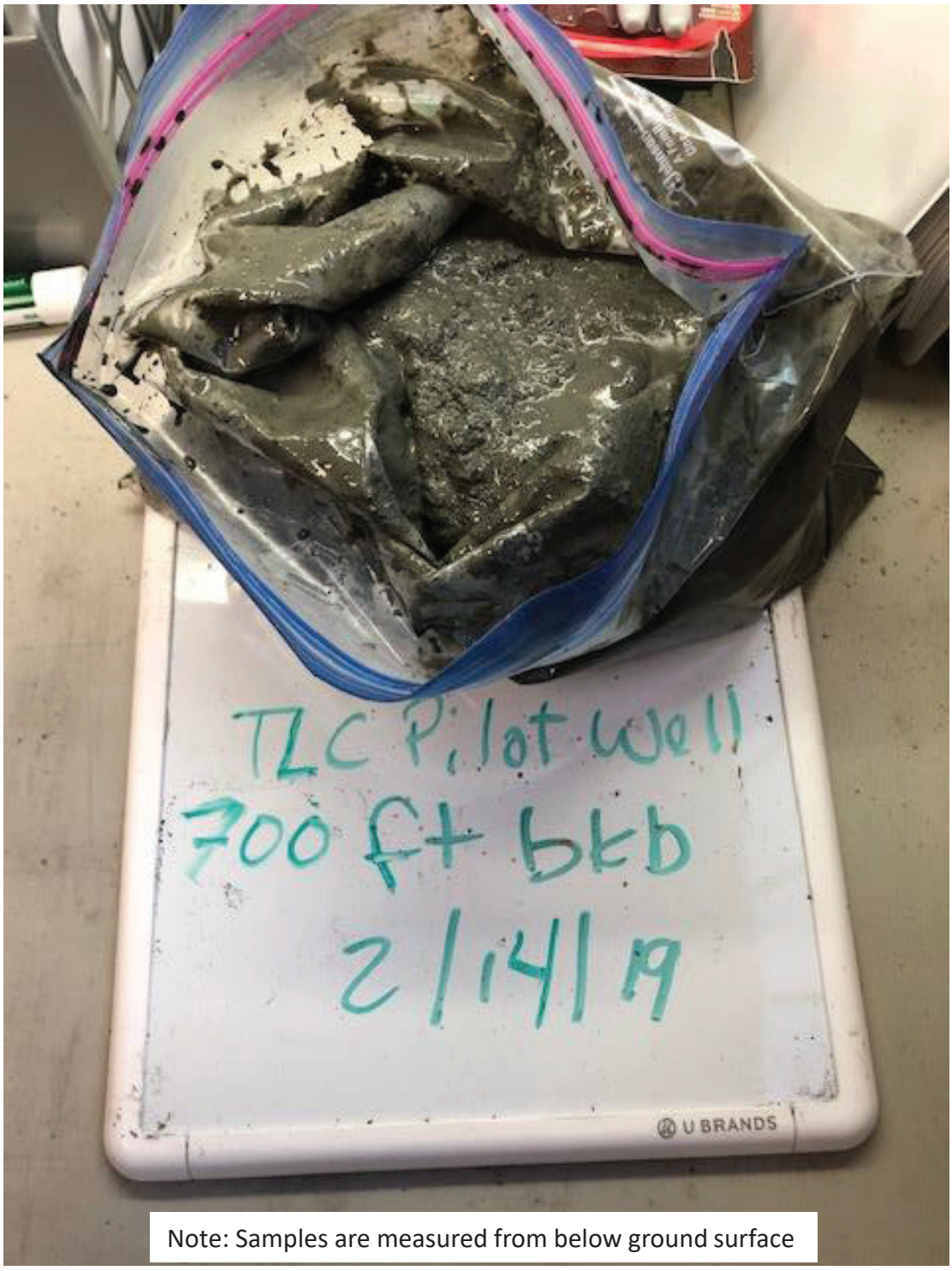


Note: Samples are measured from below ground surface

Figure C-128
Photograph of sample TLC Pilot Well 695 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

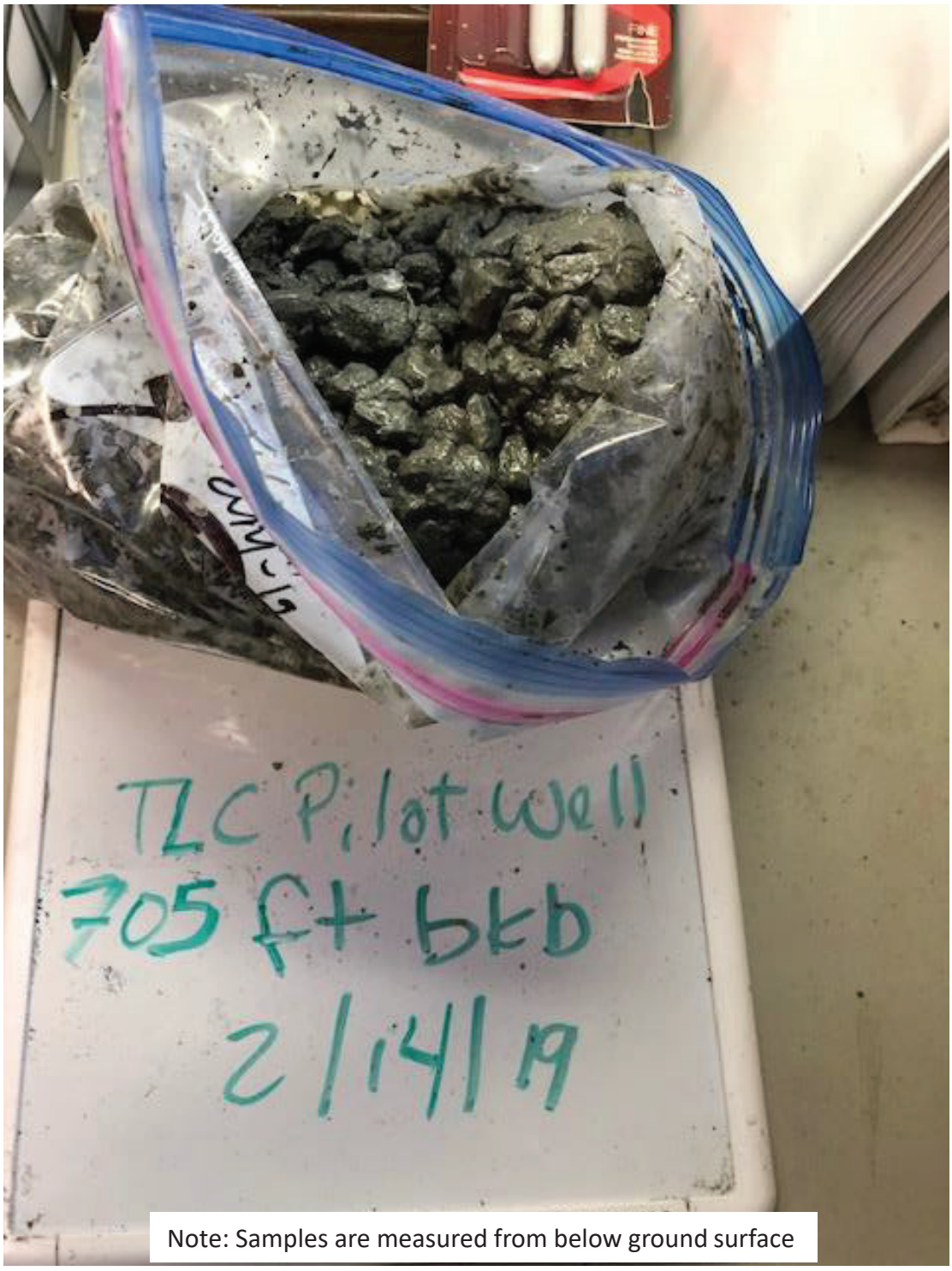


Note: Samples are measured from below ground surface

Figure C-129
Photograph of sample TLC Pilot Well 700 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

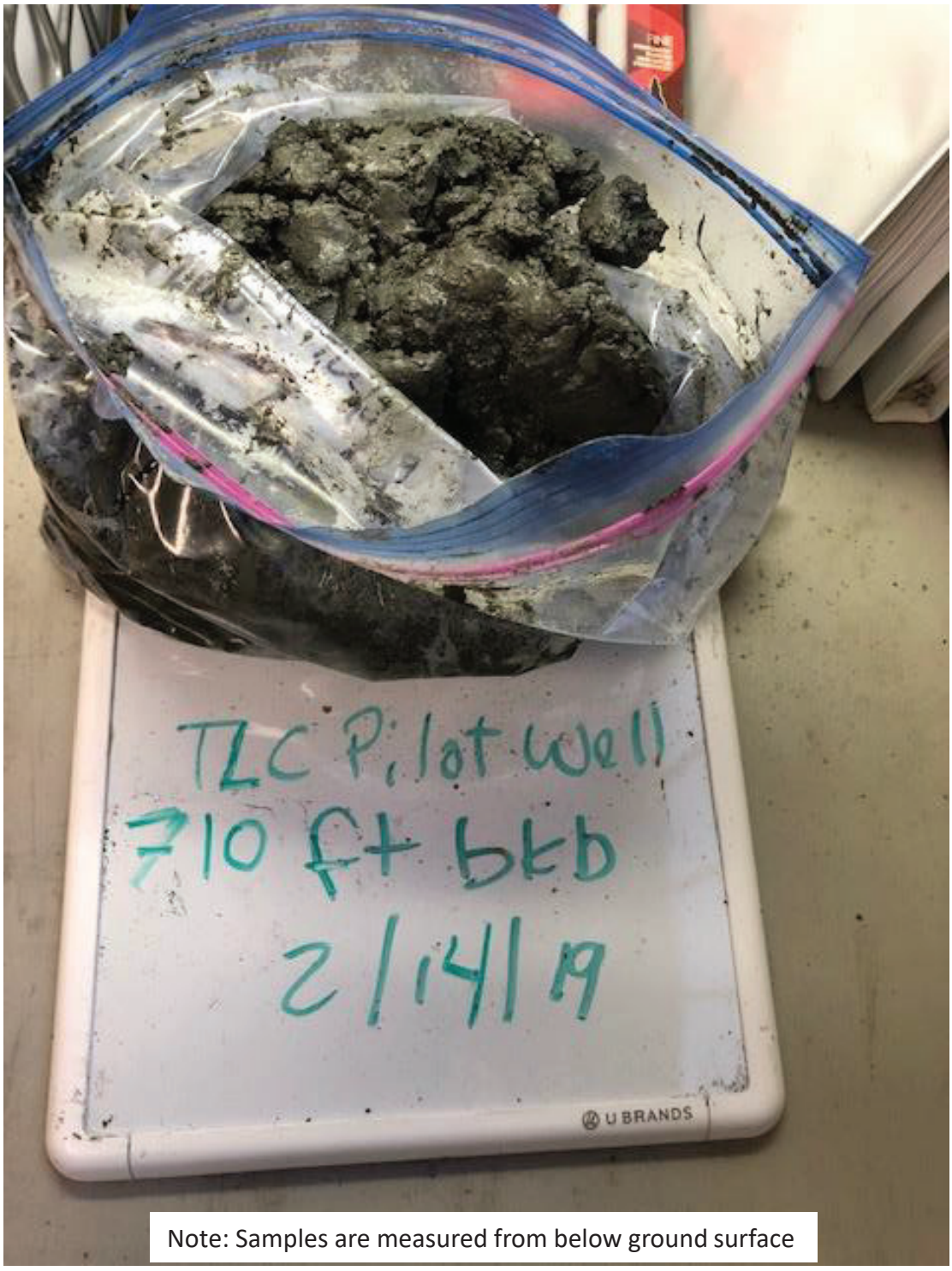


Note: Samples are measured from below ground surface

Figure C-130
Photograph of sample TLC Pilot Well 705 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

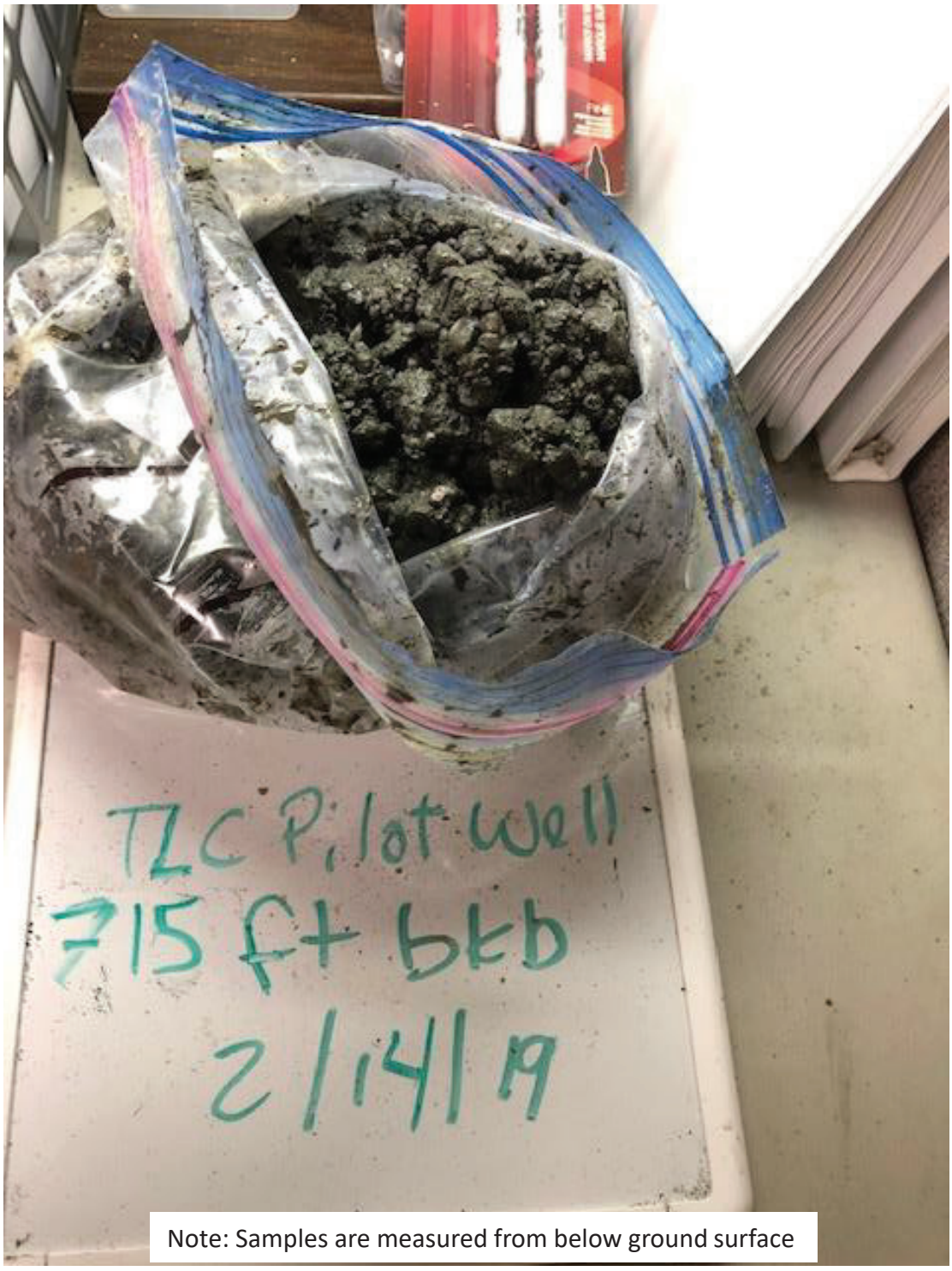


Note: Samples are measured from below ground surface

Figure C-131
Photograph of sample TLC Pilot Well 710 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

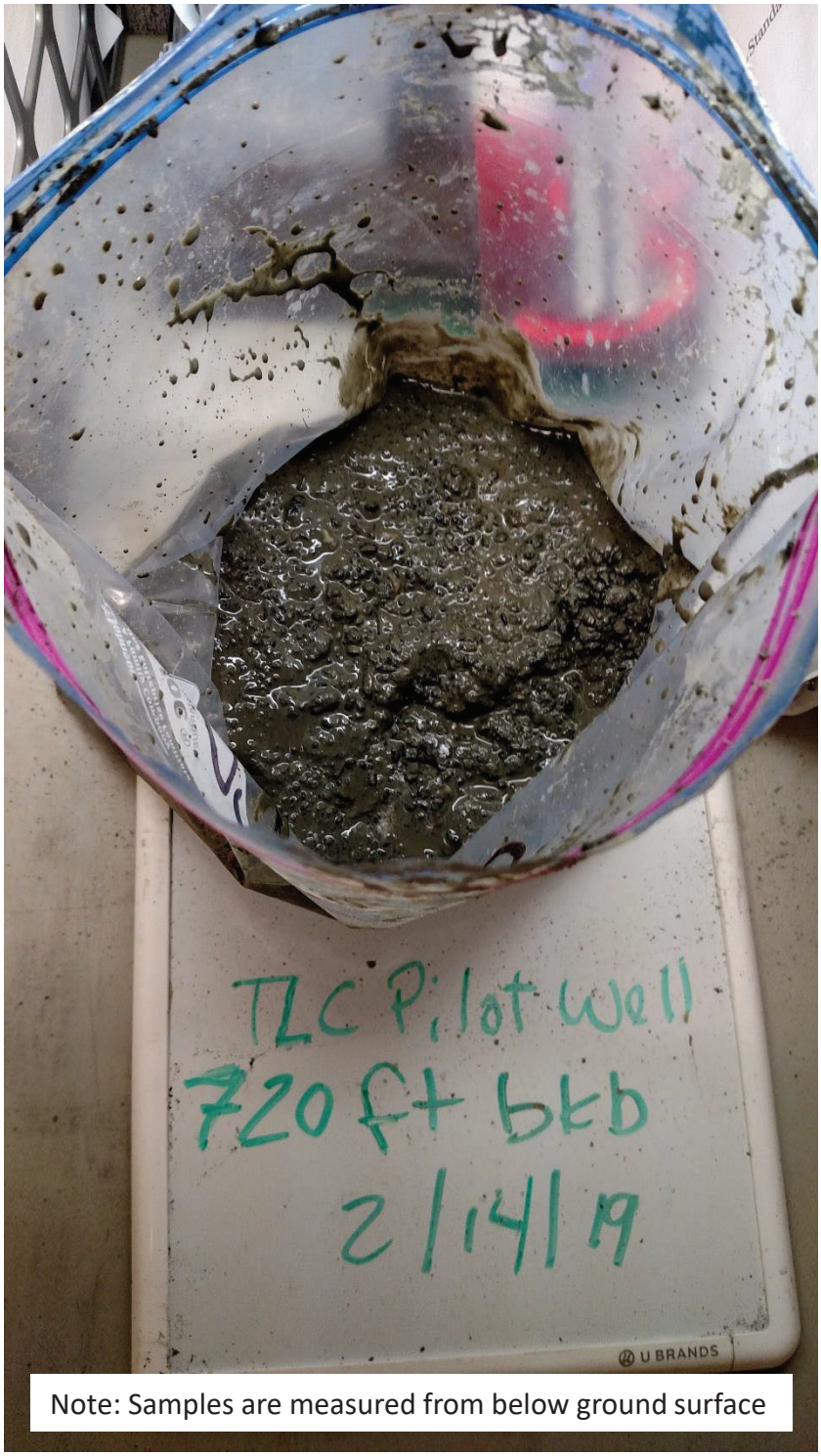


Note: Samples are measured from below ground surface

Figure C-132
Photograph of sample TLC Pilot Well 715 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-133
Photograph of sample TLC Pilot Well 720 ft

Brown AND Caldwell

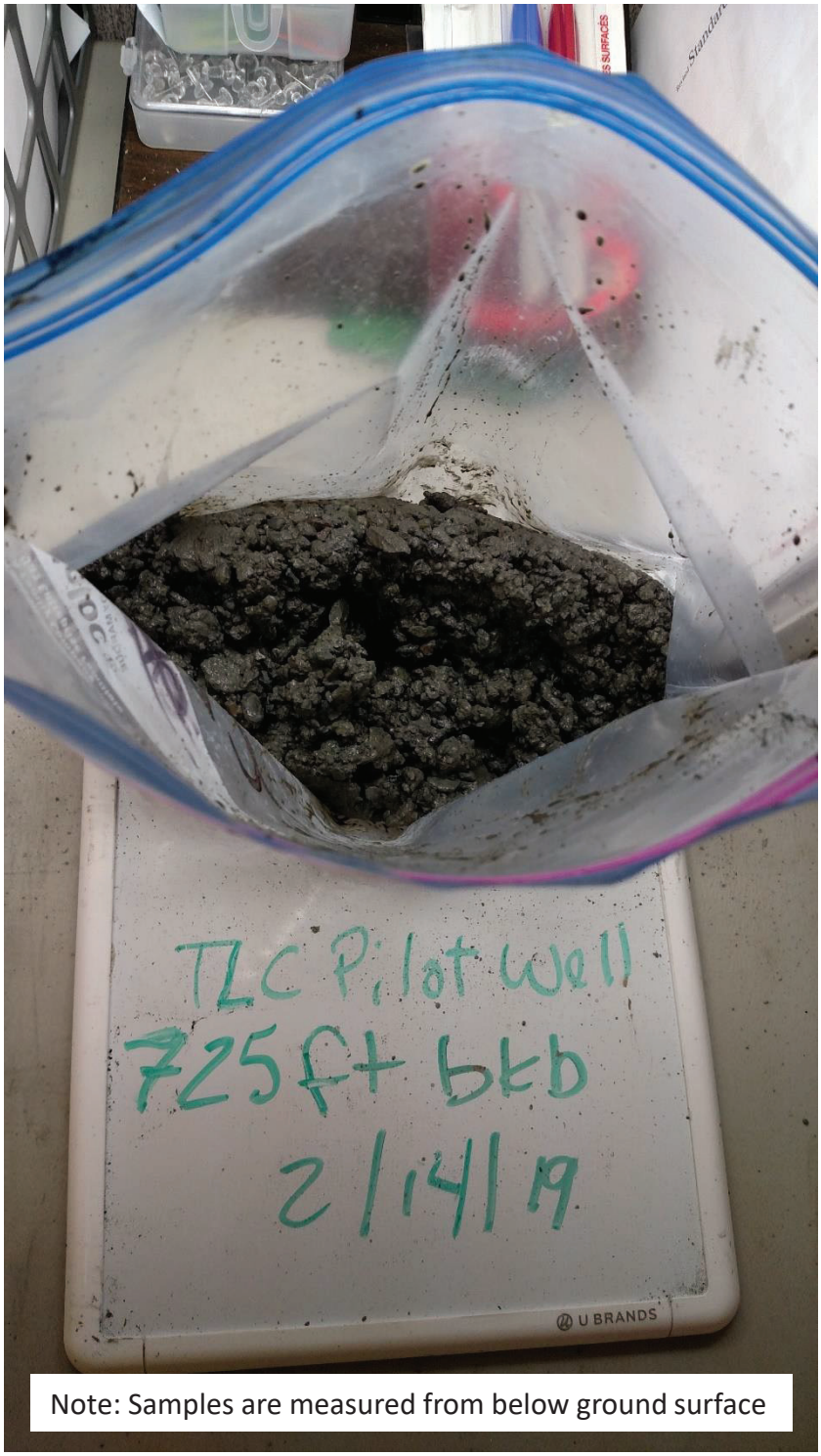
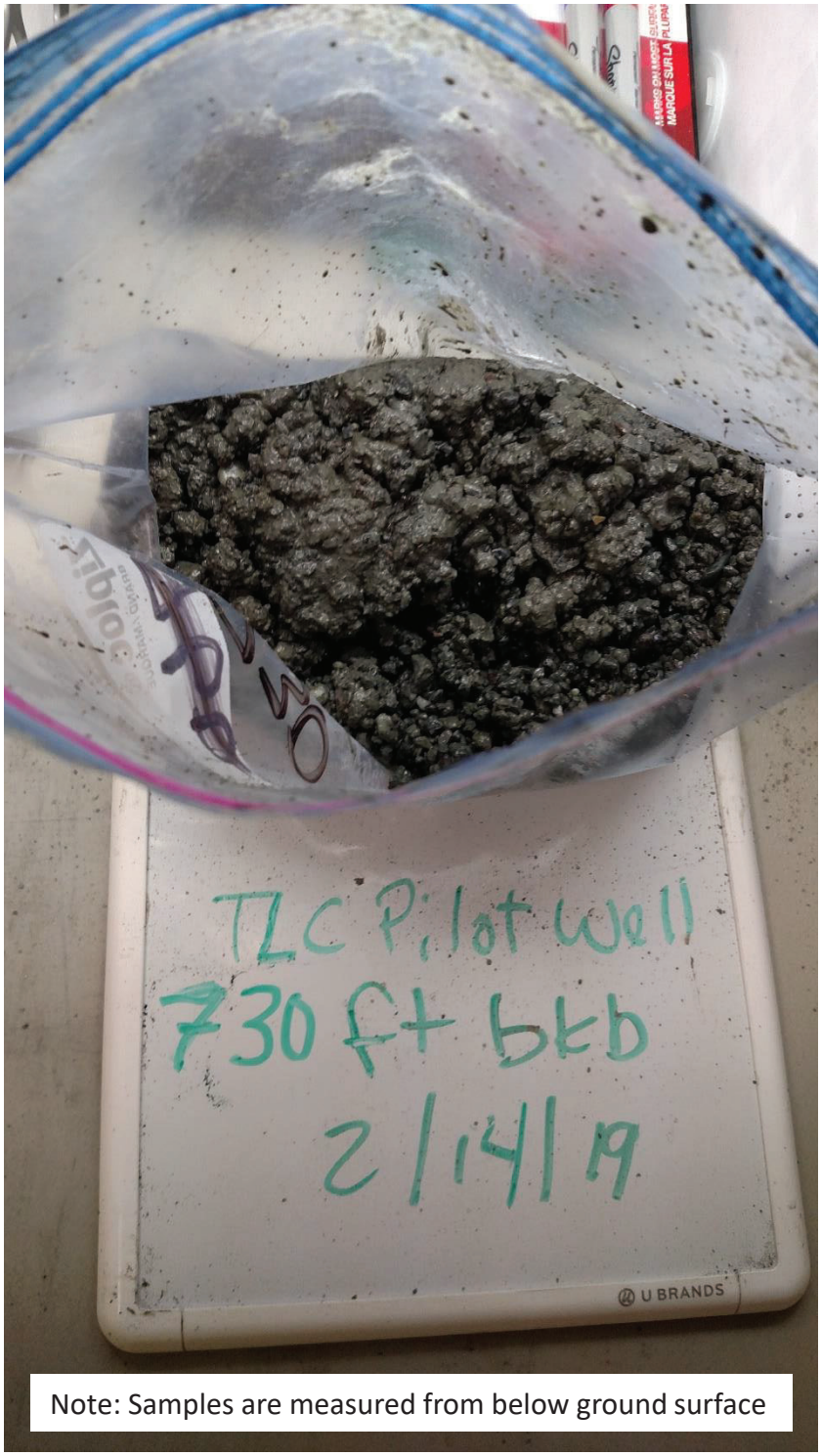


Figure C-134
Photograph of sample TLC Pilot Well 725 ft

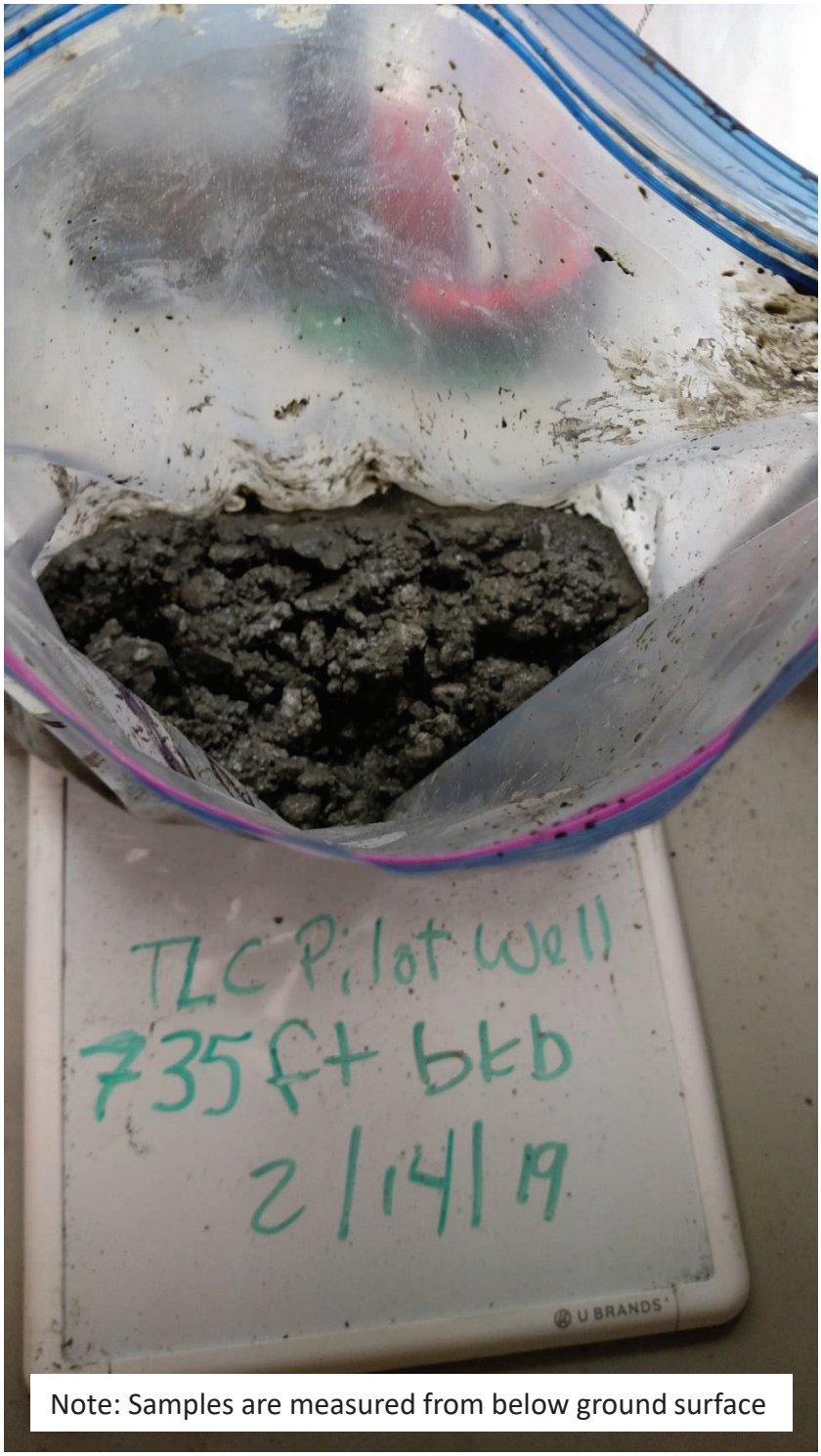
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-135
Photograph of sample TLC Pilot Well 730 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-136
Photograph of sample TLC Pilot Well 735 ft

Brown AND Caldwell

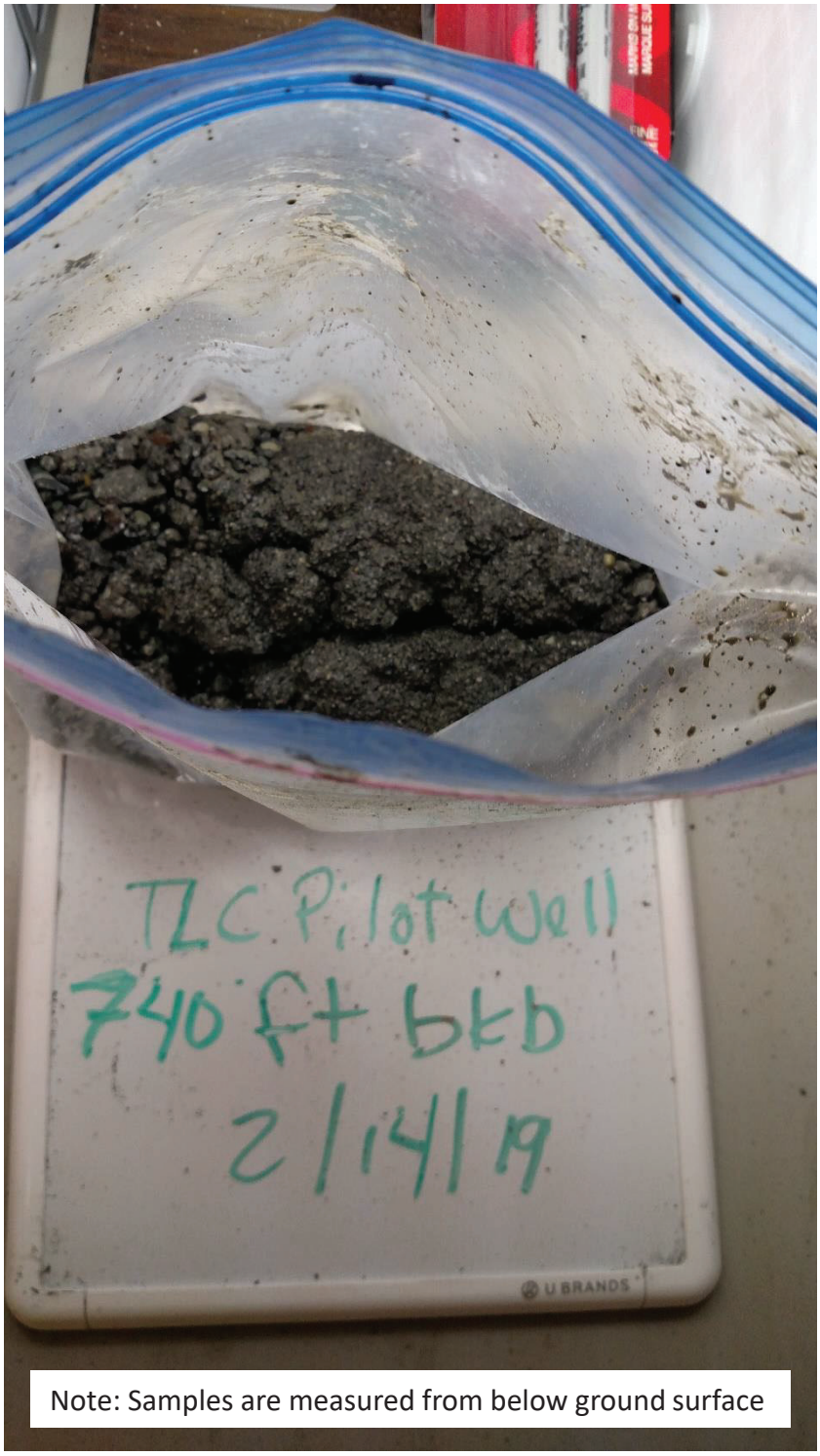
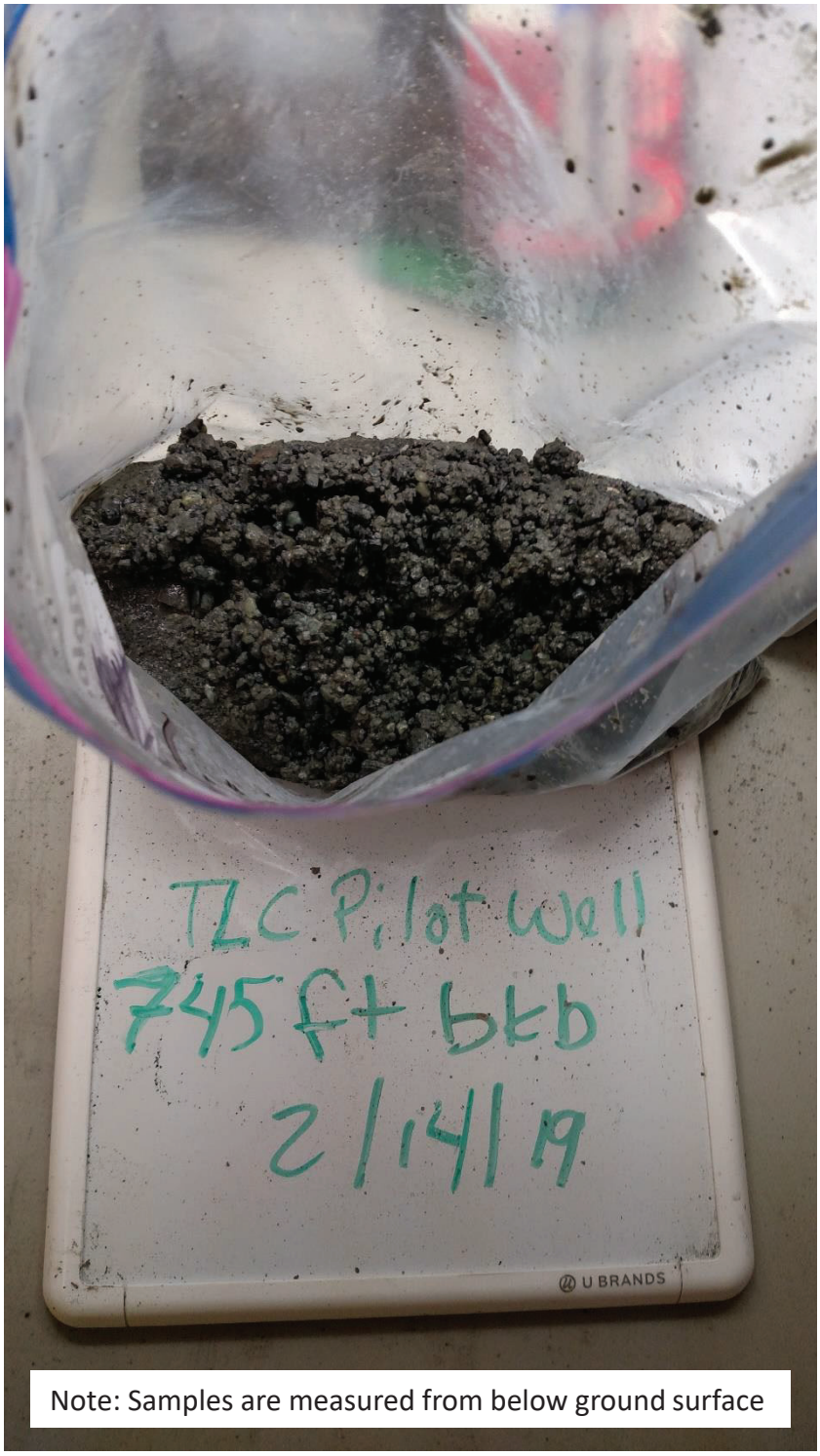


Figure C-137
Photograph of sample TLC Pilot Well 740 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

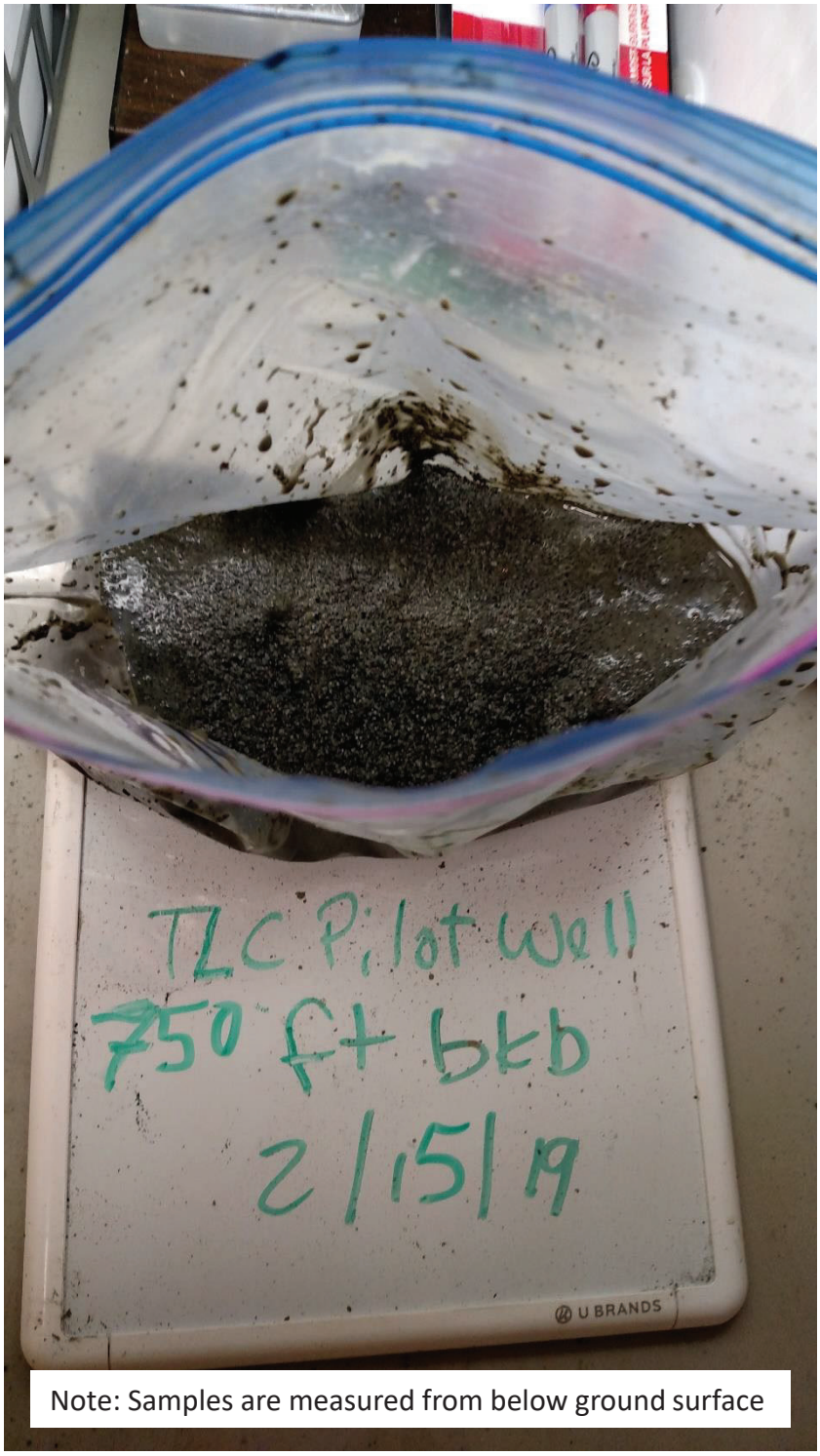


Note: Samples are measured from below ground surface

Figure C-138
Photograph of sample TLC Pilot Well 745 ft

Brown AND Caldwell

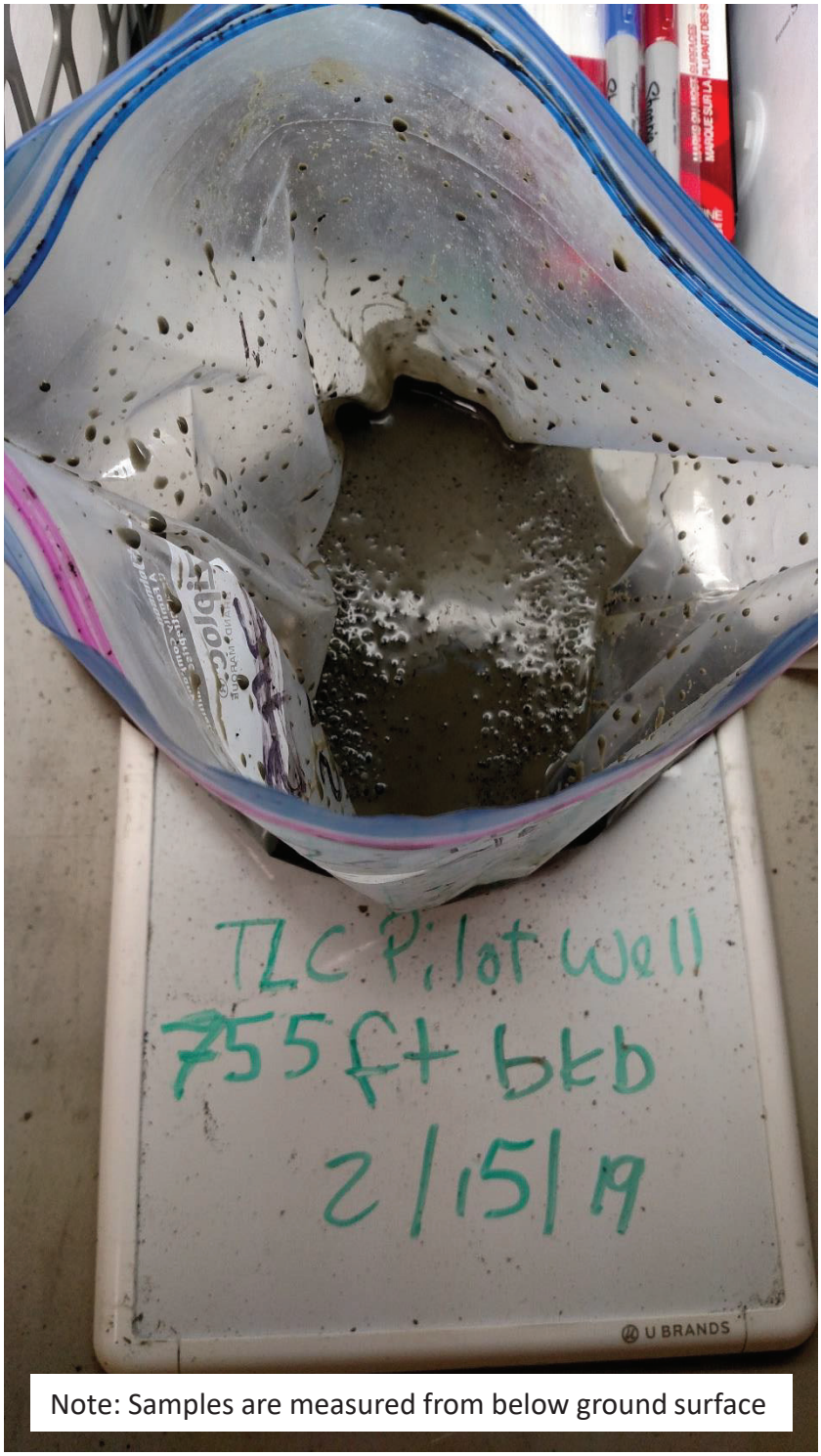
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-139
Photograph of sample TLC Pilot Well 750 ft

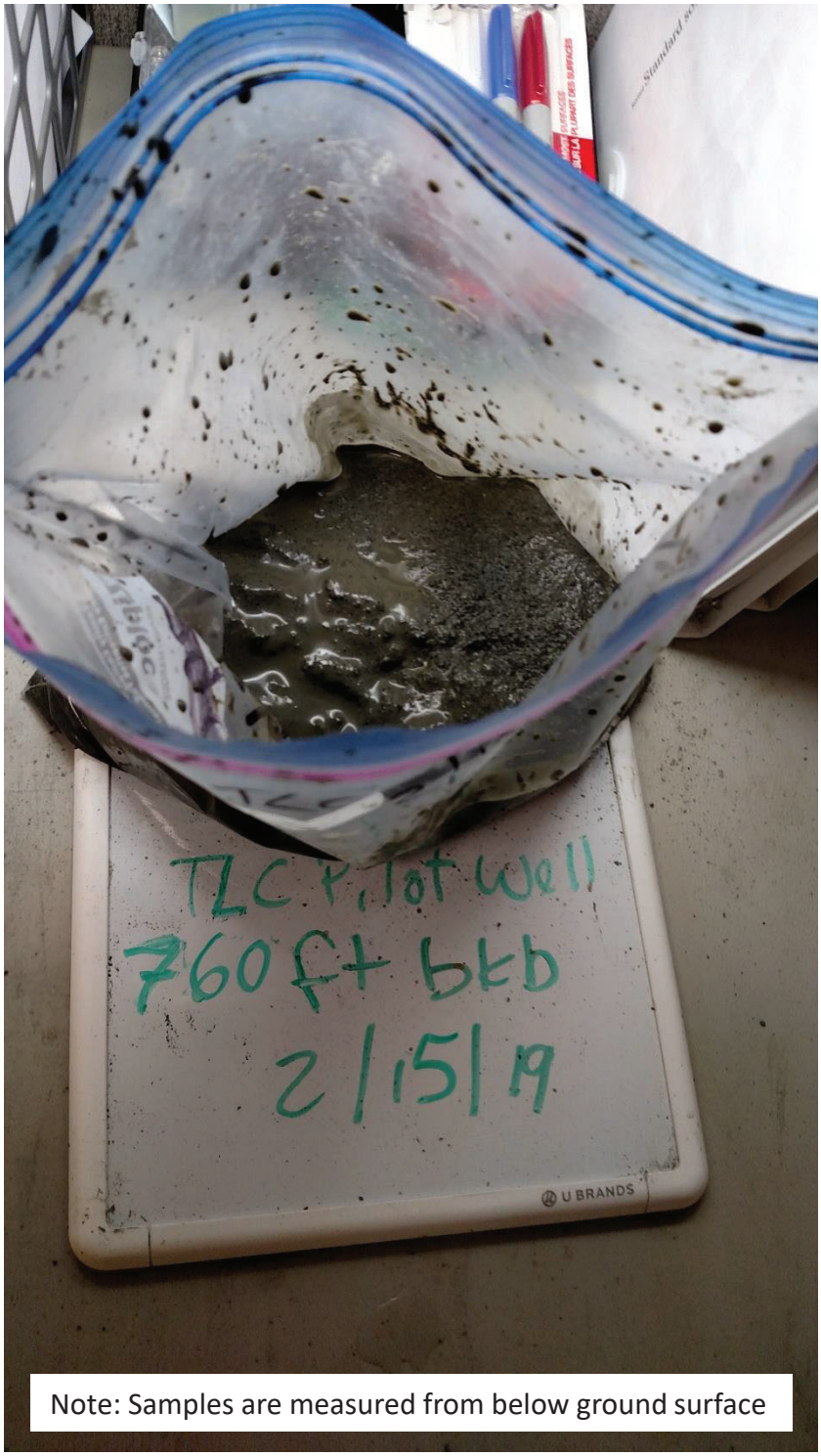
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-140
Photograph of sample TLC Pilot Well 755 ft

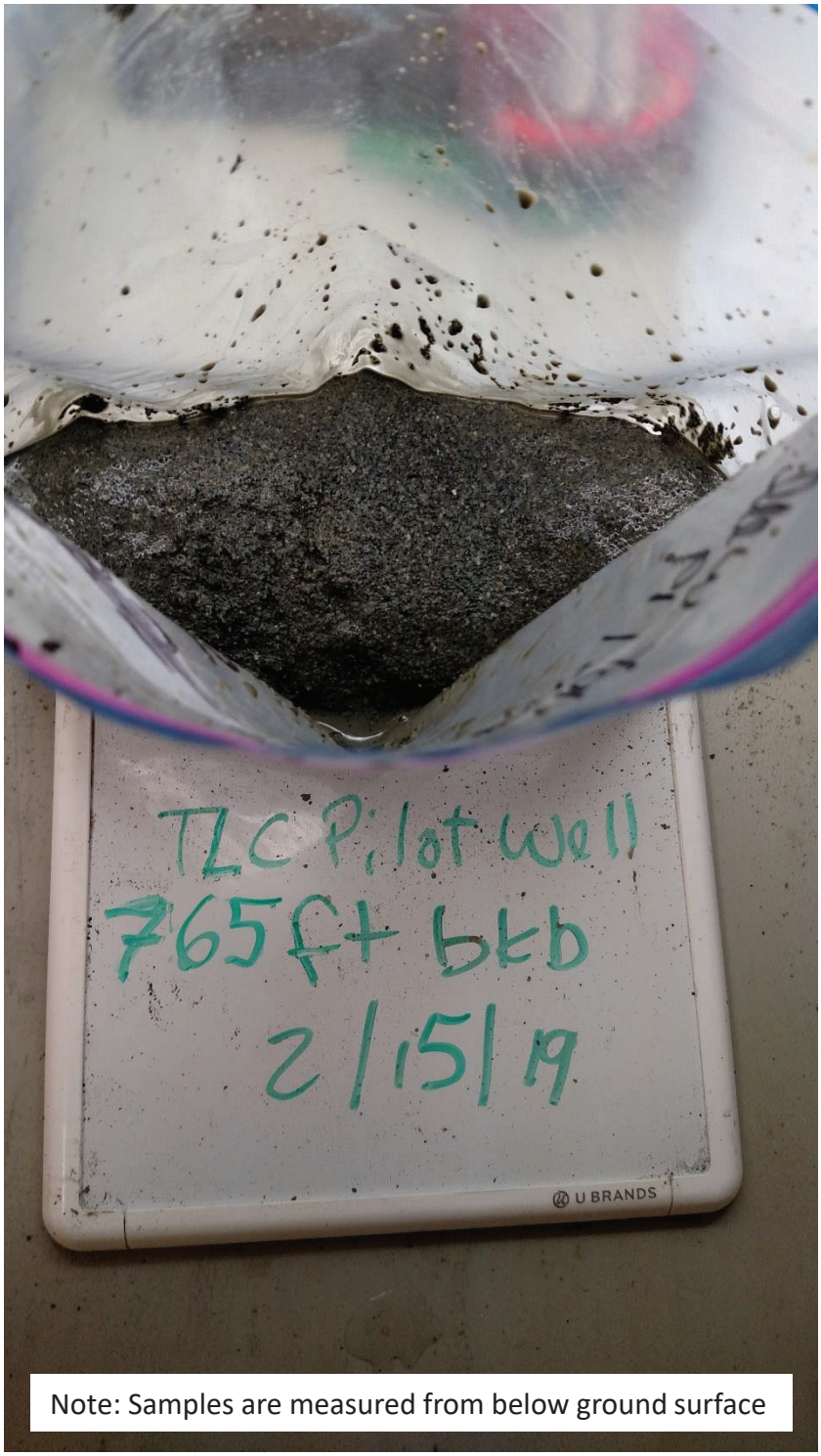
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-141
Photograph of sample TLC Pilot Well 760 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-142
Photograph of sample TLC Pilot Well 765 ft

Brown AND Caldwell

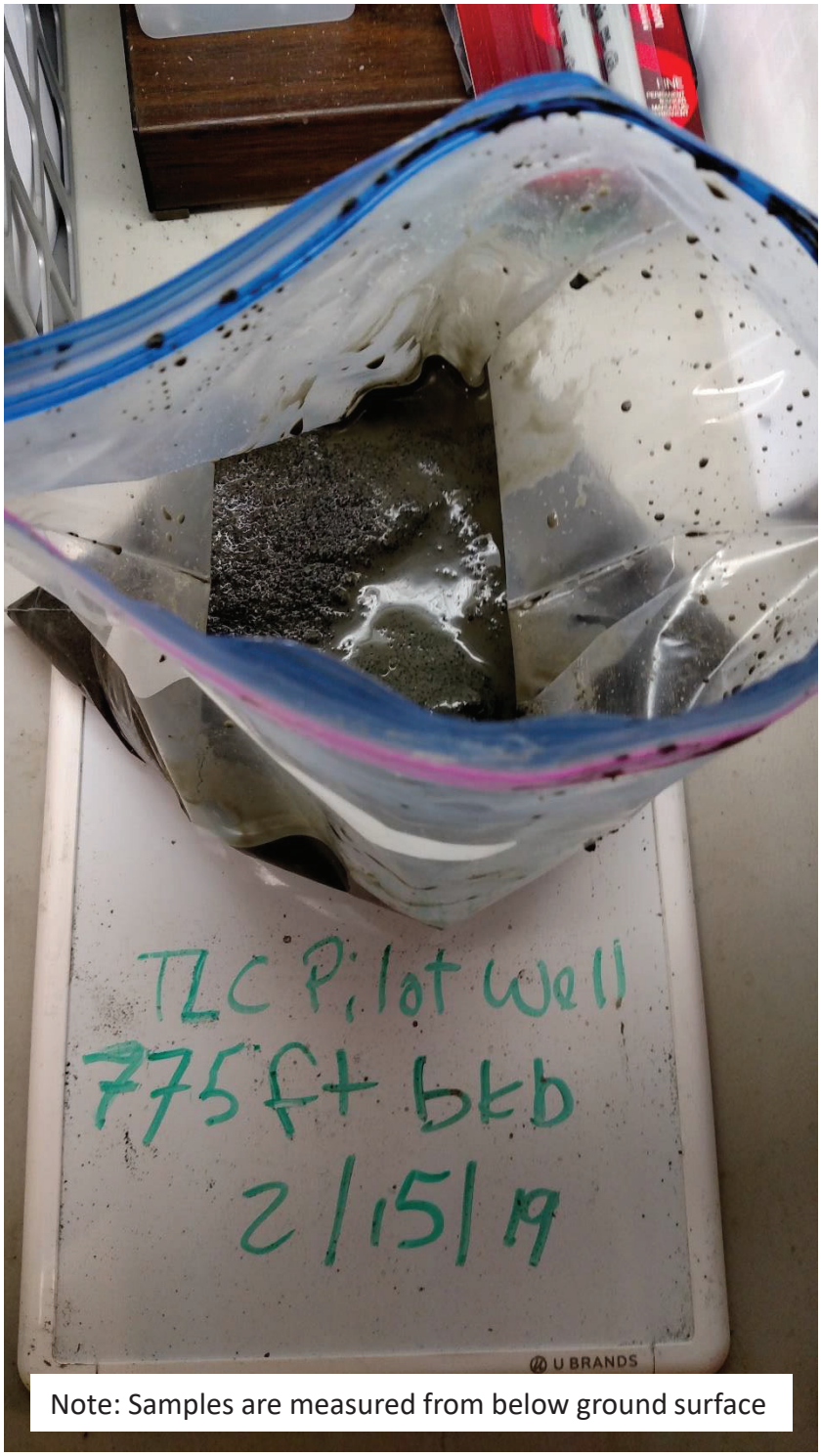
Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Figure C-143
Photograph of sample TLC Pilot Well 770 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

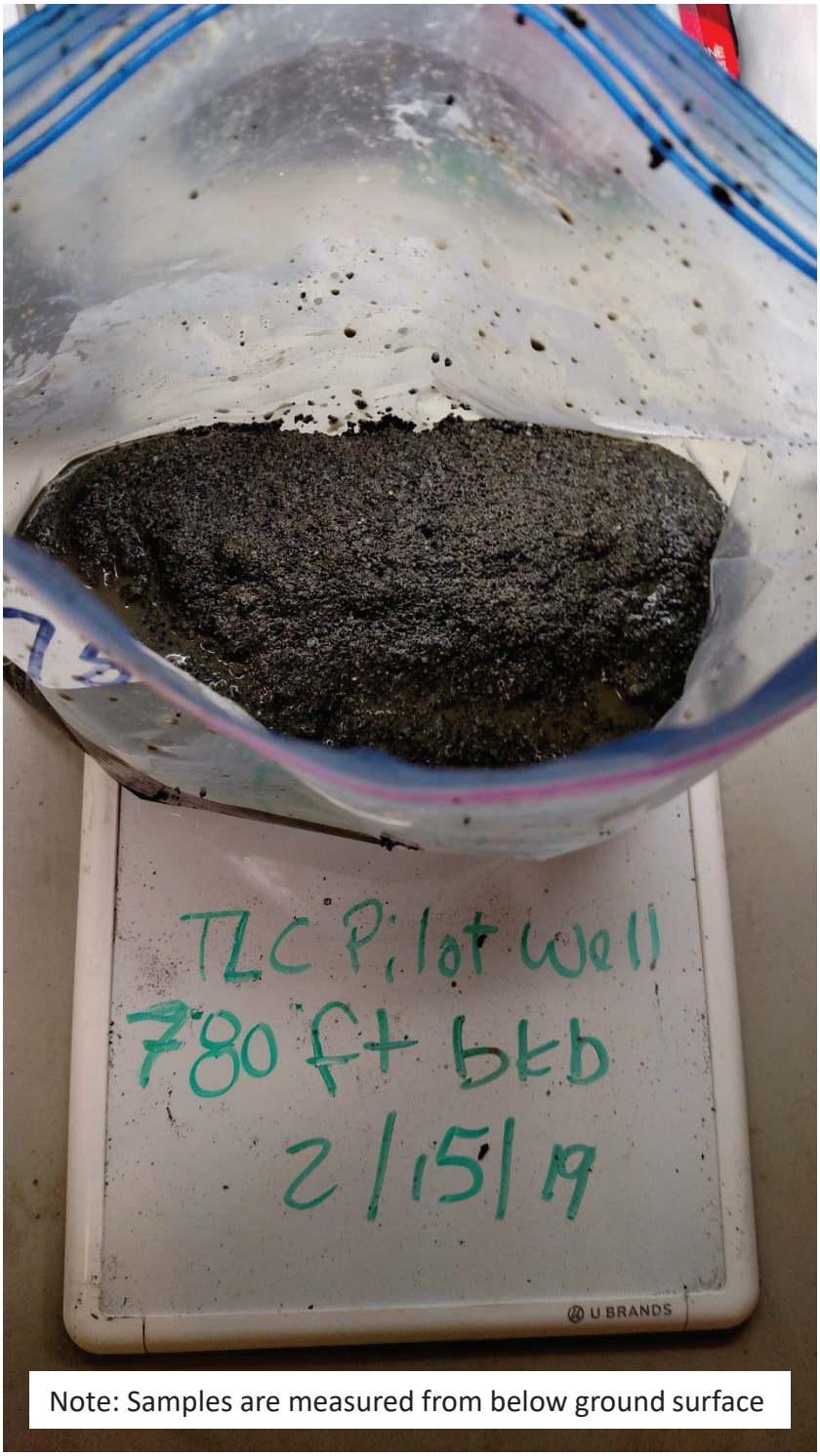


Note: Samples are measured from below ground surface

Figure C-144
Photograph of sample TLC Pilot Well 775 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

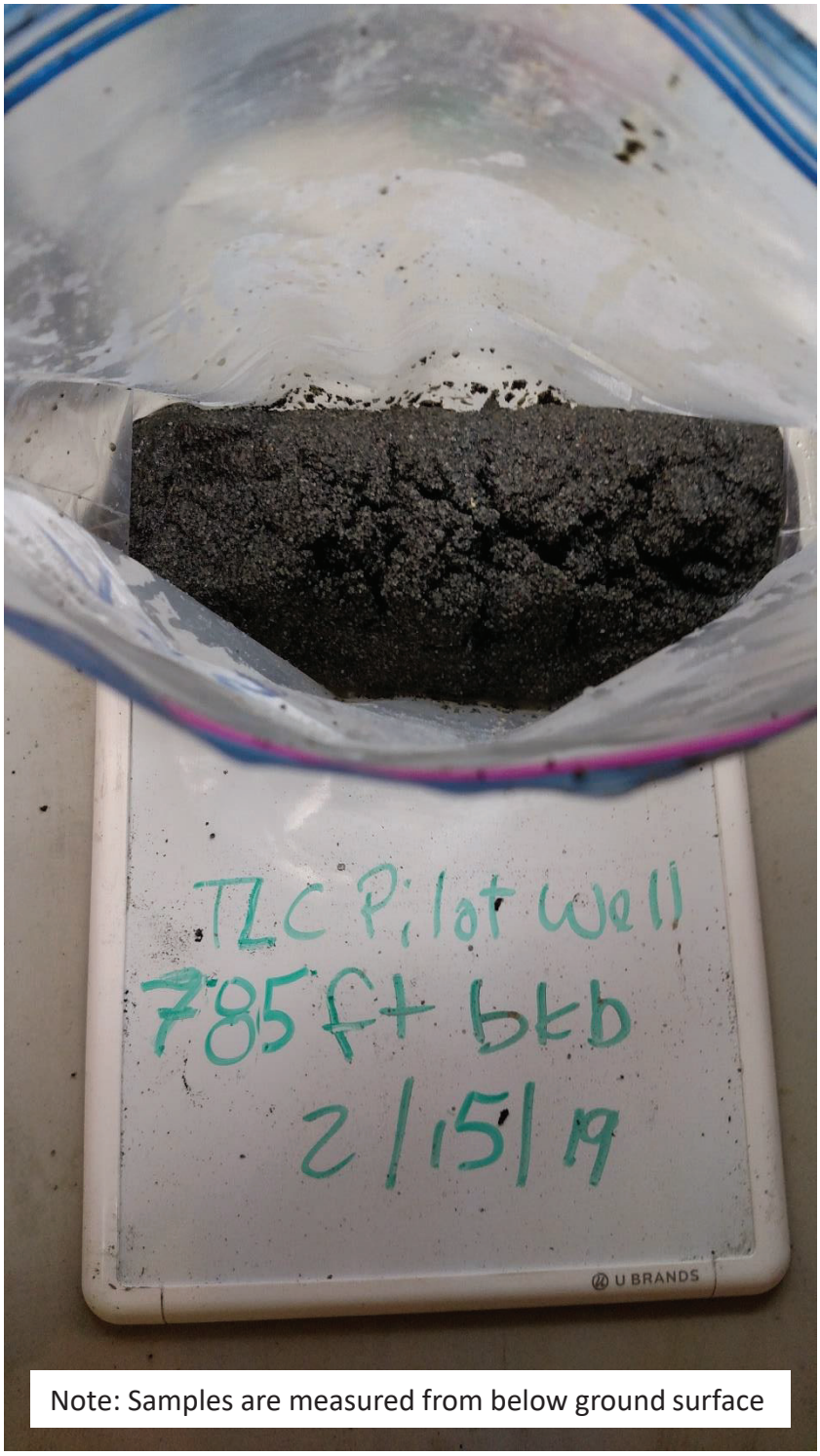


Note: Samples are measured from below ground surface

Figure C-145
Photograph of sample TLC Pilot Well 780 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-146
Photograph of sample TLC Pilot Well 785 ft

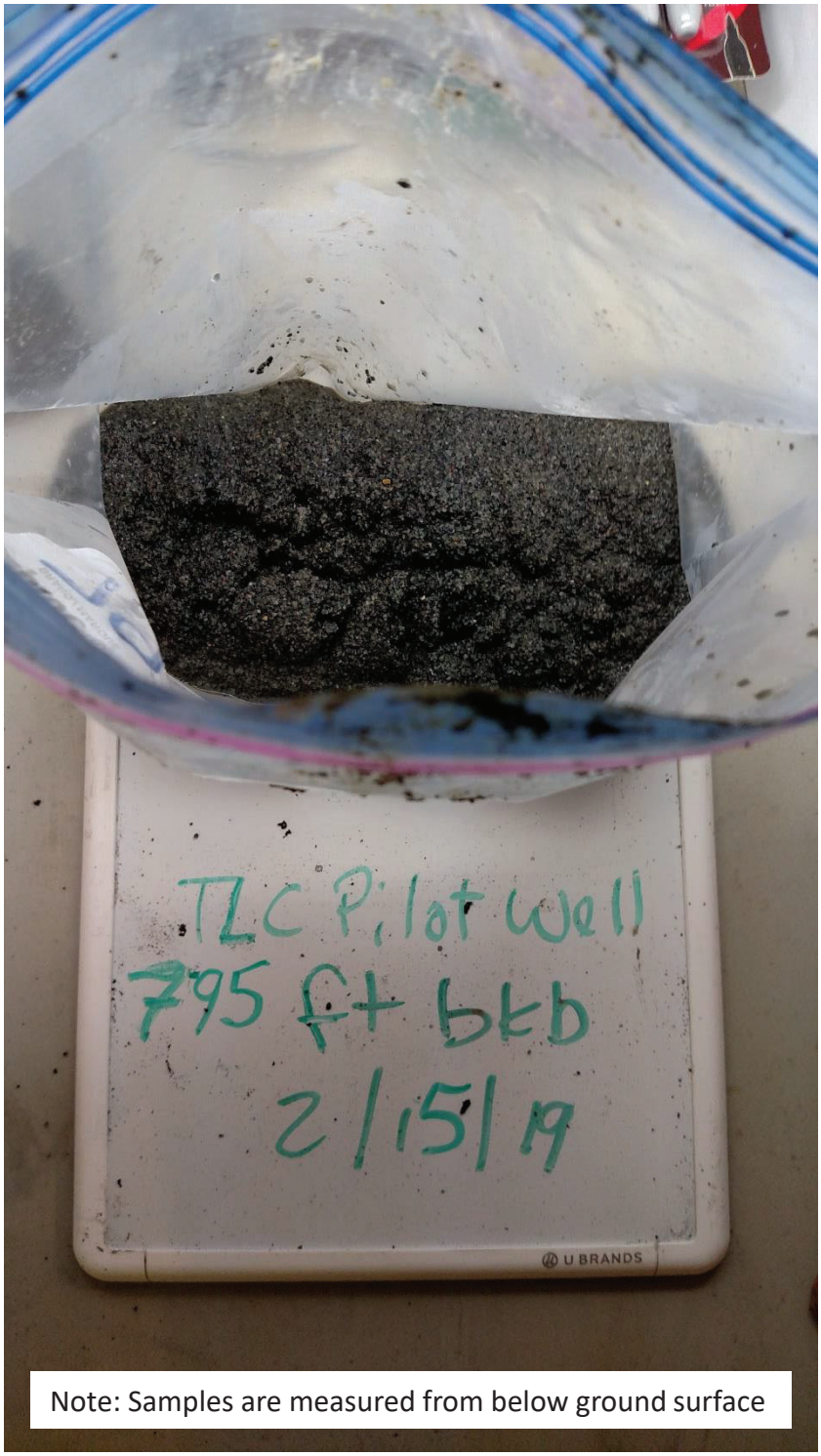
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-147
Photograph of sample TLC Pilot Well 790 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-148
Photograph of sample TLC Pilot Well 795 ft

Brown AND Caldwell

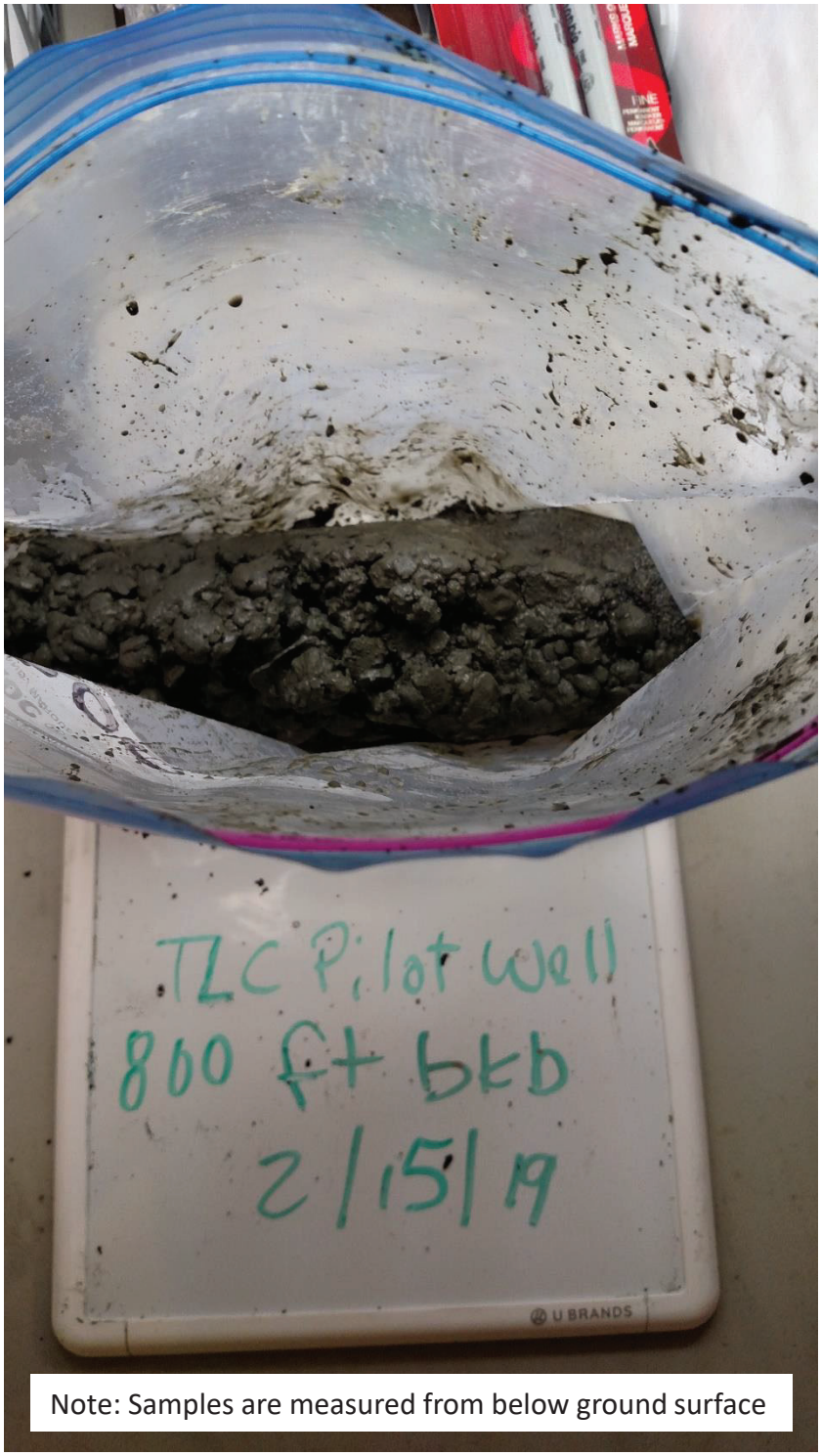


Figure C-149
Photograph of sample TLC Pilot Well 800 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

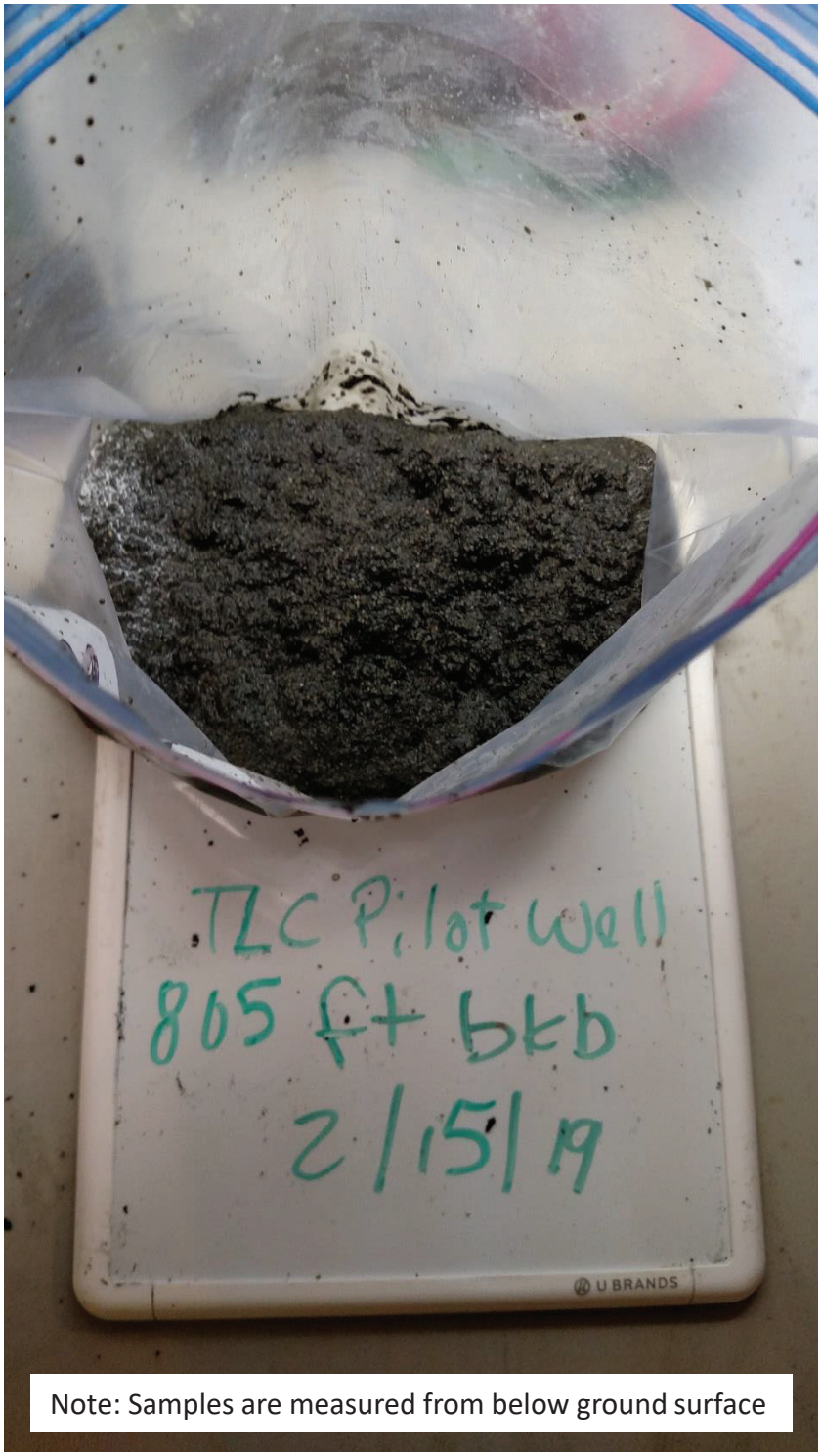
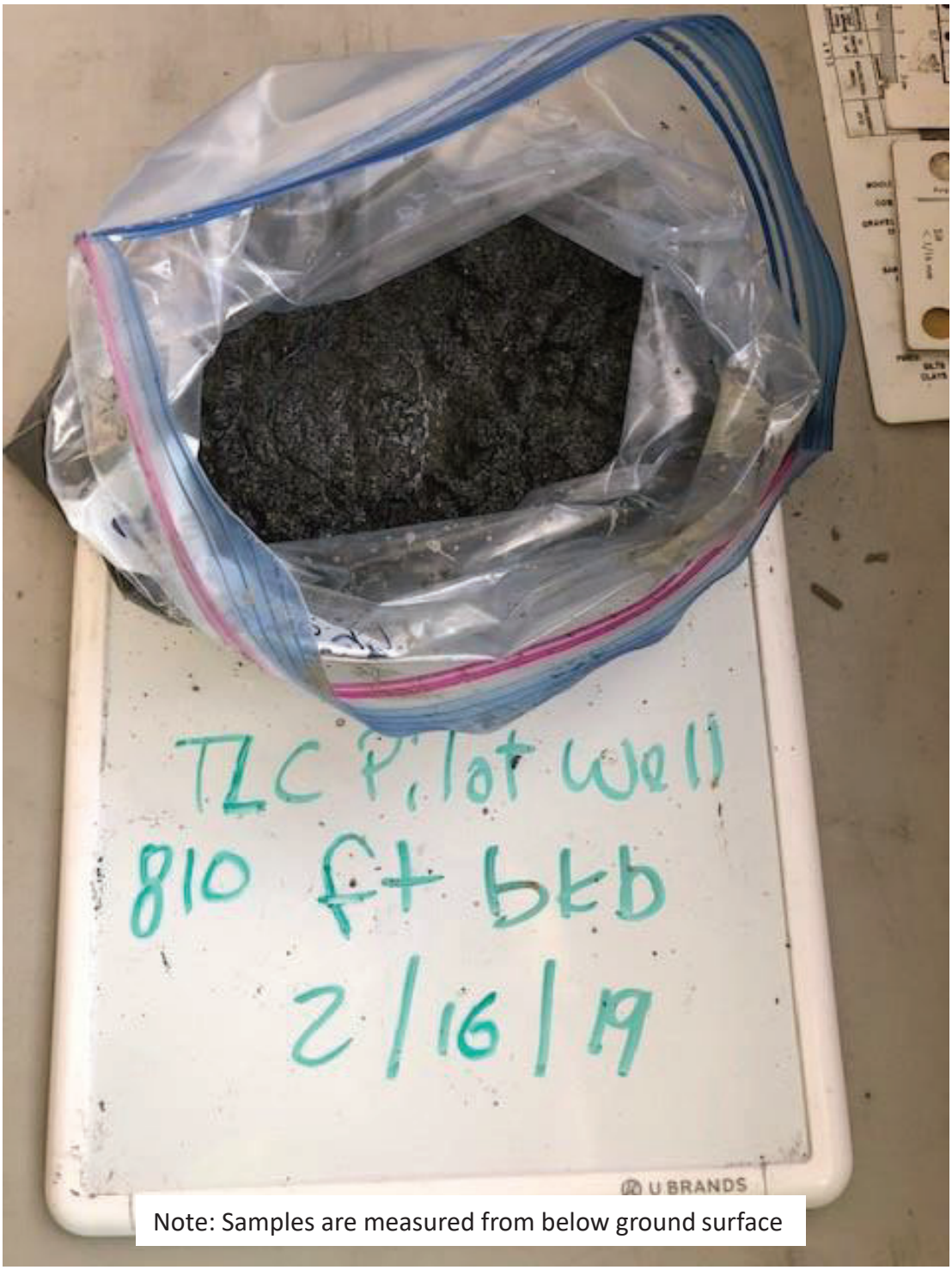


Figure C-150
Photograph of sample TLC Pilot Well 805 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-151
Photograph of sample TLC Pilot Well 810 ft

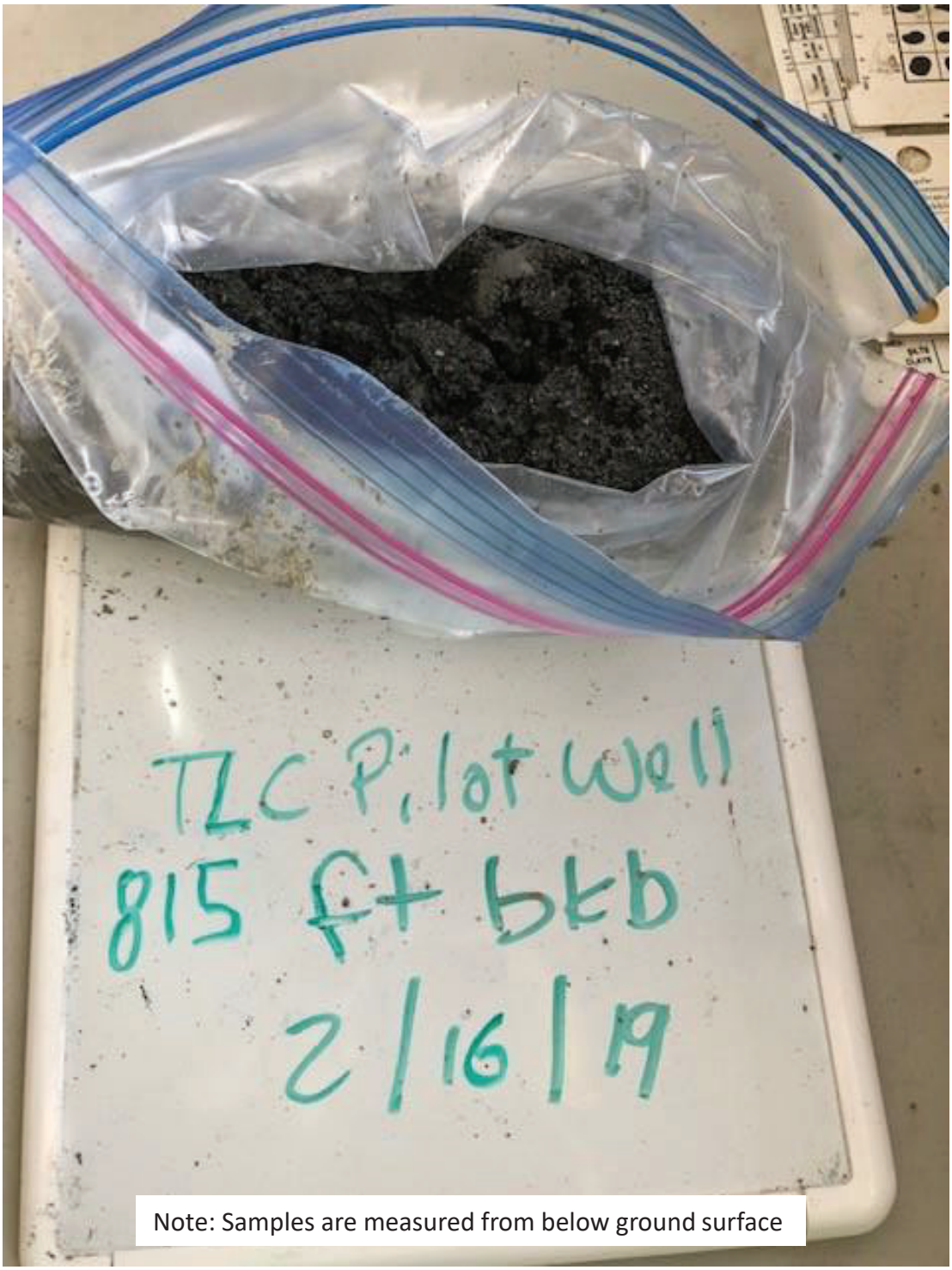
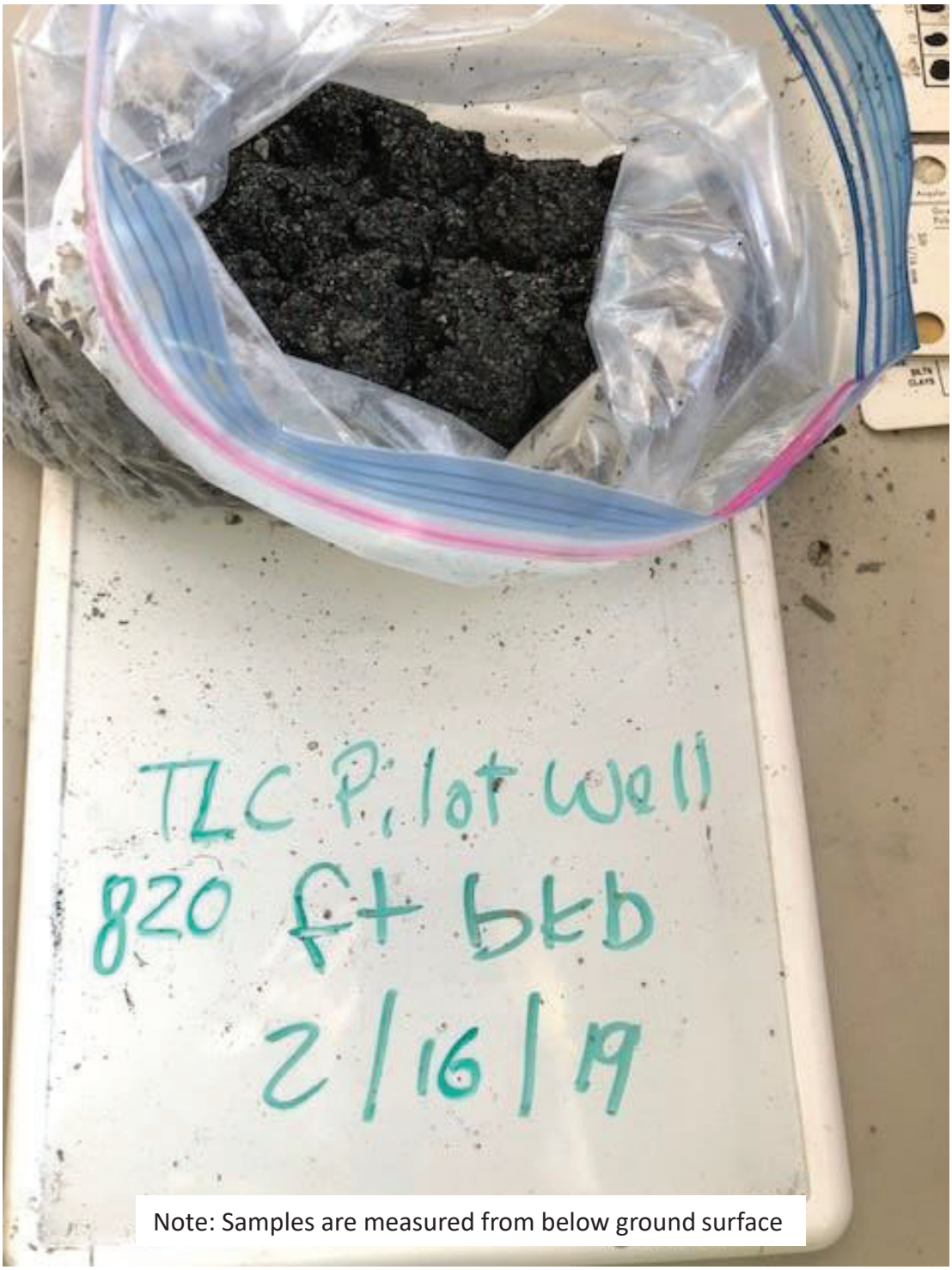


Figure C-152
Photograph of sample TLC Pilot Well 815 ft

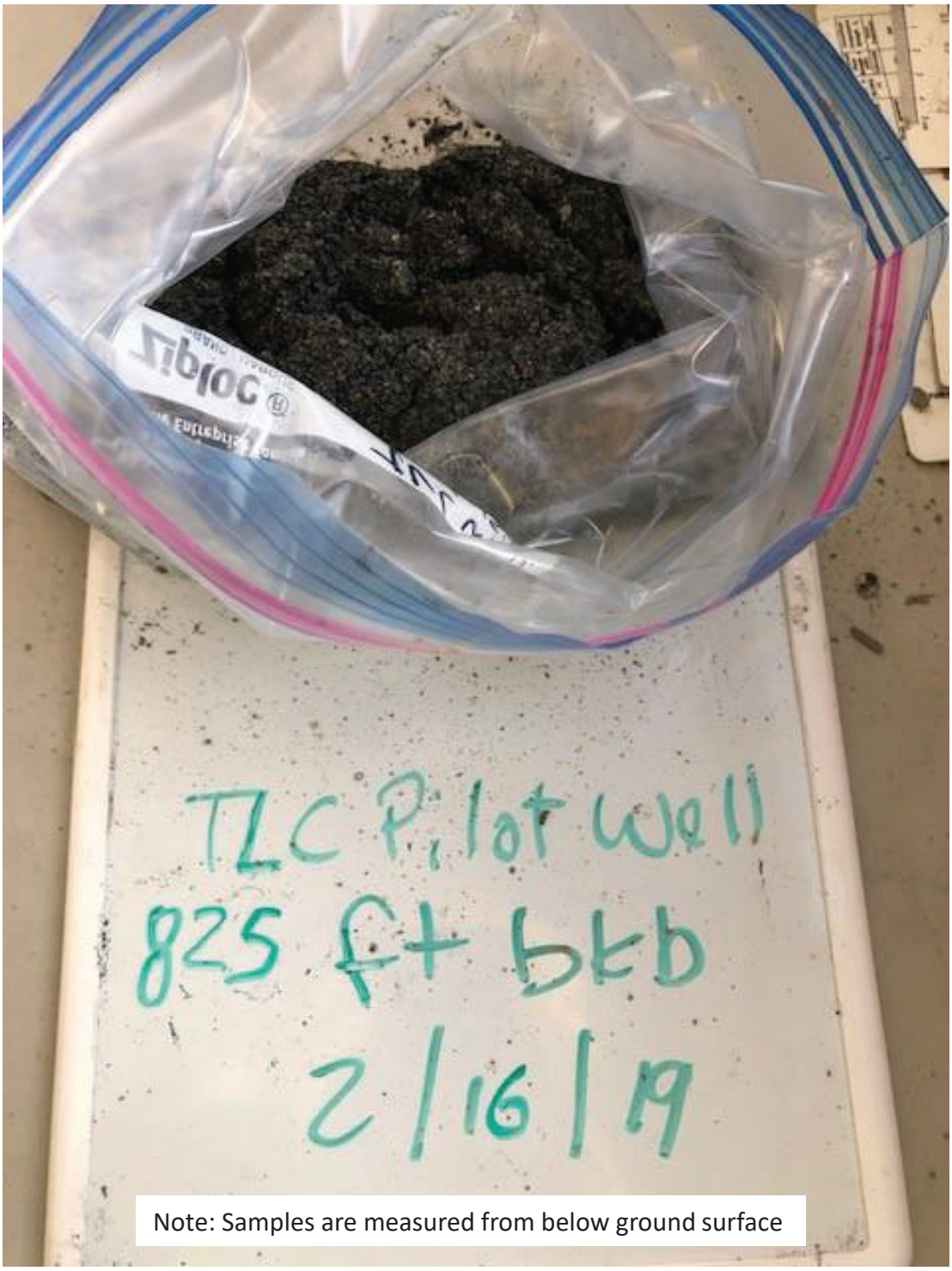
Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

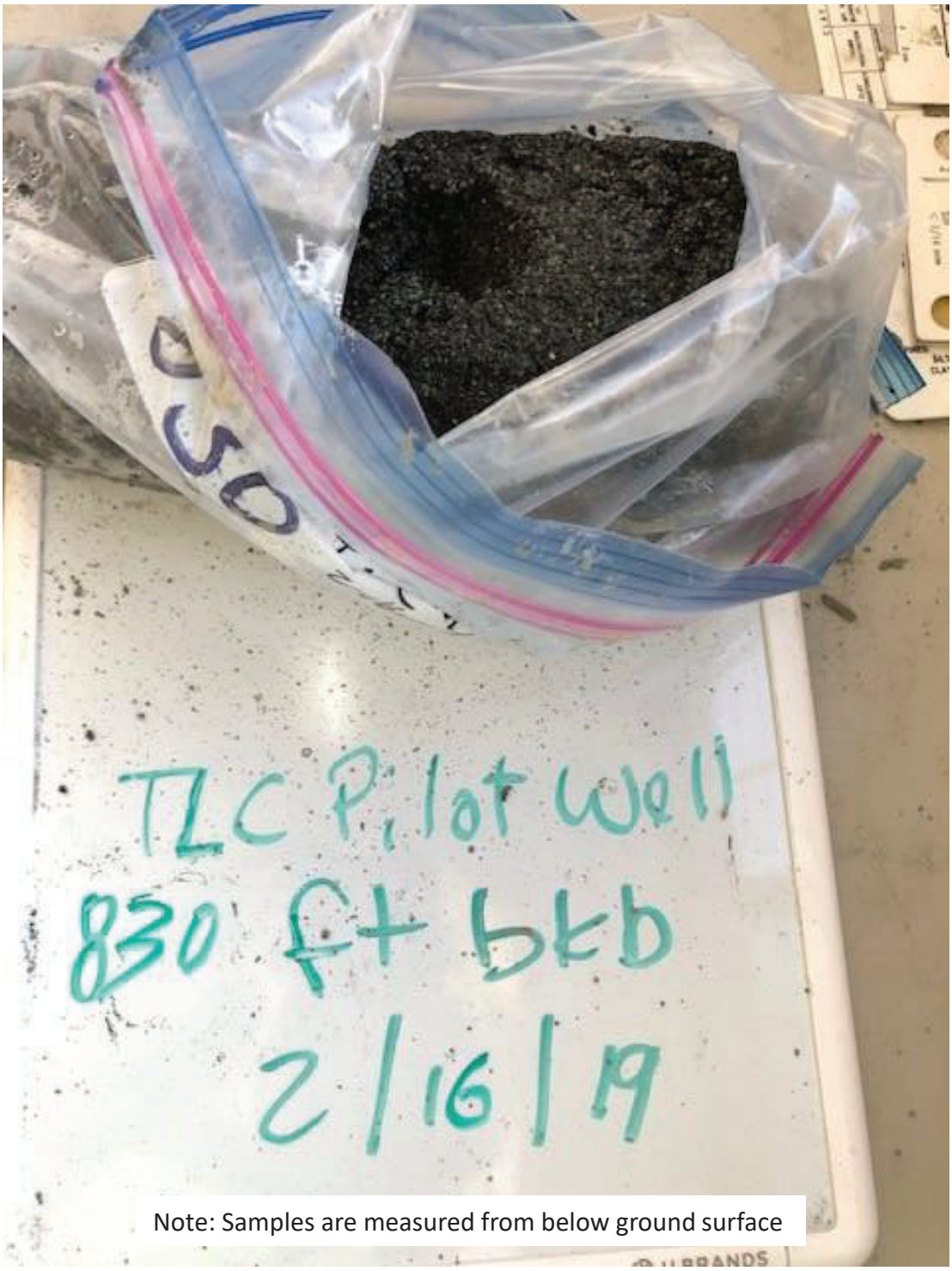
Figure C-153
Photograph of sample TLC Pilot Well 820 ft



Note: Samples are measured from below ground surface

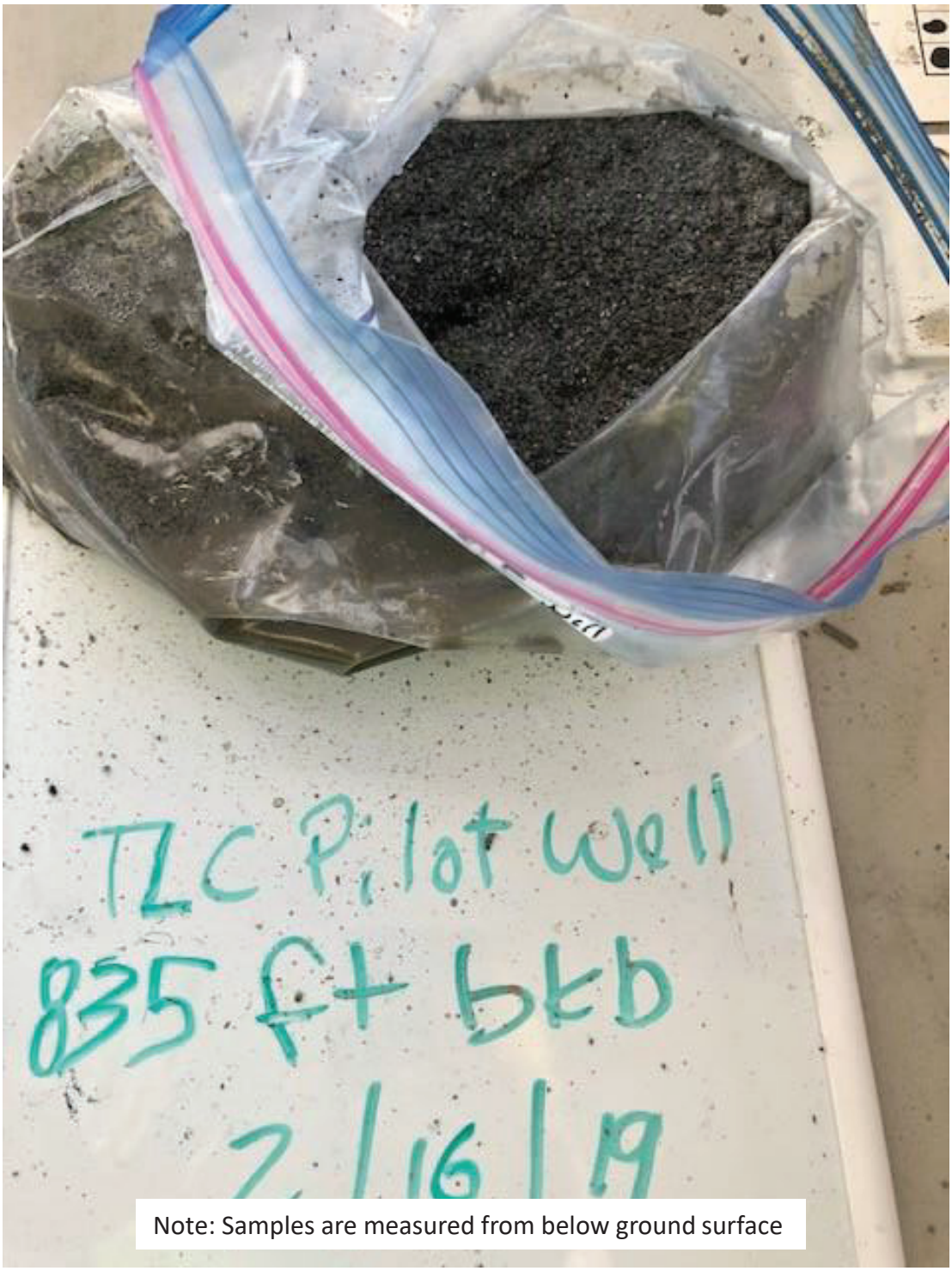
Figure C-154
Photograph of sample TLC Pilot Well 825 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

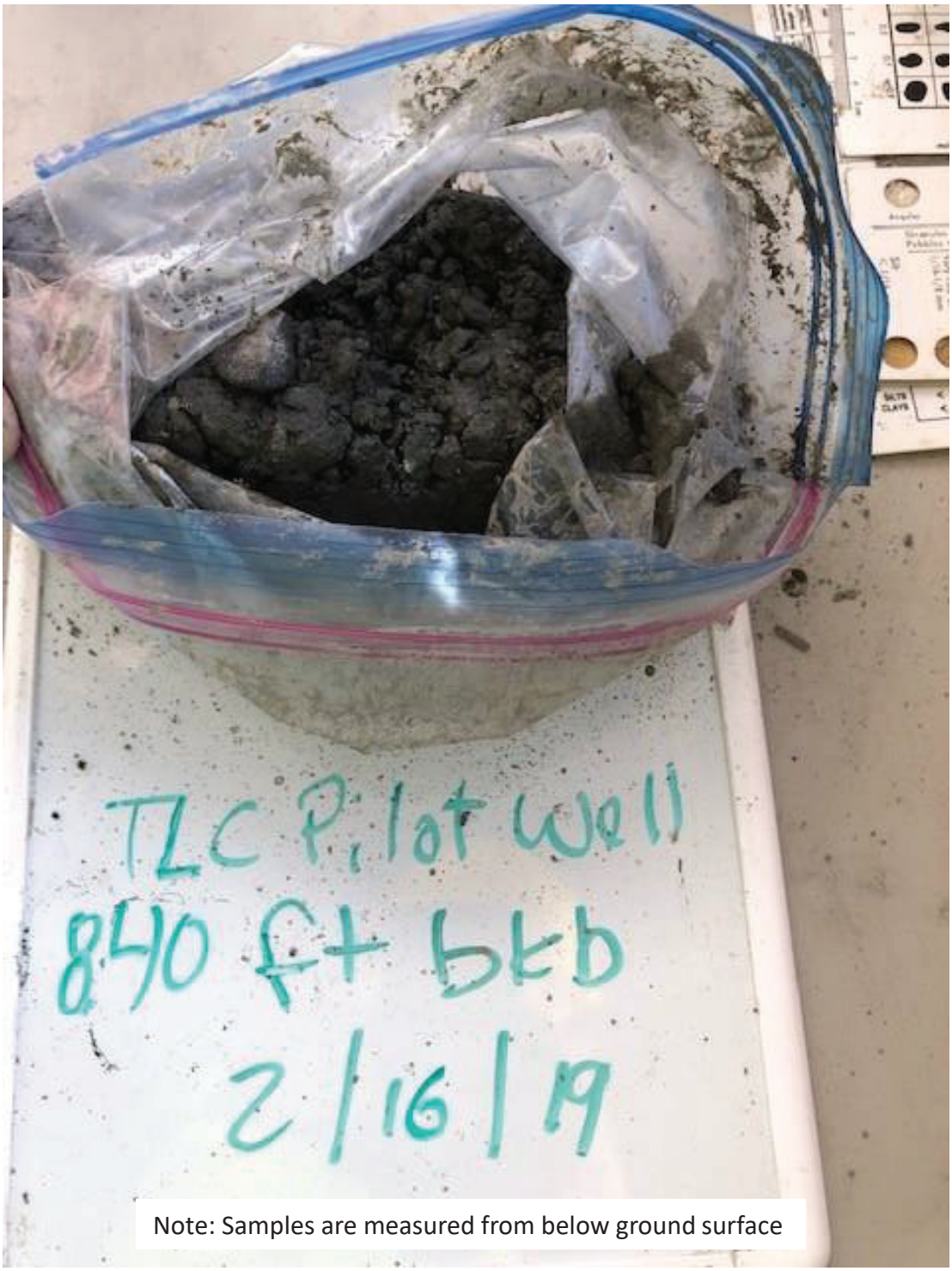
Figure C-155
Photograph of sample TLC Pilot Well 830 ft



Note: Samples are measured from below ground surface

Figure C-156
Photograph of sample TLC Pilot Well 835 ft

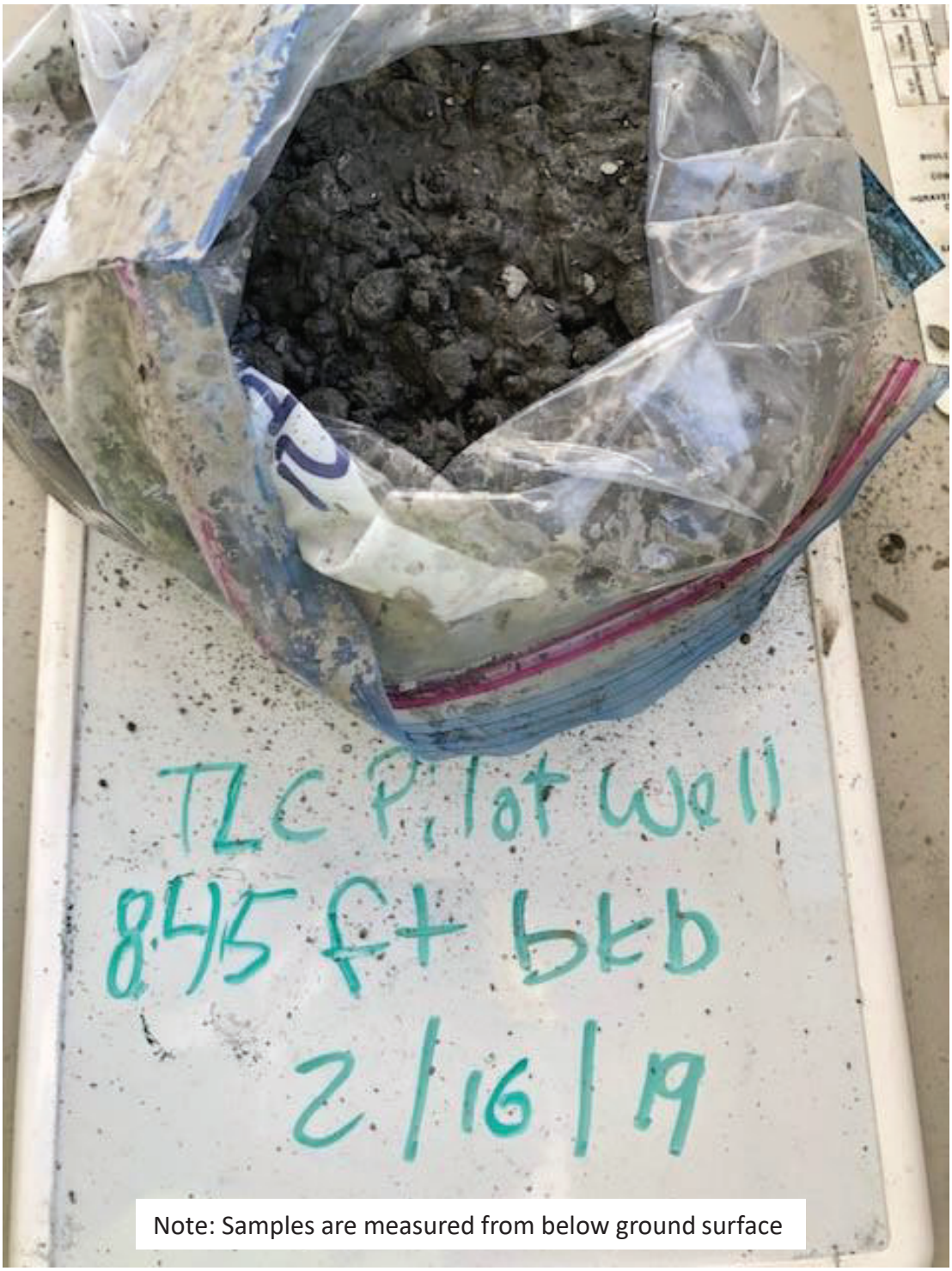
Brown AND Caldwell



Note: Samples are measured from below ground surface

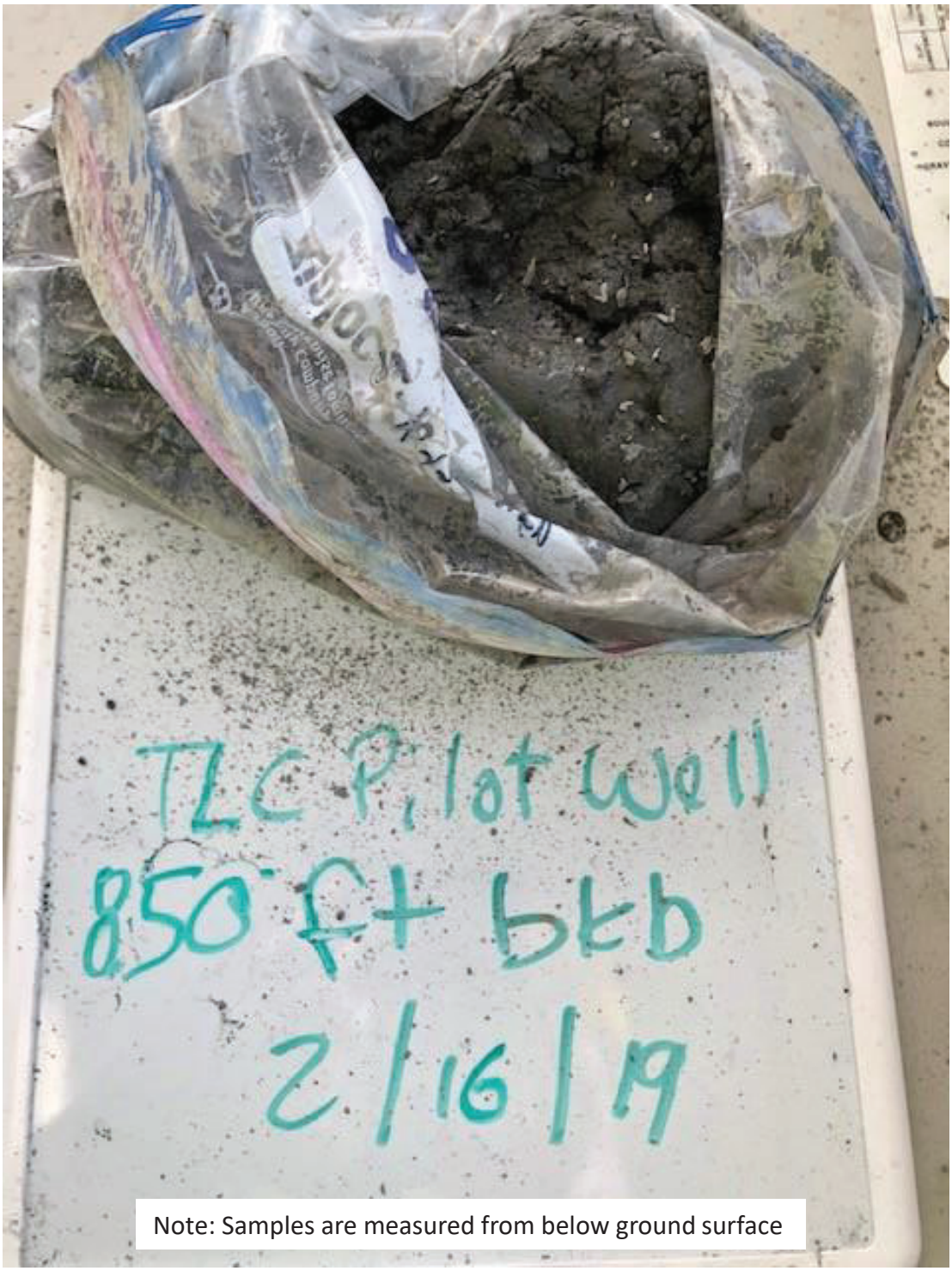
Figure C-157
Photograph of sample TLC Pilot Well 840 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

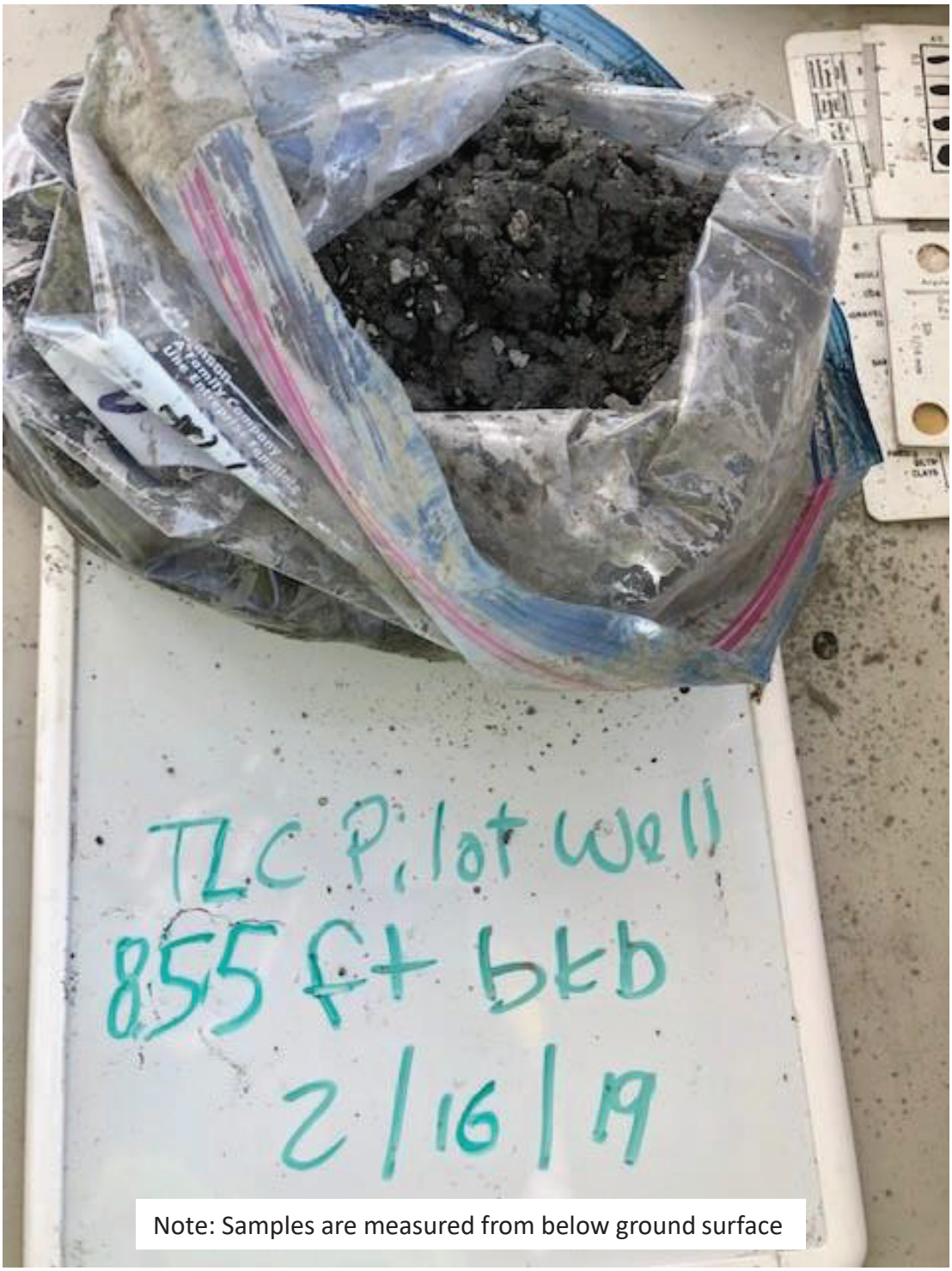
Figure C-158
Photograph of sample TLC Pilot Well 845 ft



Note: Samples are measured from below ground surface

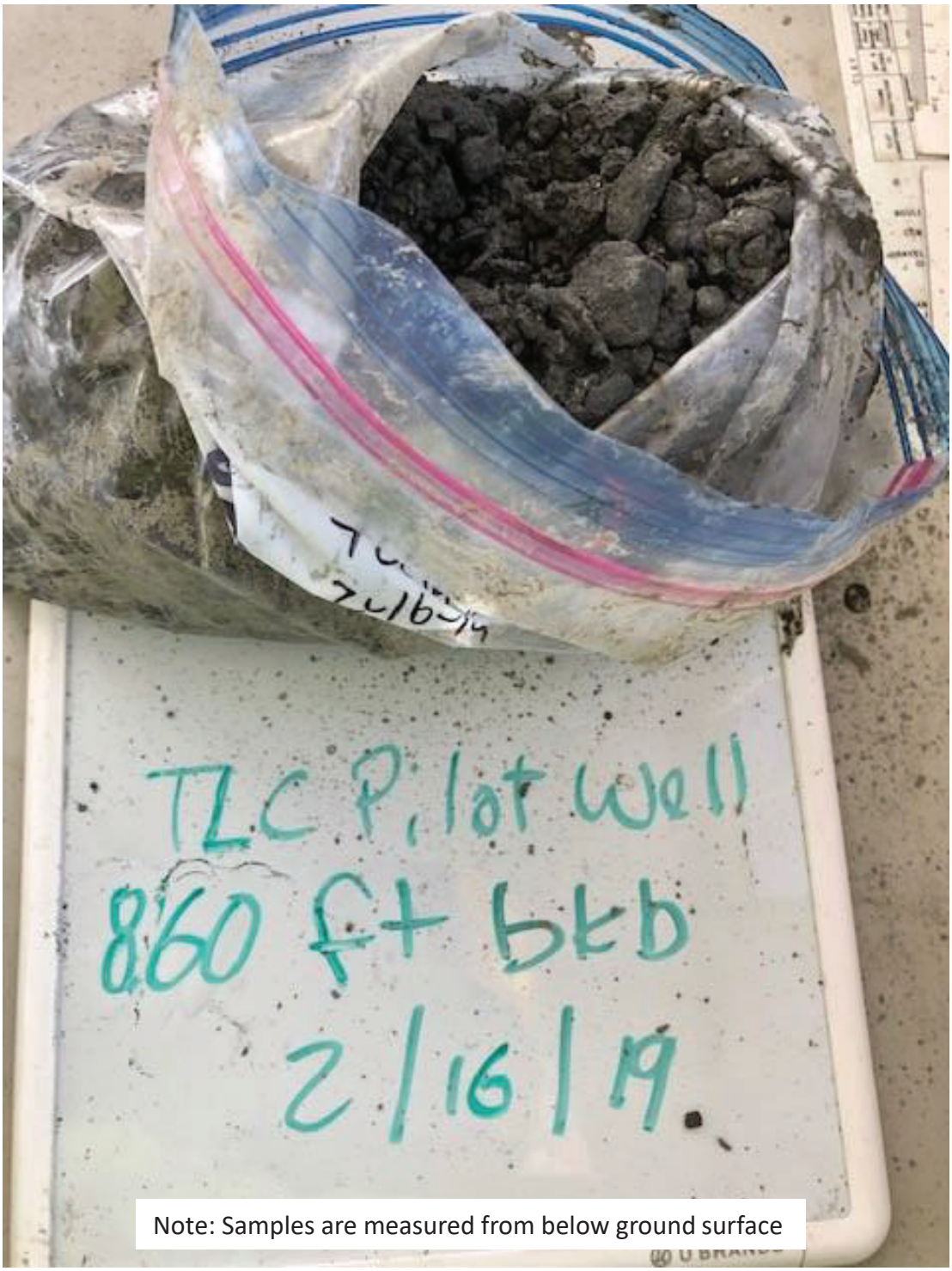
Figure C-159
Photograph of sample TLC Pilot Well 850 ft

Brown AND Caldwell



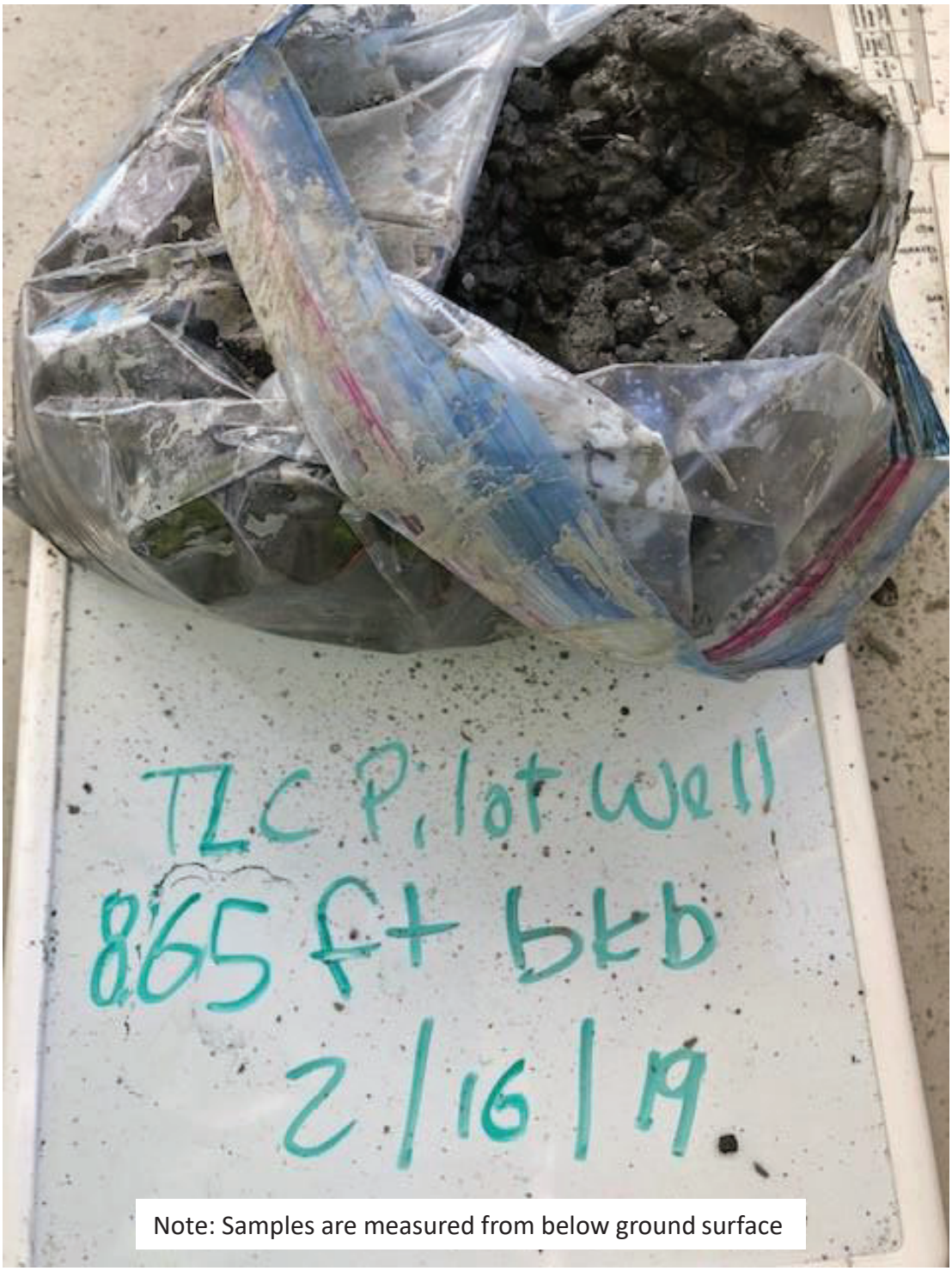
Note: Samples are measured from below ground surface

Figure C-160
Photograph of sample TLC Pilot Well 855 ft



Note: Samples are measured from below ground surface

Figure C-161
Photograph of sample TLC Pilot Well 860 ft



Note: Samples are measured from below ground surface

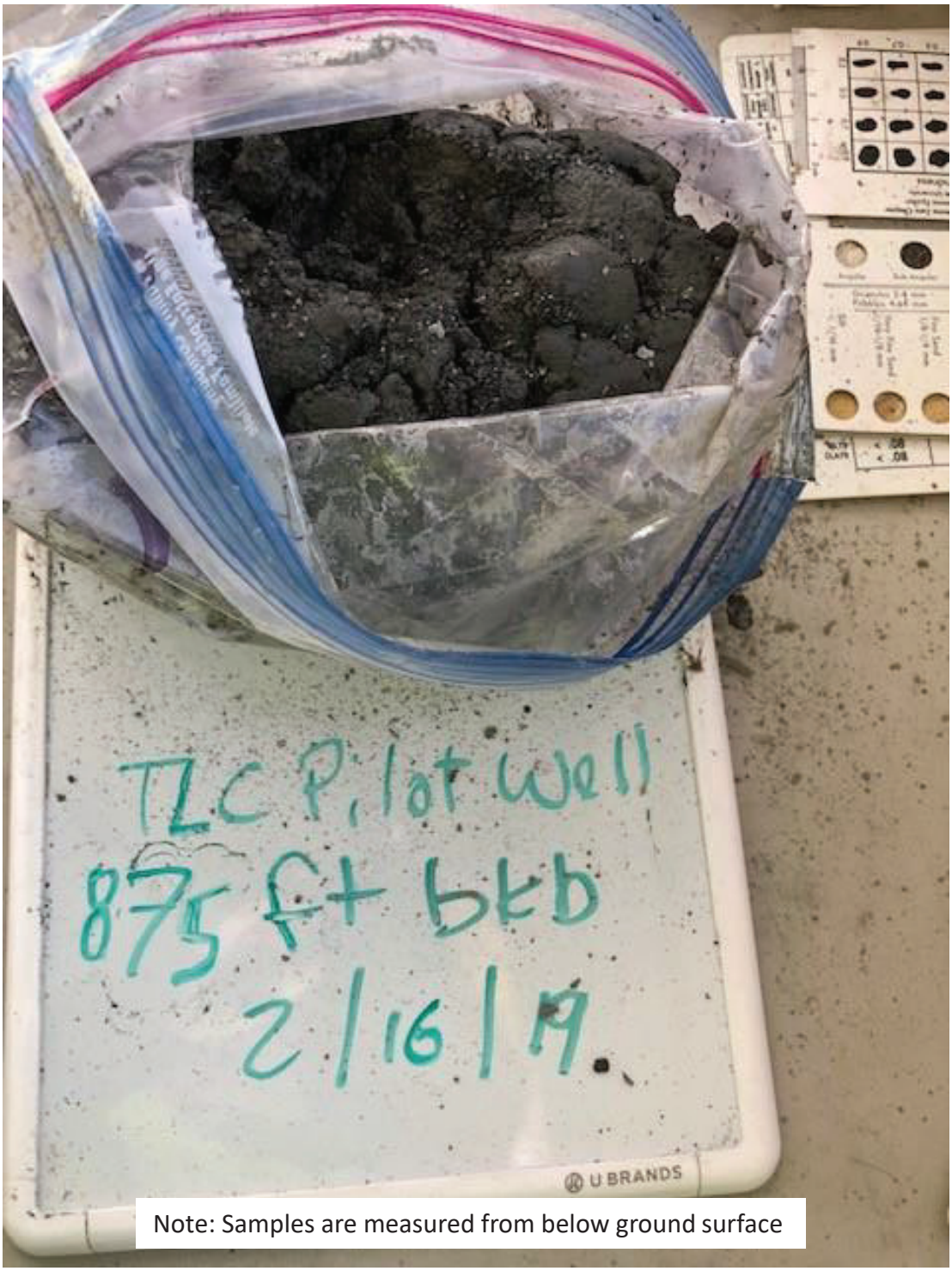
Figure C-162
Photograph of sample TLC Pilot Well 865 ft



Note: Samples are measured from below ground surface

Figure C-163
Photograph of sample TLC Pilot Well 870 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

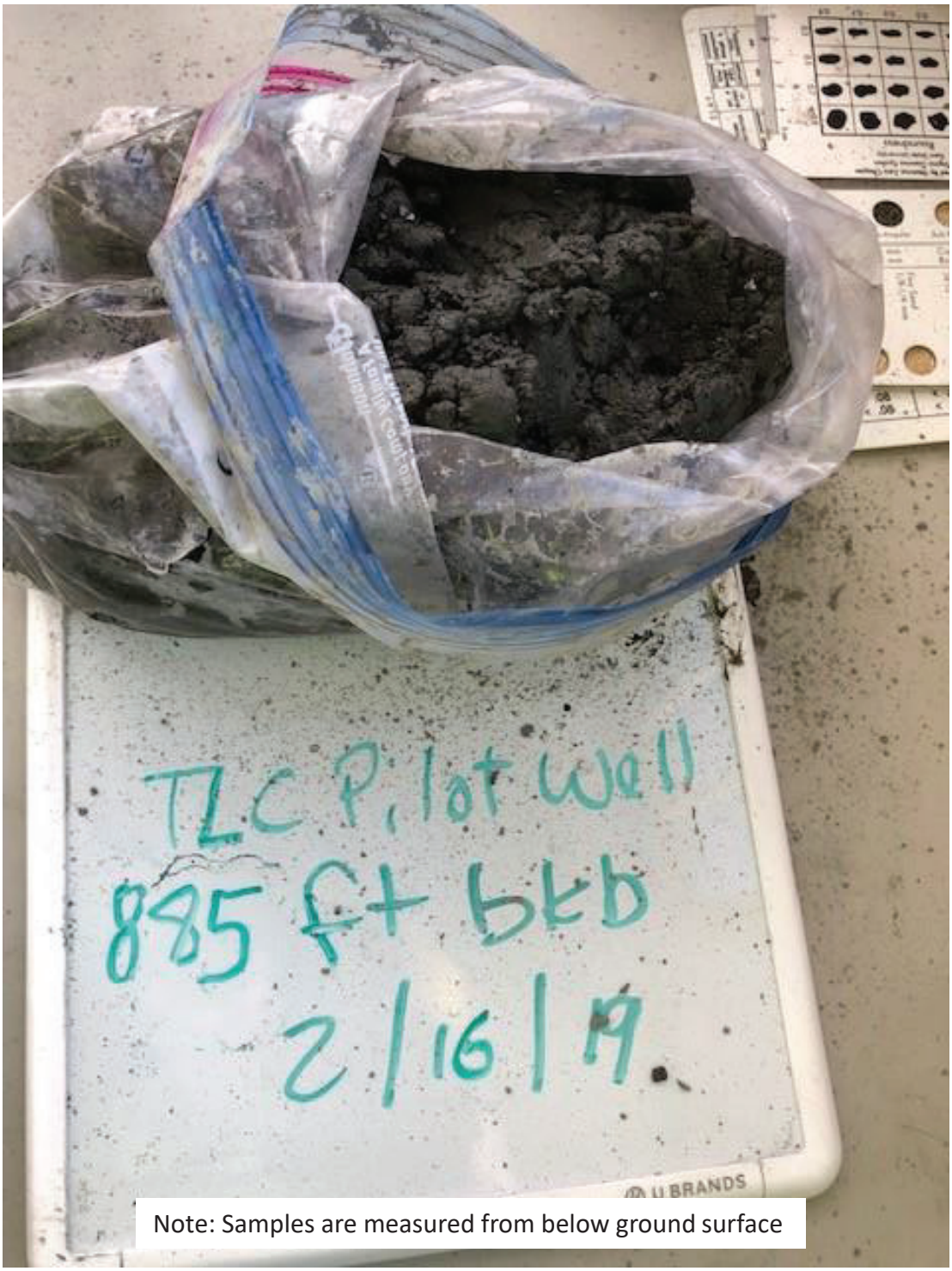
Figure C-164
Photograph of sample TLC Pilot Well 875 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-165
Photograph of sample TLC Pilot Well 880 ft



Note: Samples are measured from below ground surface

Figure C-166
Photograph of sample TLC Pilot Well 885 ft

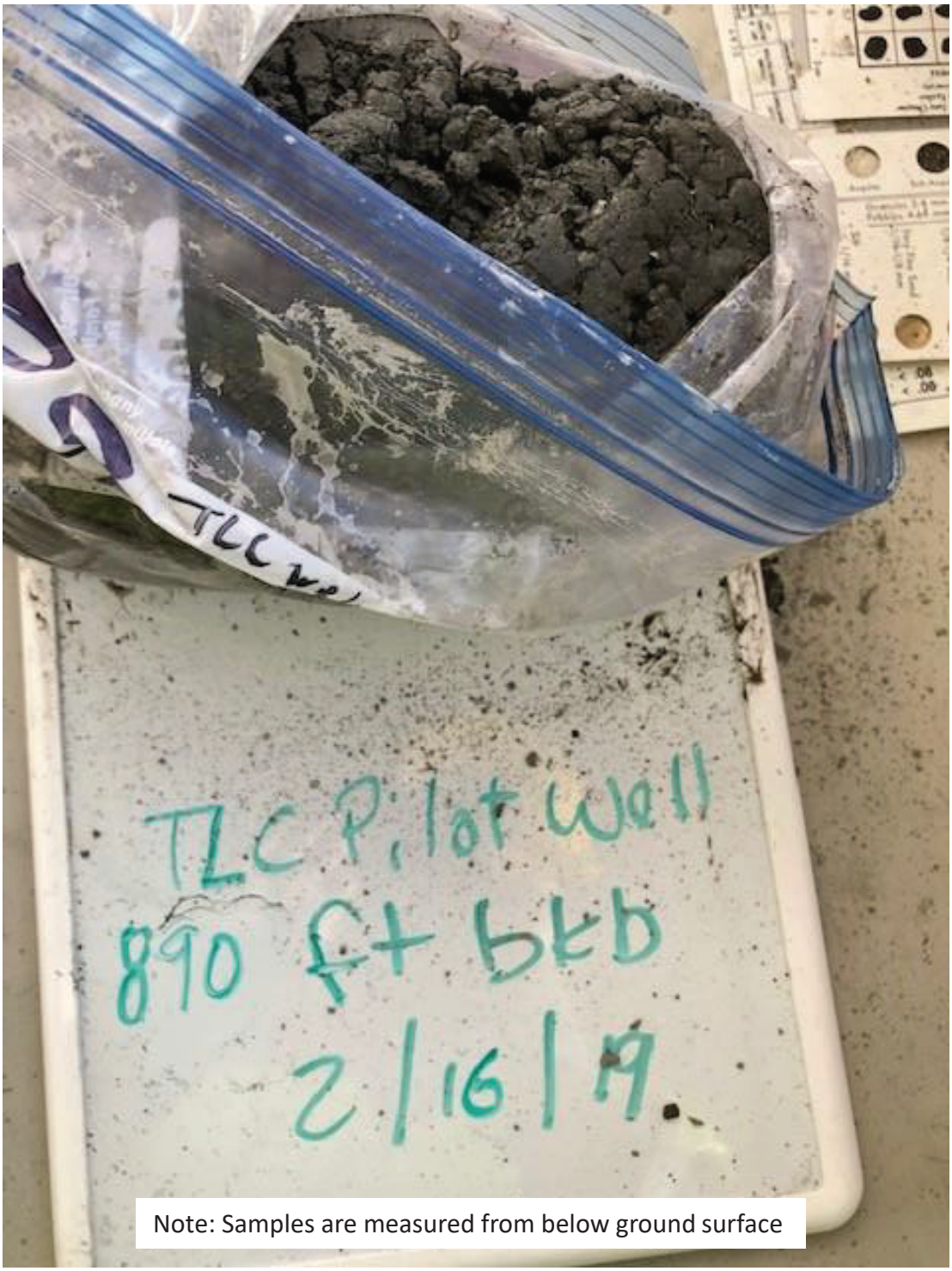
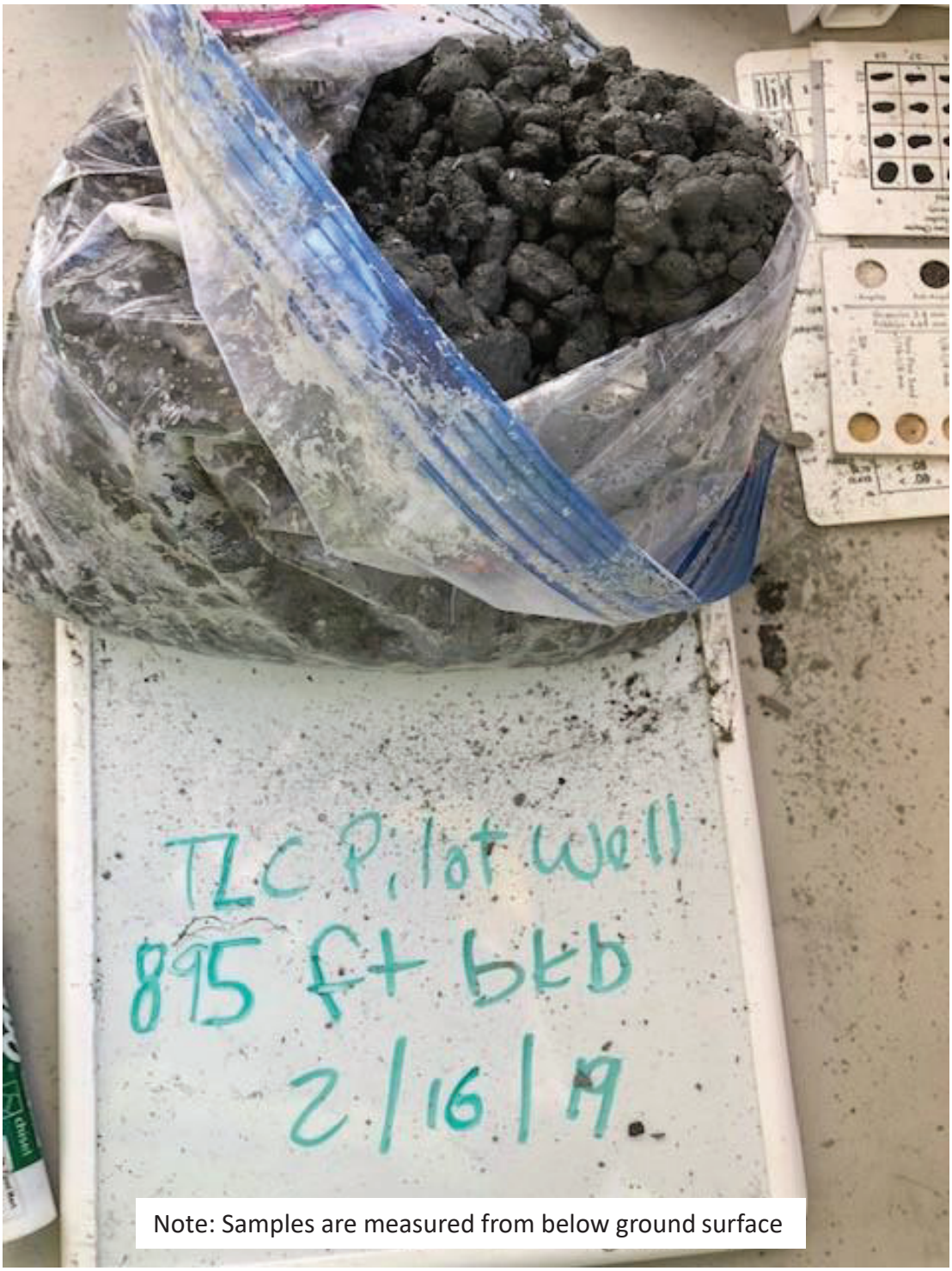


Figure C-167
Photograph of sample TLC Pilot Well 890 ft

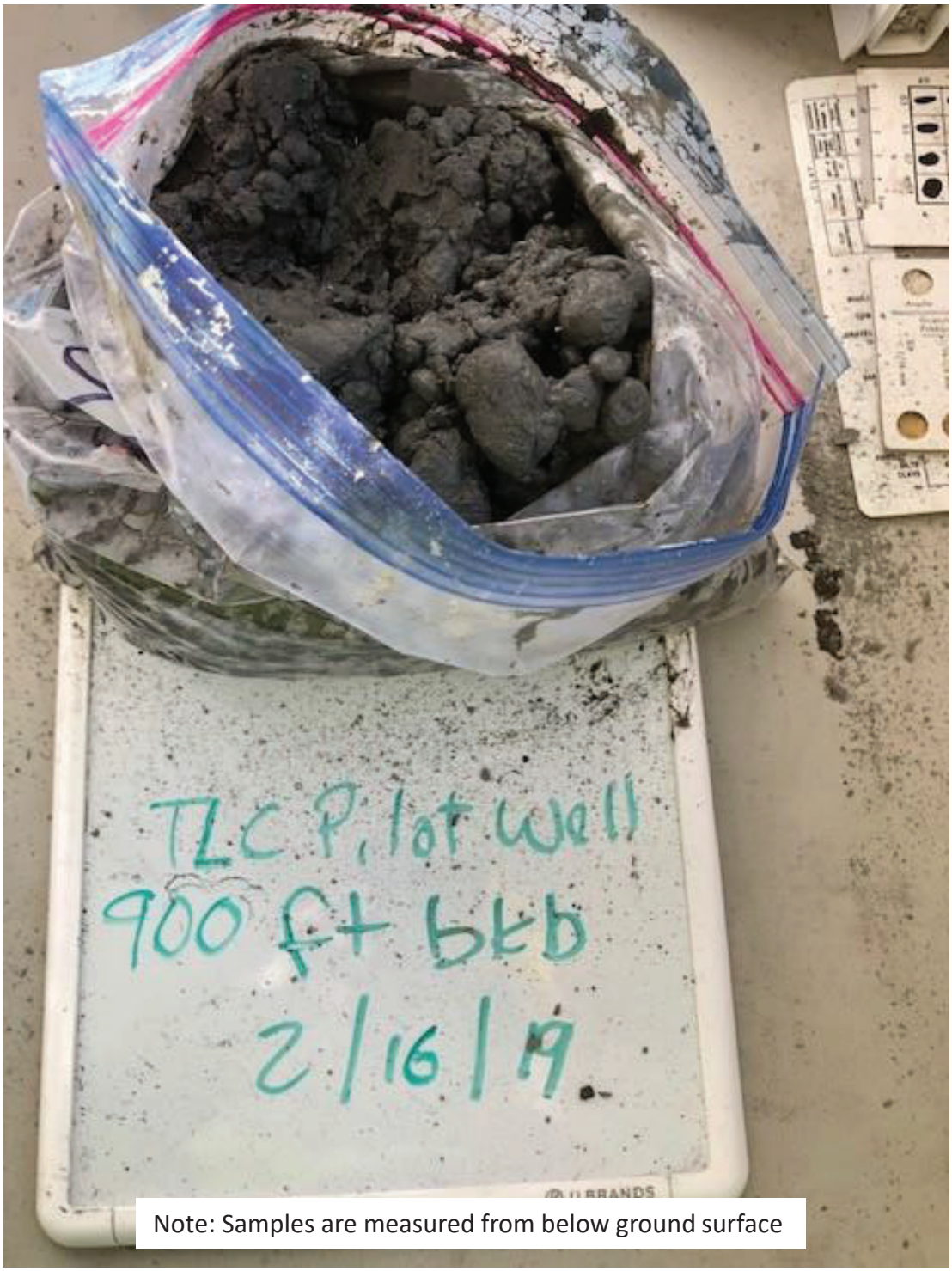
Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

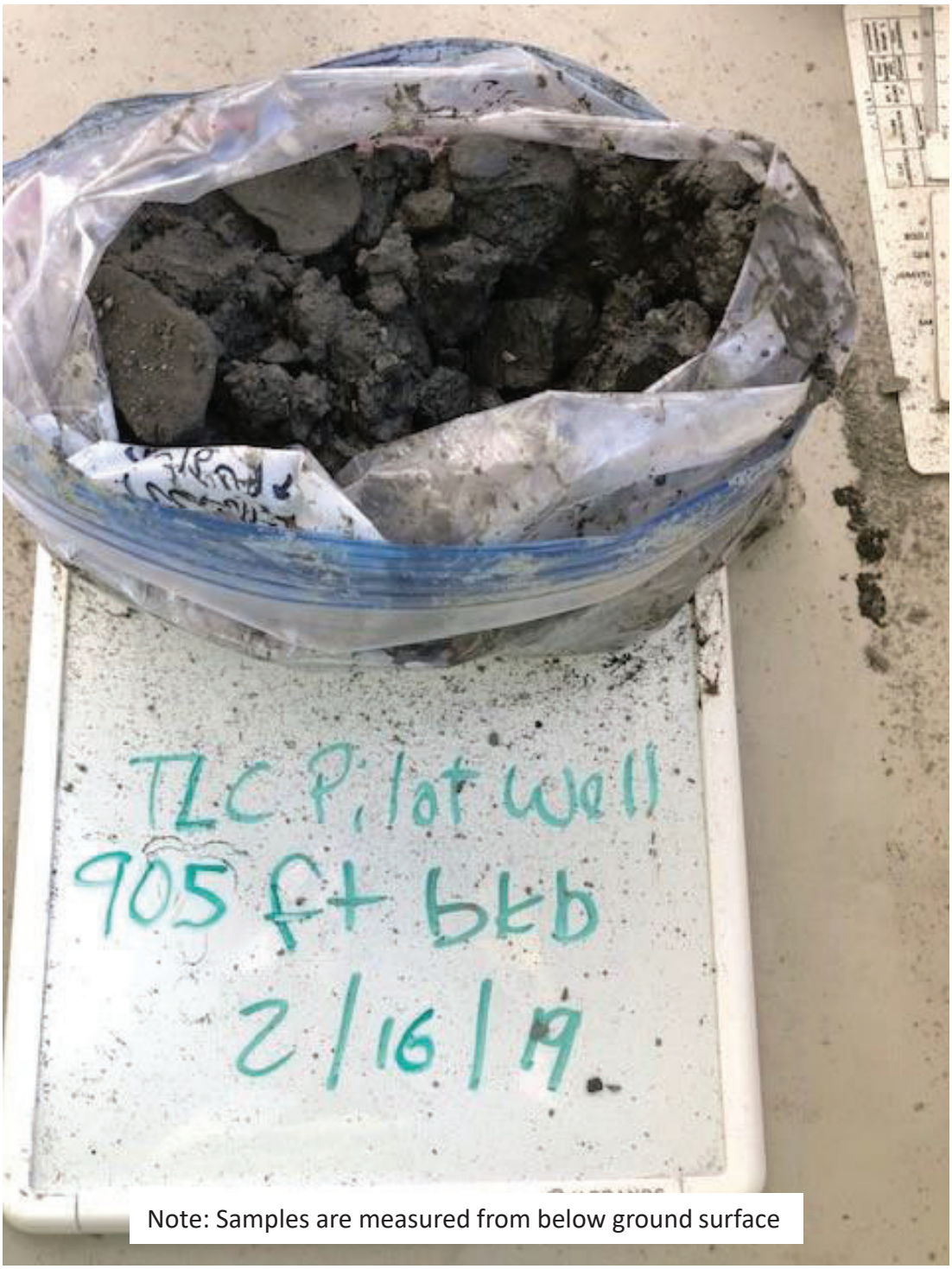
Figure C-168
Photograph of sample TLC Pilot Well 895 ft



Note: Samples are measured from below ground surface

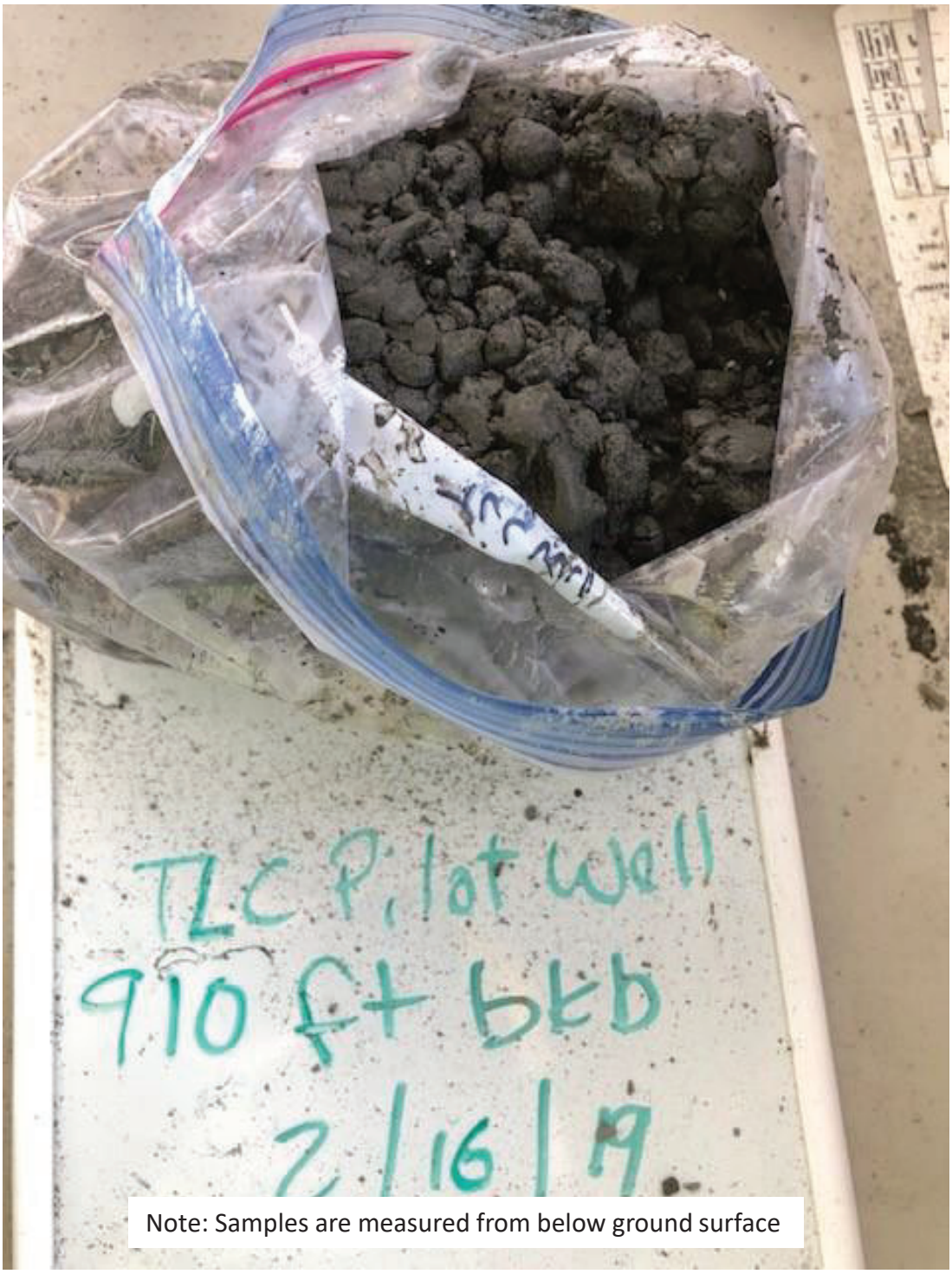
Figure C-169
Photograph of sample TLC Pilot Well 900 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-170
Photograph of sample TLC Pilot Well 905 ft



Note: Samples are measured from below ground surface

Figure C-171
Photograph of sample TLC Pilot Well 910 ft

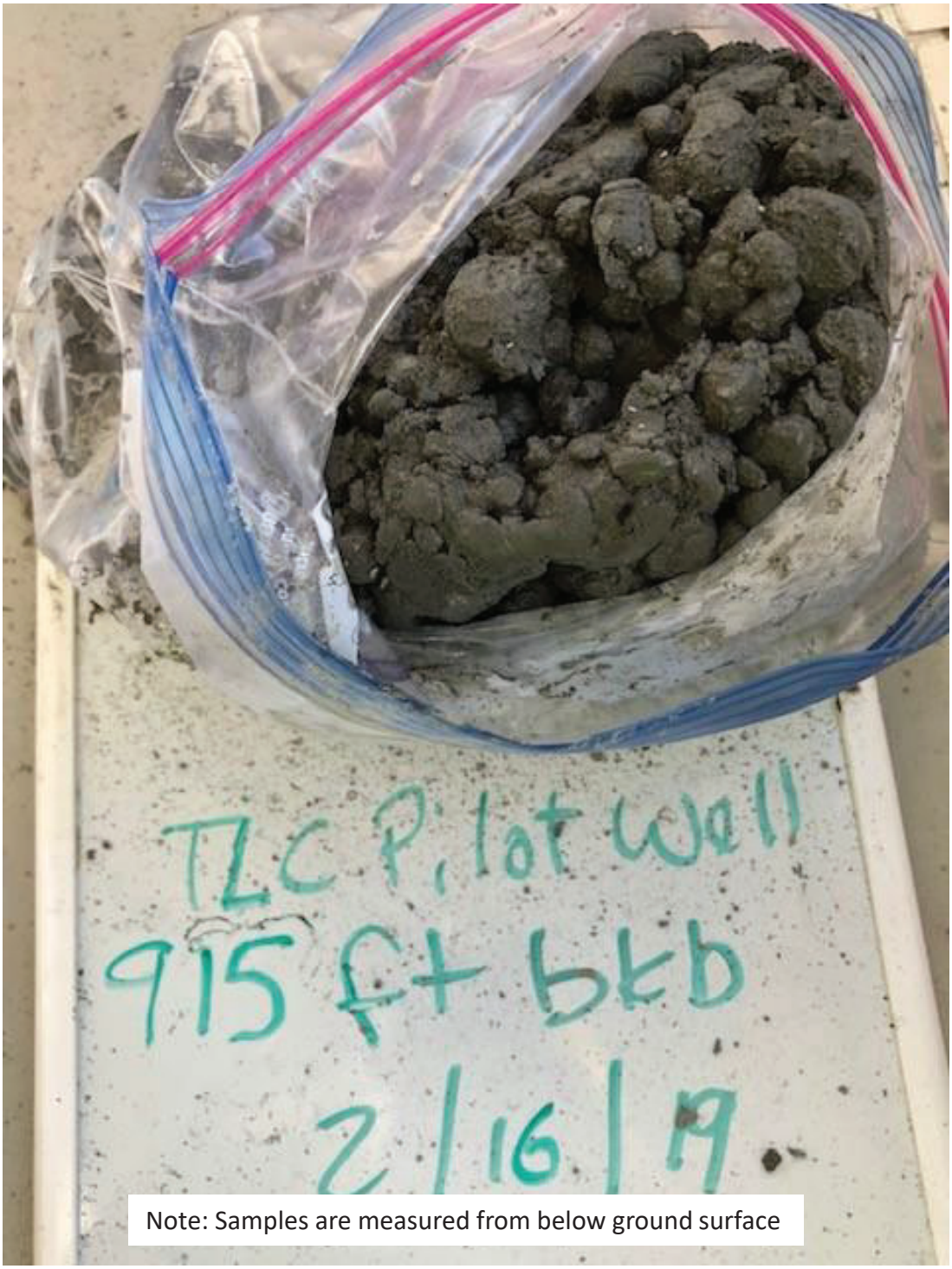
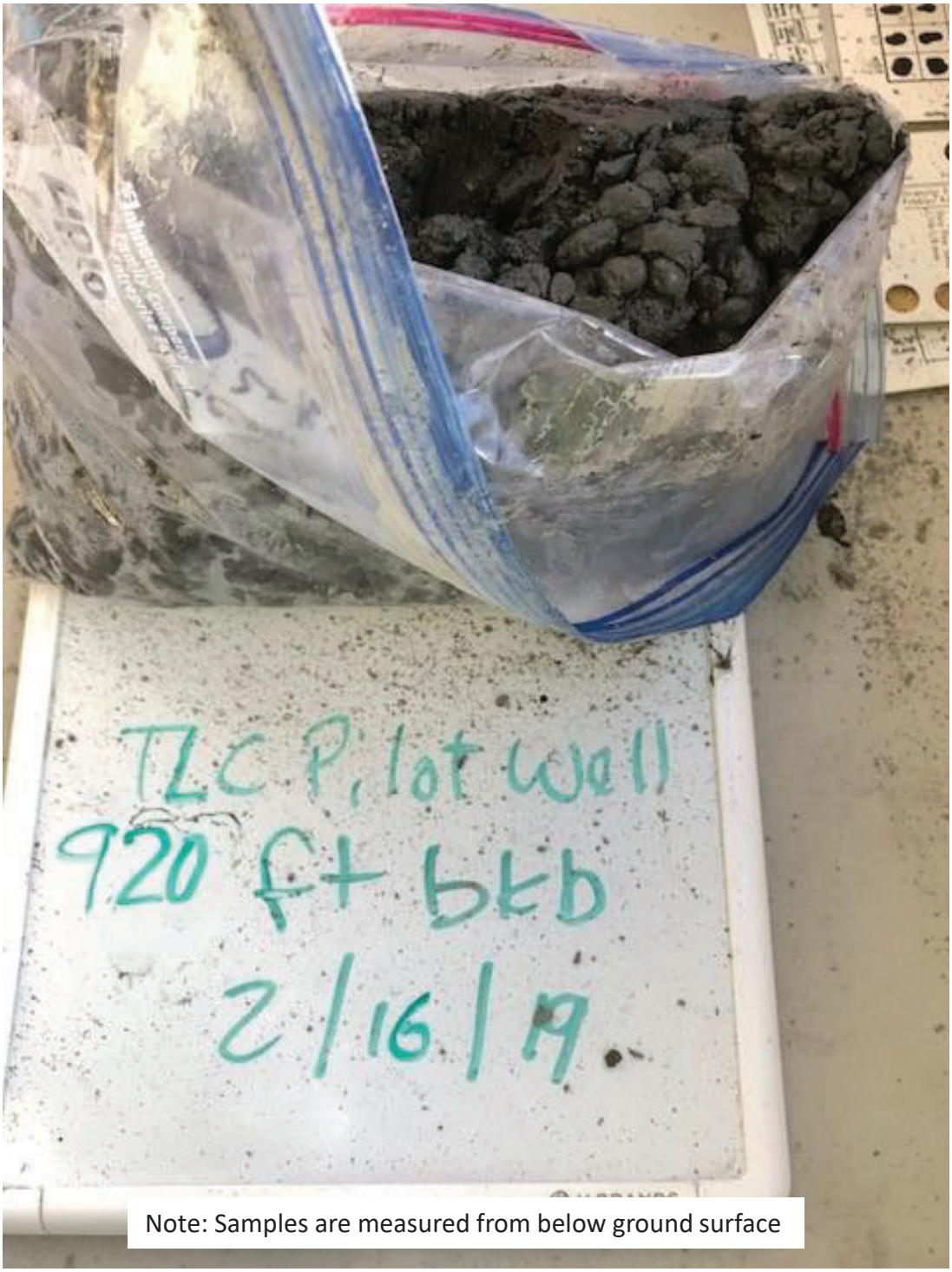


Figure C-172
Photograph of sample TLC Pilot Well 915 ft

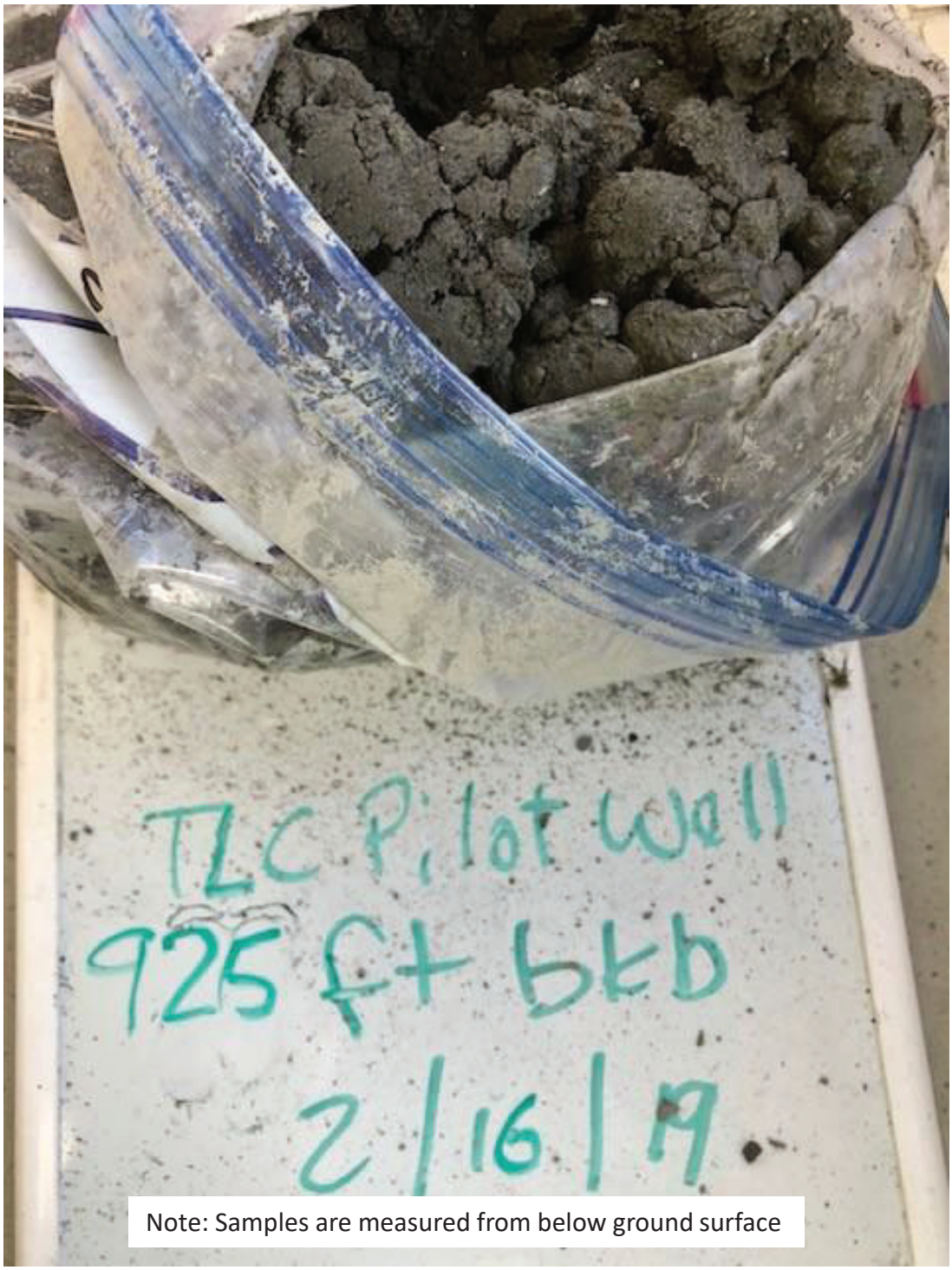
Brown AND Caldwell



Note: Samples are measured from below ground surface

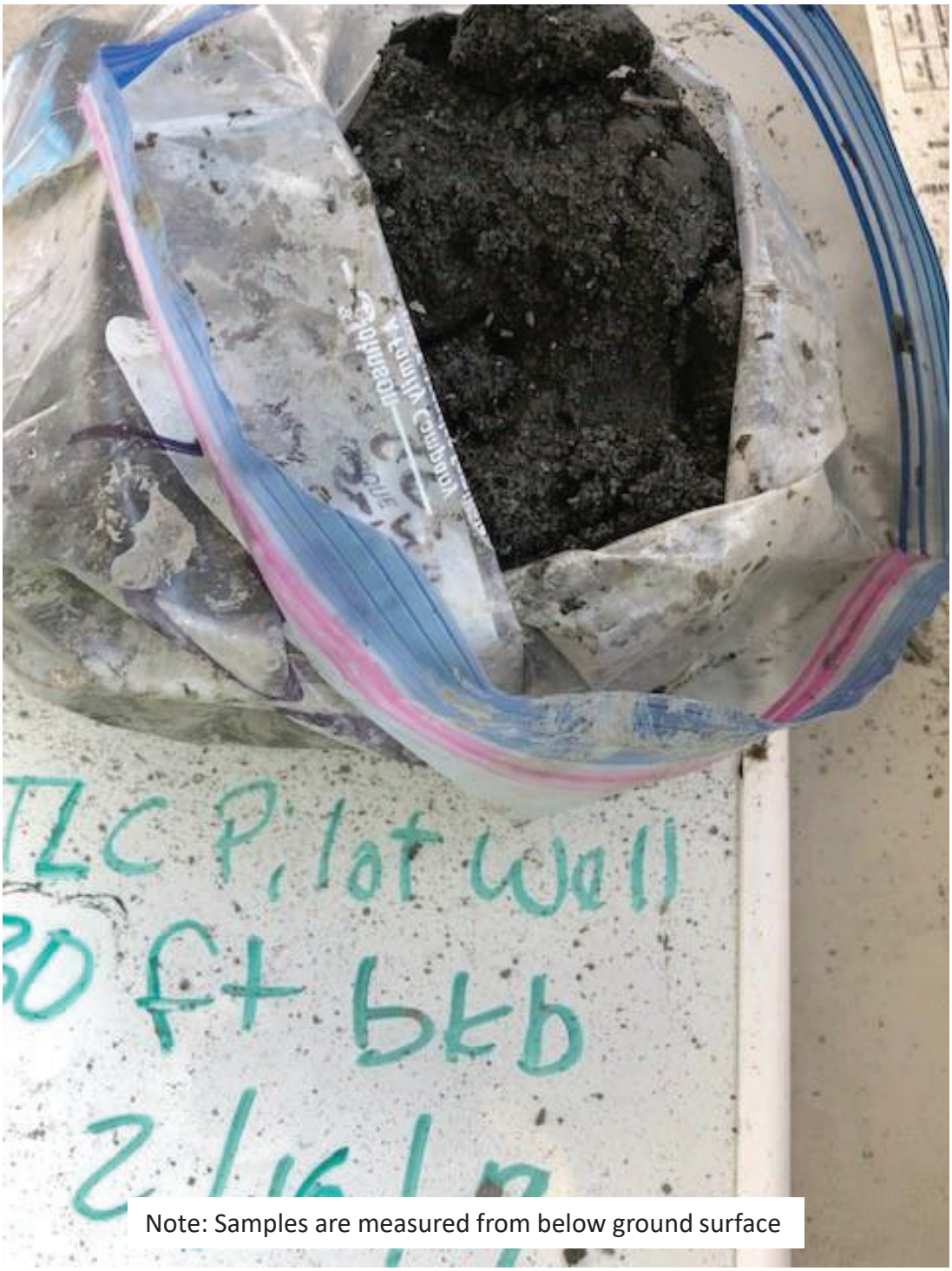
Figure C-173
Photograph of sample TLC Pilot Well 920 ft

Brown AND Caldwell



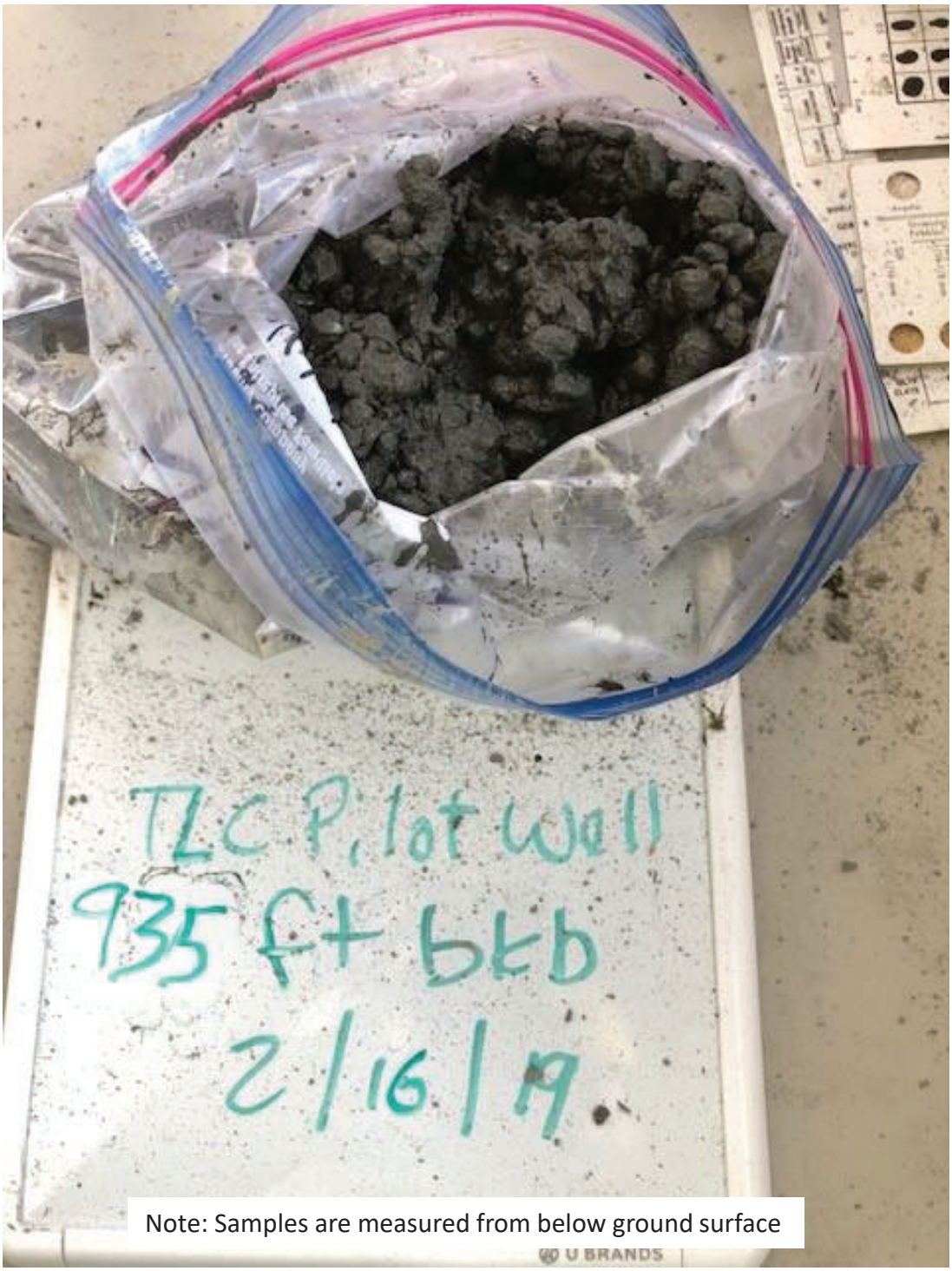
Note: Samples are measured from below ground surface

Figure C-174
Photograph of sample TLC Pilot Well 925 ft



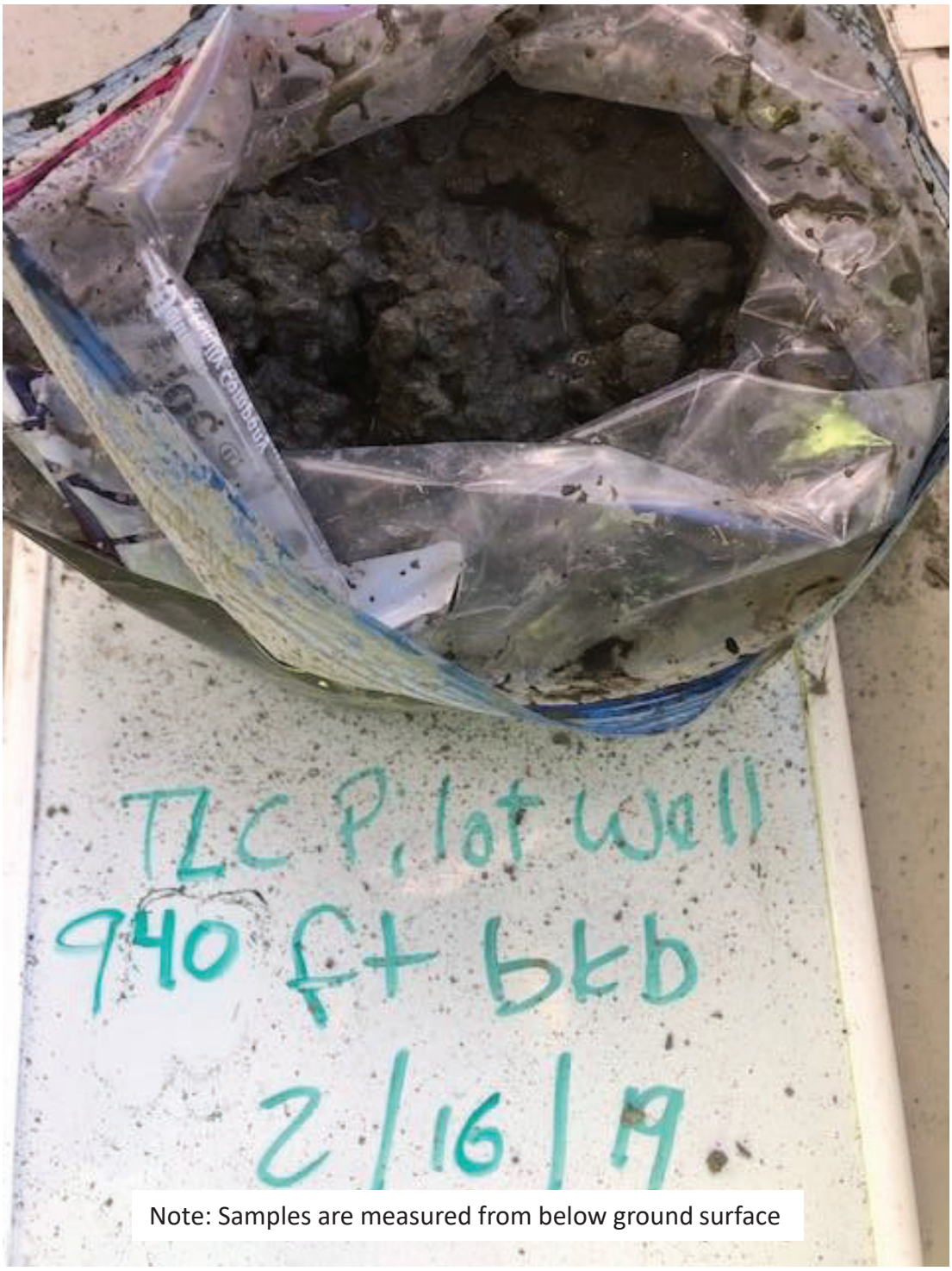
Note: Samples are measured from below ground surface

Figure C-175
Photograph of sample TLC Pilot Well 930 ft



Note: Samples are measured from below ground surface

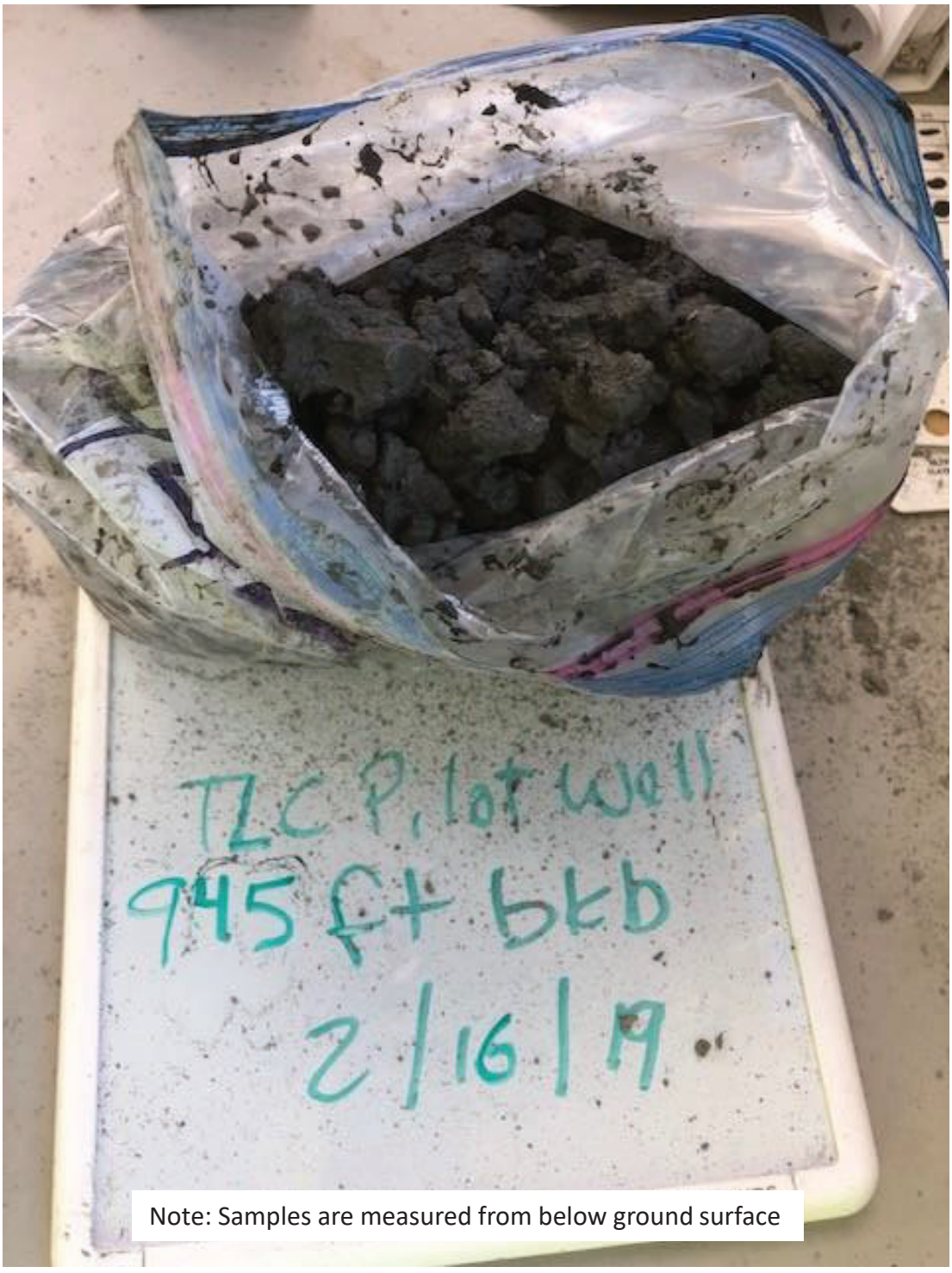
Figure C-176
Photograph of sample TLC Pilot Well 935 ft



Note: Samples are measured from below ground surface

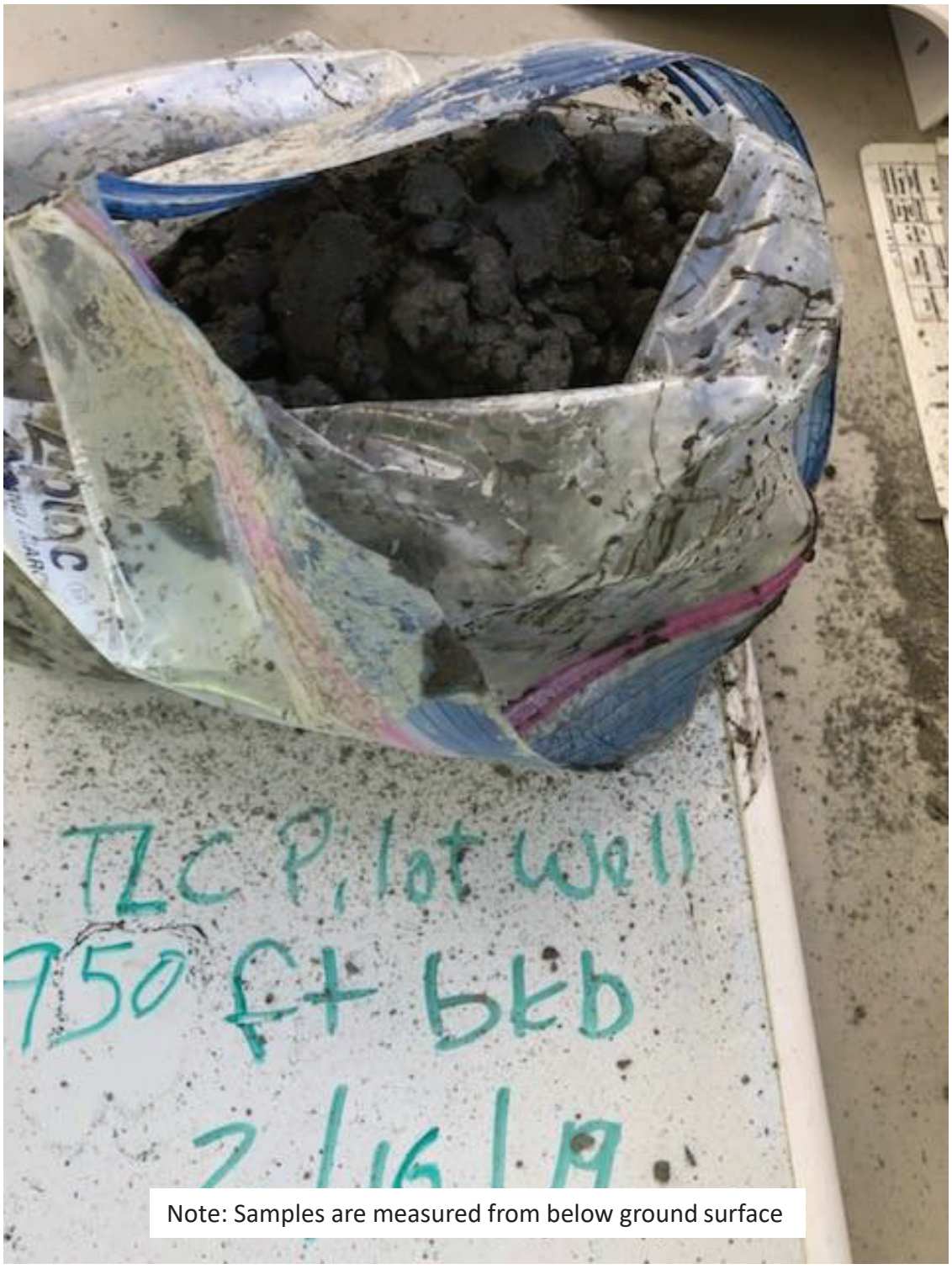
Figure C-177
Photograph of sample TLC Pilot Well 940 ft

Brown AND Caldwell



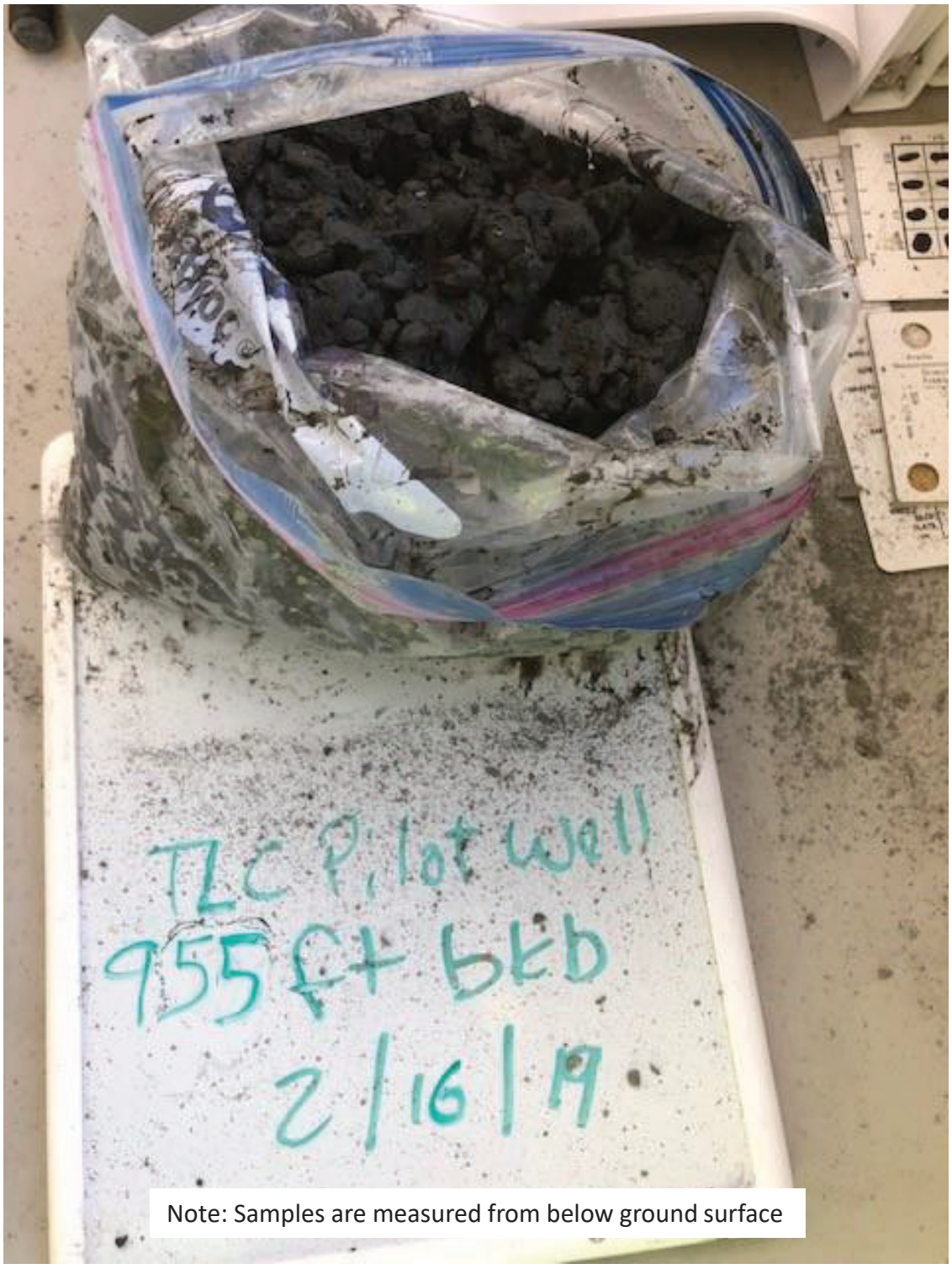
Note: Samples are measured from below ground surface

Figure C-178
Photograph of sample TLC Pilot Well 945 ft



Note: Samples are measured from below ground surface

Figure C-179
Photograph of sample TLC Pilot Well 950 ft

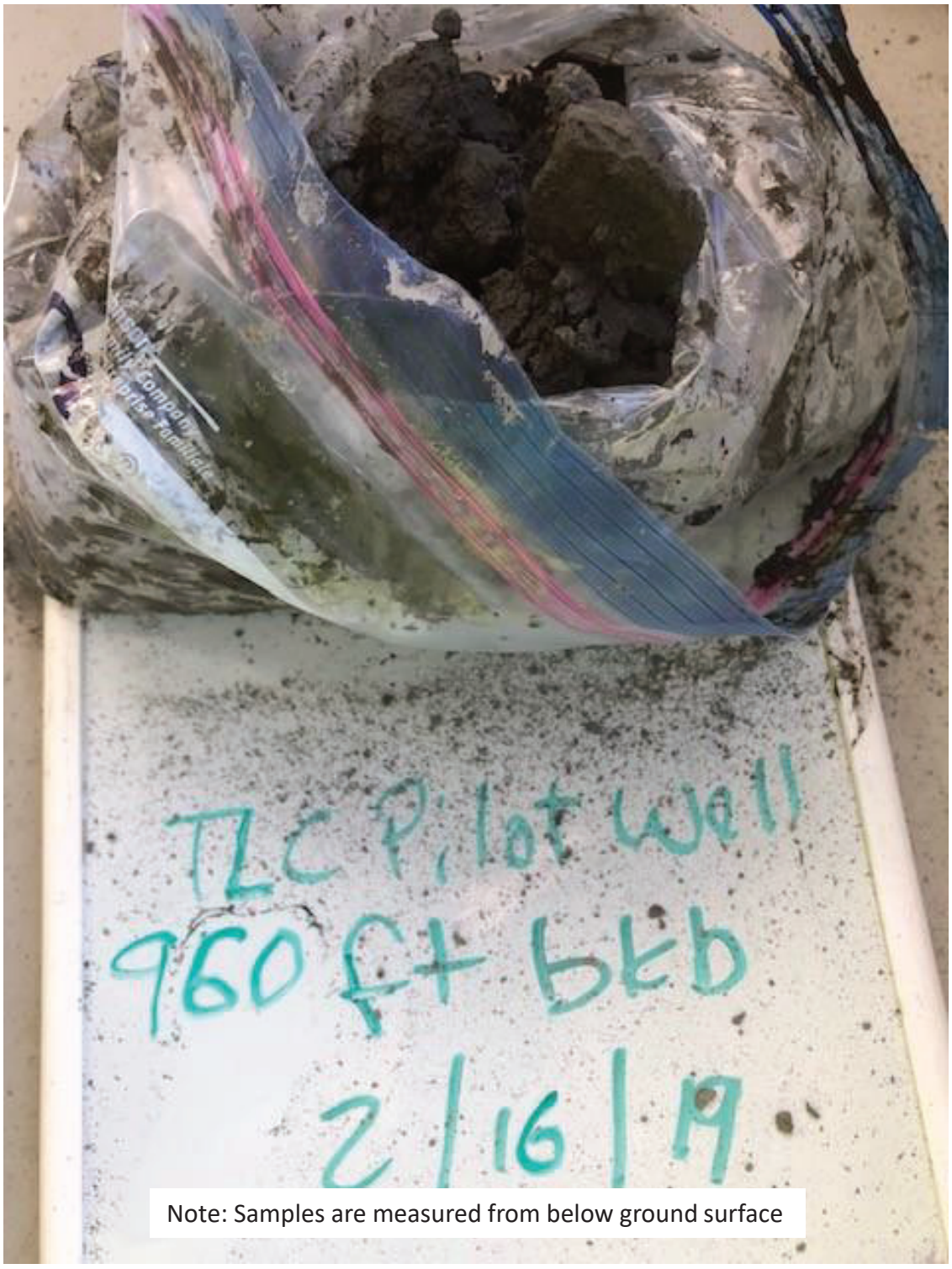


Note: Samples are measured from below ground surface

Figure C-180
Photograph of sample TLC Pilot Well 955 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District



Note: Samples are measured from below ground surface

Figure C-181
Photograph of sample TLC Pilot Well 960 ft

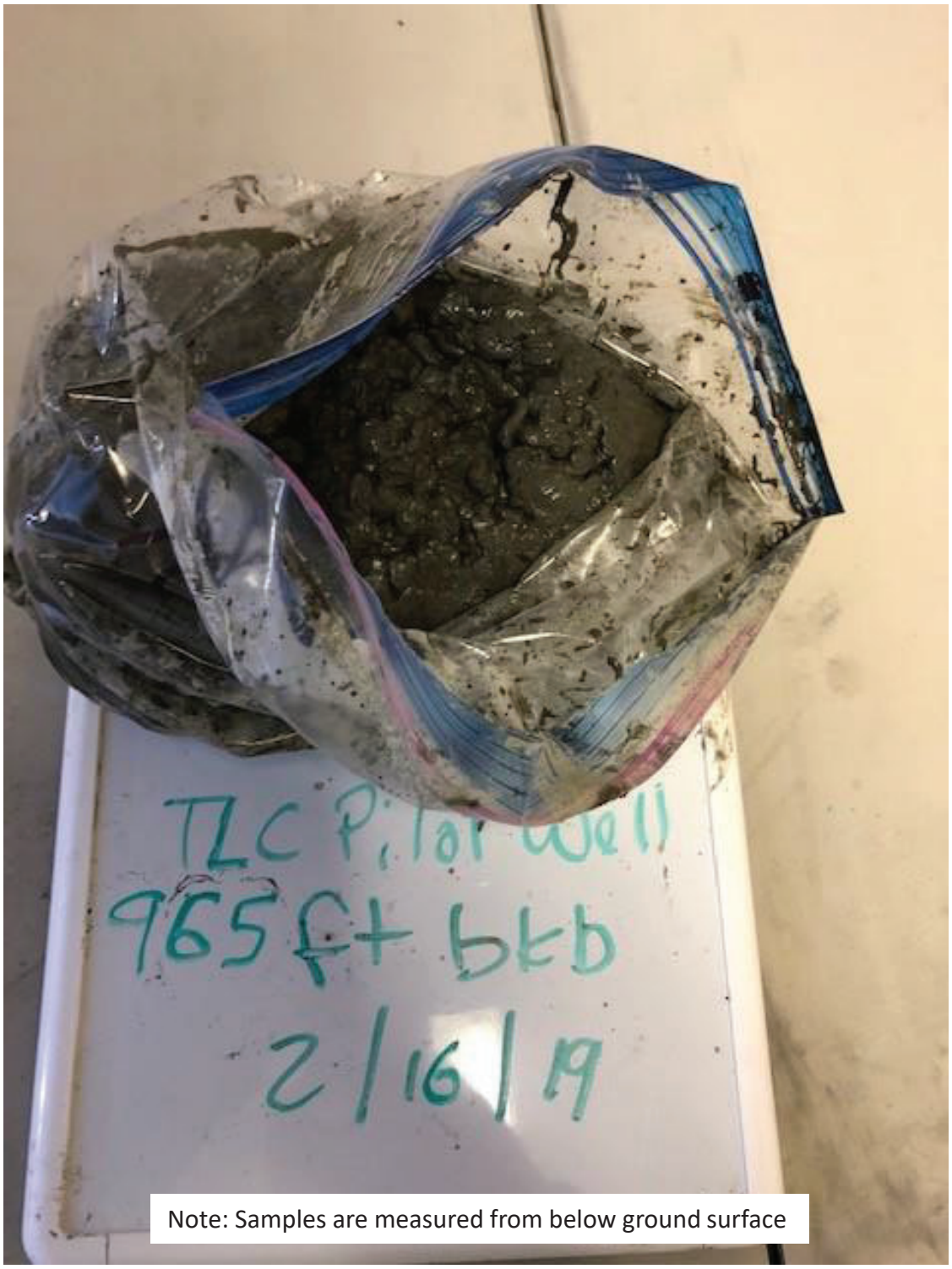


Figure C-182
Photograph of sample TLC Pilot Well 965 ft

Brown AND Caldwell

Phase II Potential Injection Aquifer Geochemical Characterization
Soquel Creek Water District

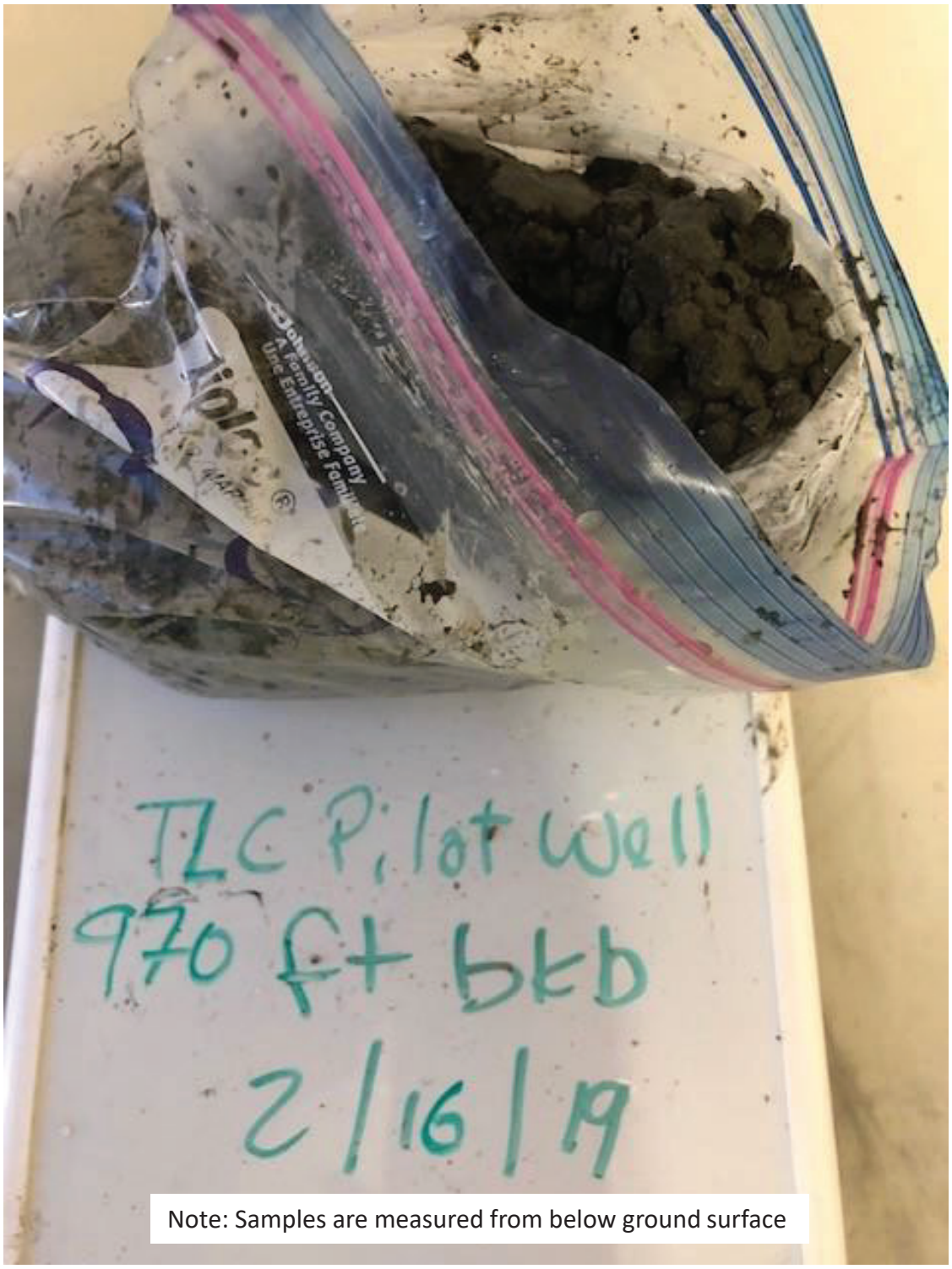
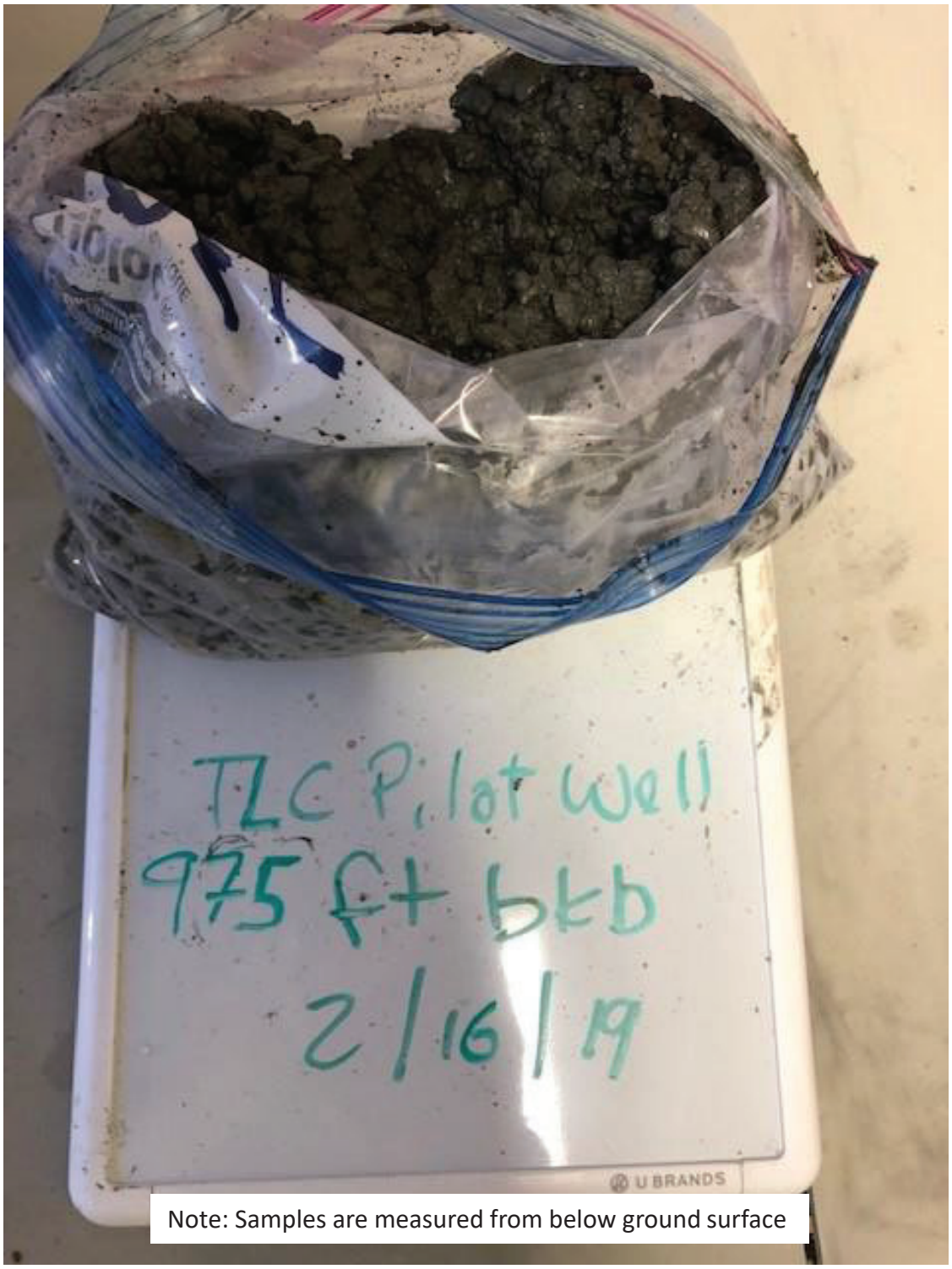
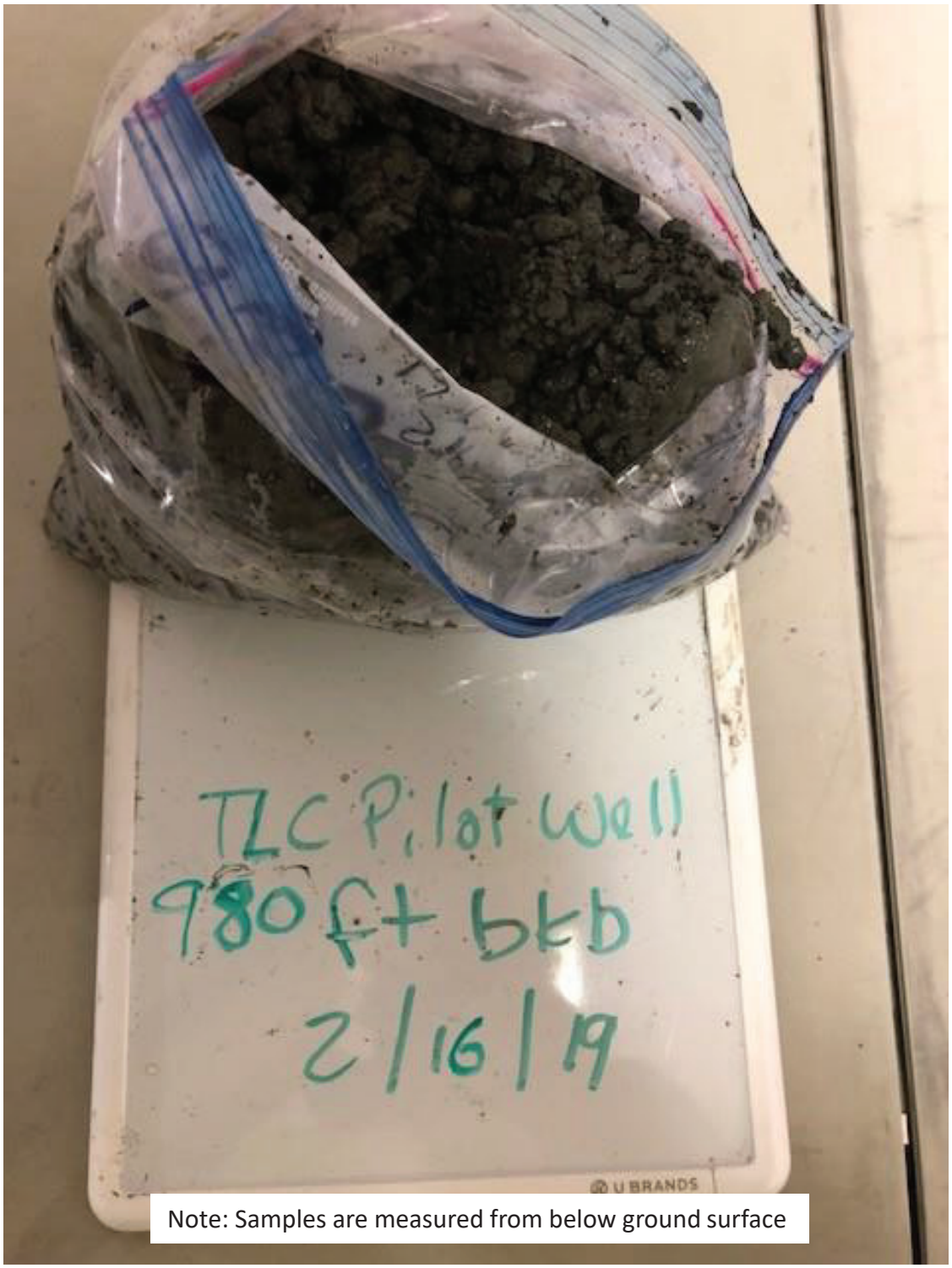


Figure C-183
Photograph of sample TLC Pilot Well 970 ft



Note: Samples are measured from below ground surface

Figure C-184
Photograph of sample TLC Pilot Well 975 ft



Note: Samples are measured from below ground surface

Figure C-185
Photograph of sample TLC Pilot Well 980 ft

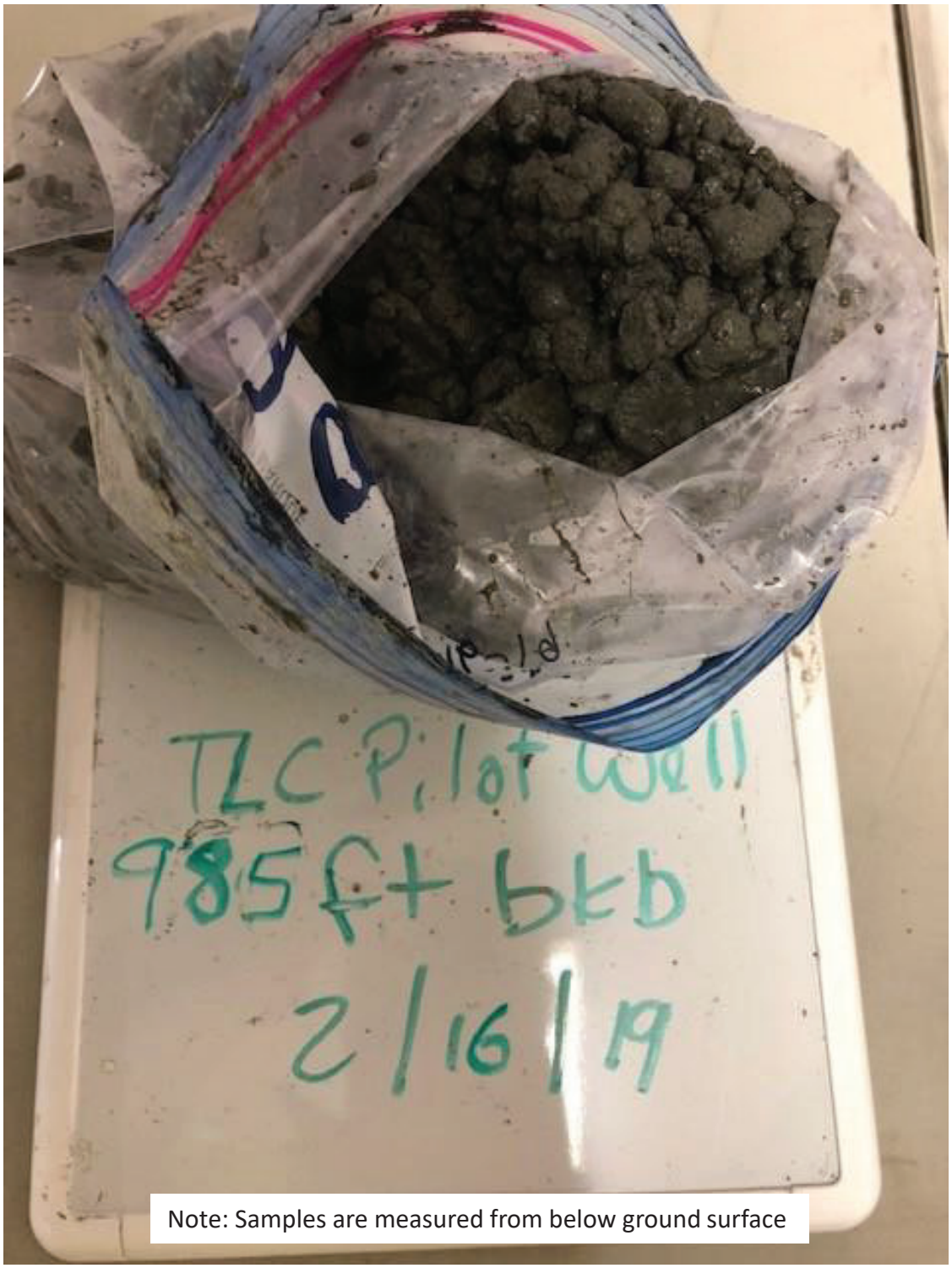
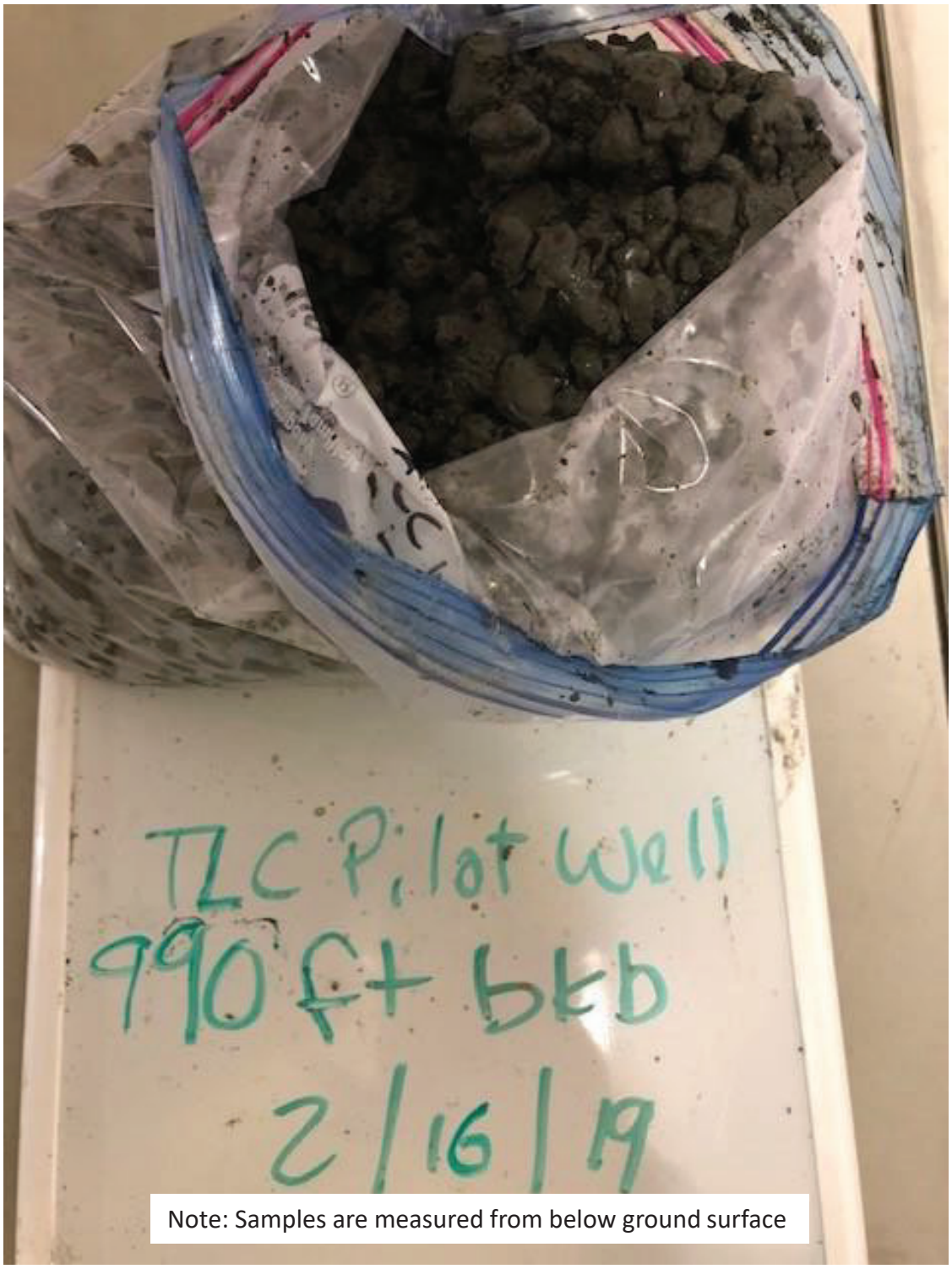


Figure C-186
Photograph of sample TLC Pilot Well 985 ft

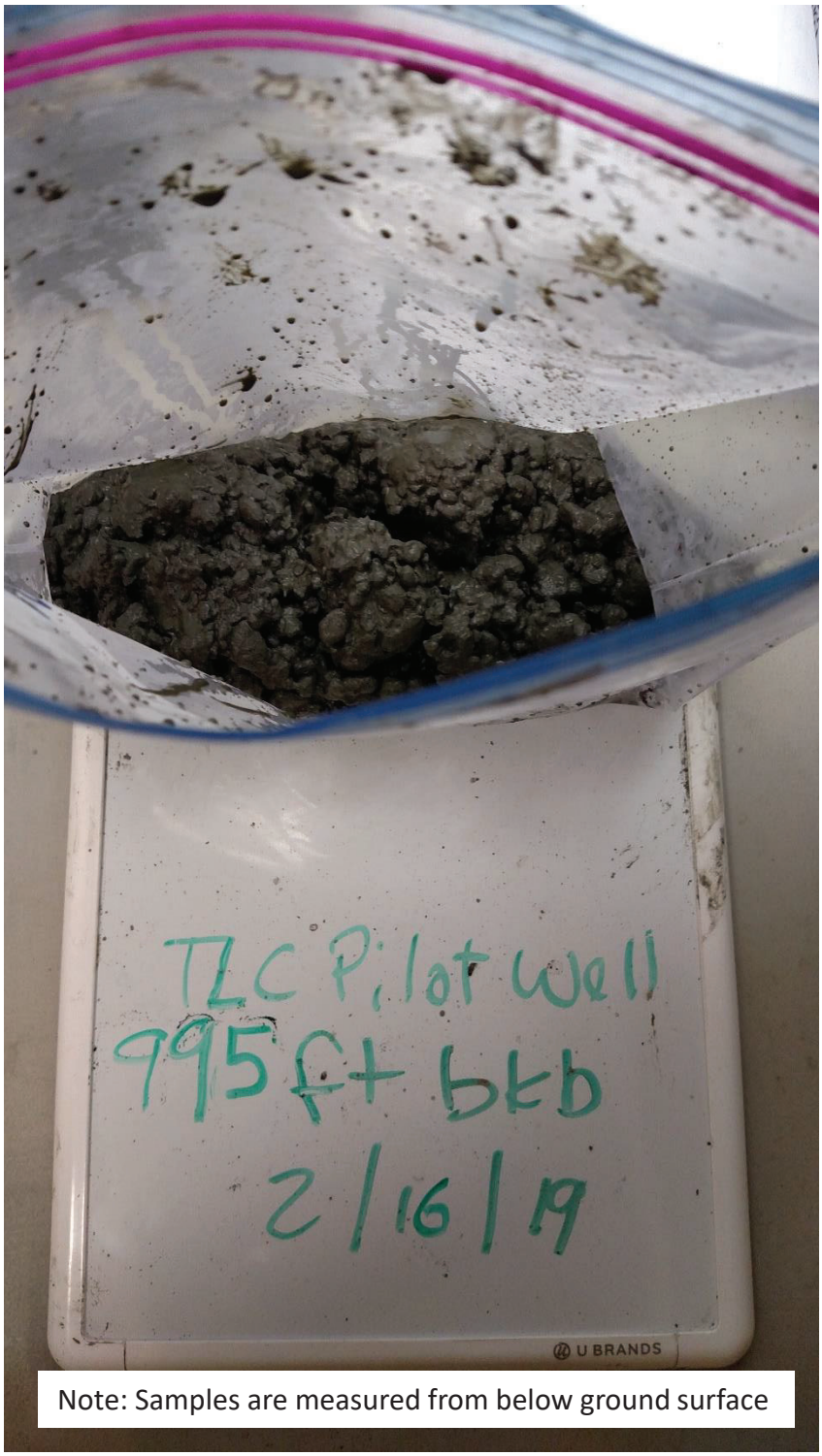
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-187
Photograph of sample TLC Pilot Well 990 ft

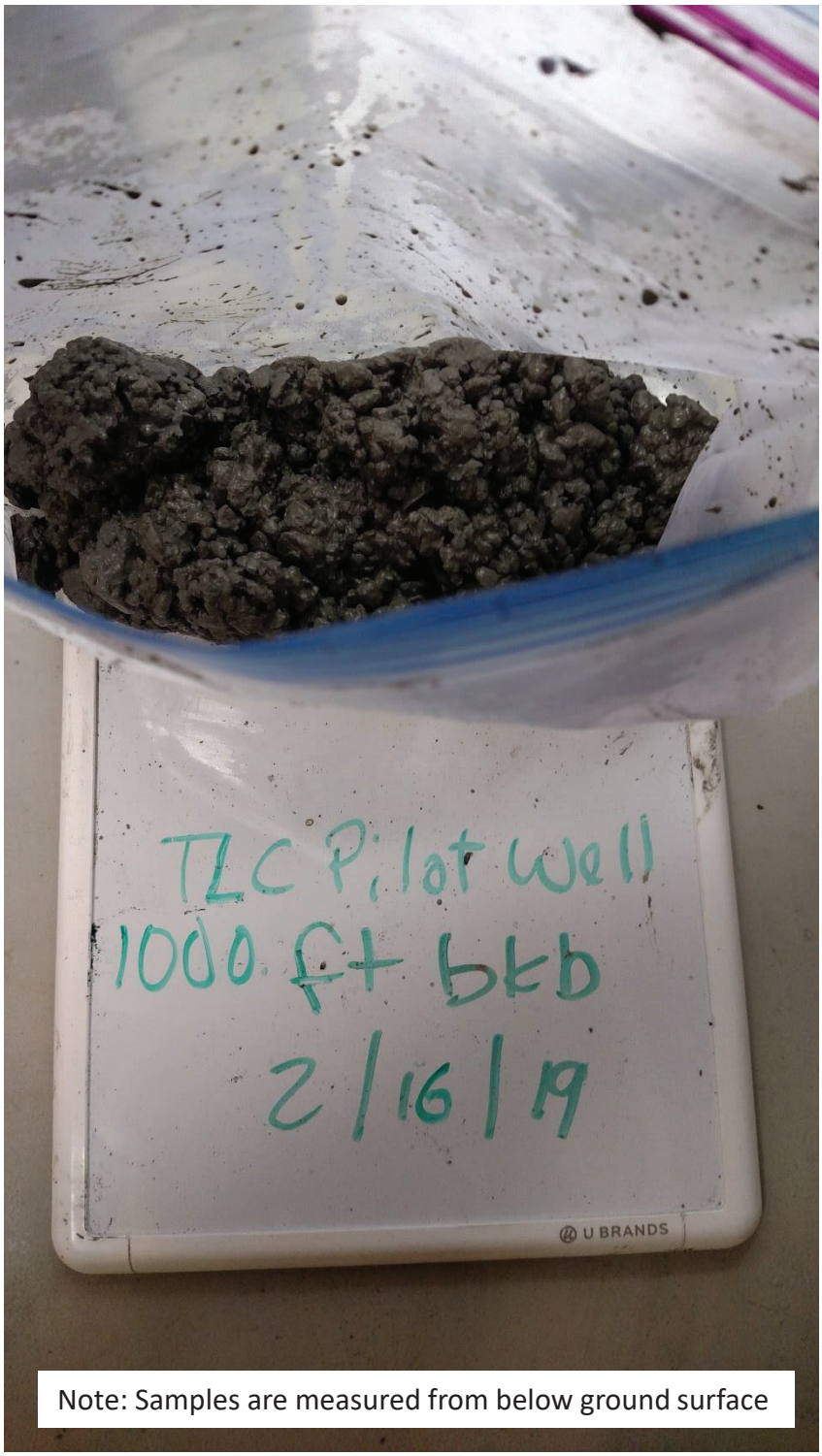
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-188
Photograph of sample TLC Pilot Well 995 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-189
Photograph of sample TLC Pilot Well 1000 ft

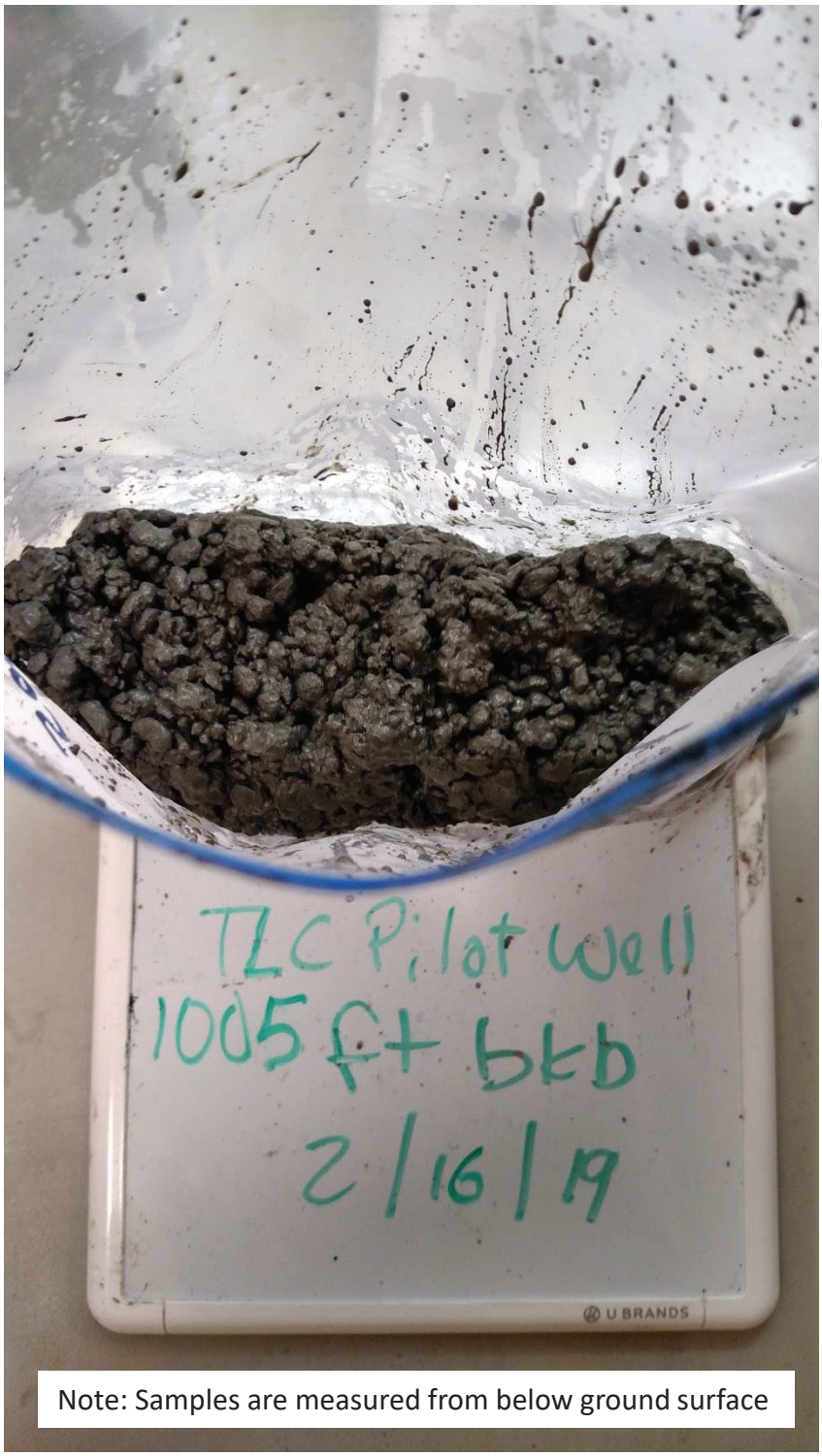
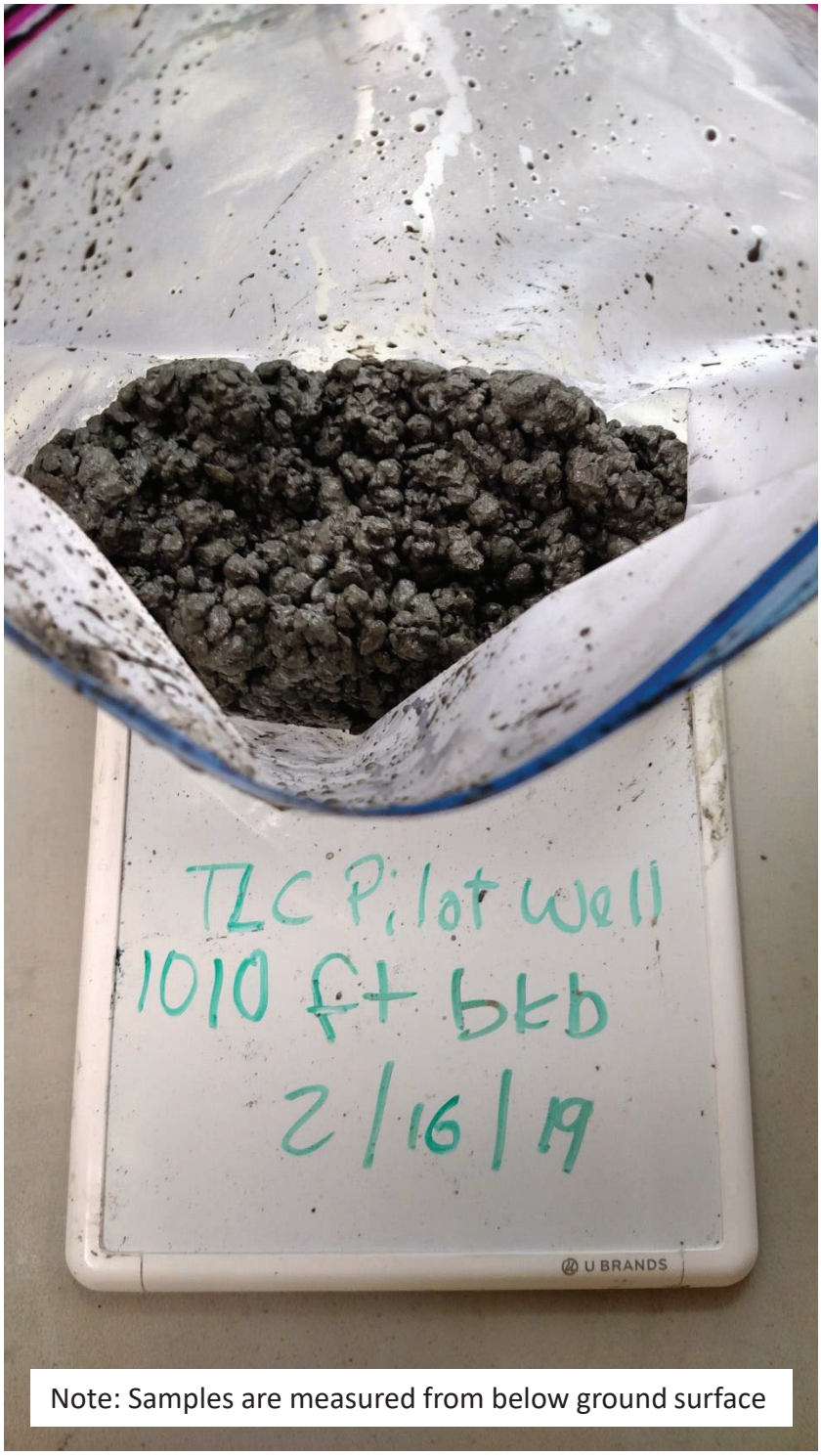


Figure C-190
Photograph of sample TLC Pilot Well 1005 ft

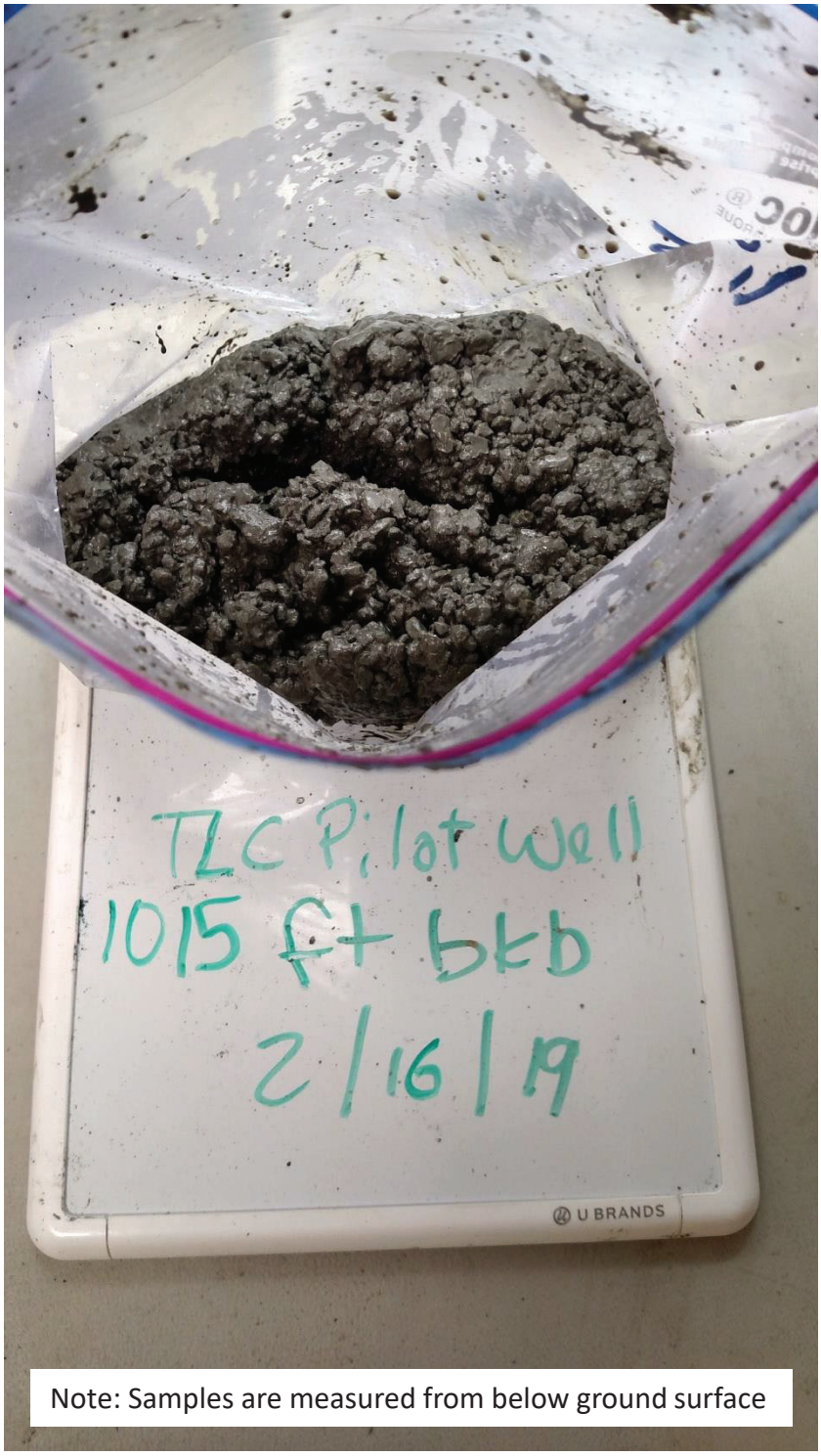
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-191
Photograph of sample TLC Pilot Well 1010 ft

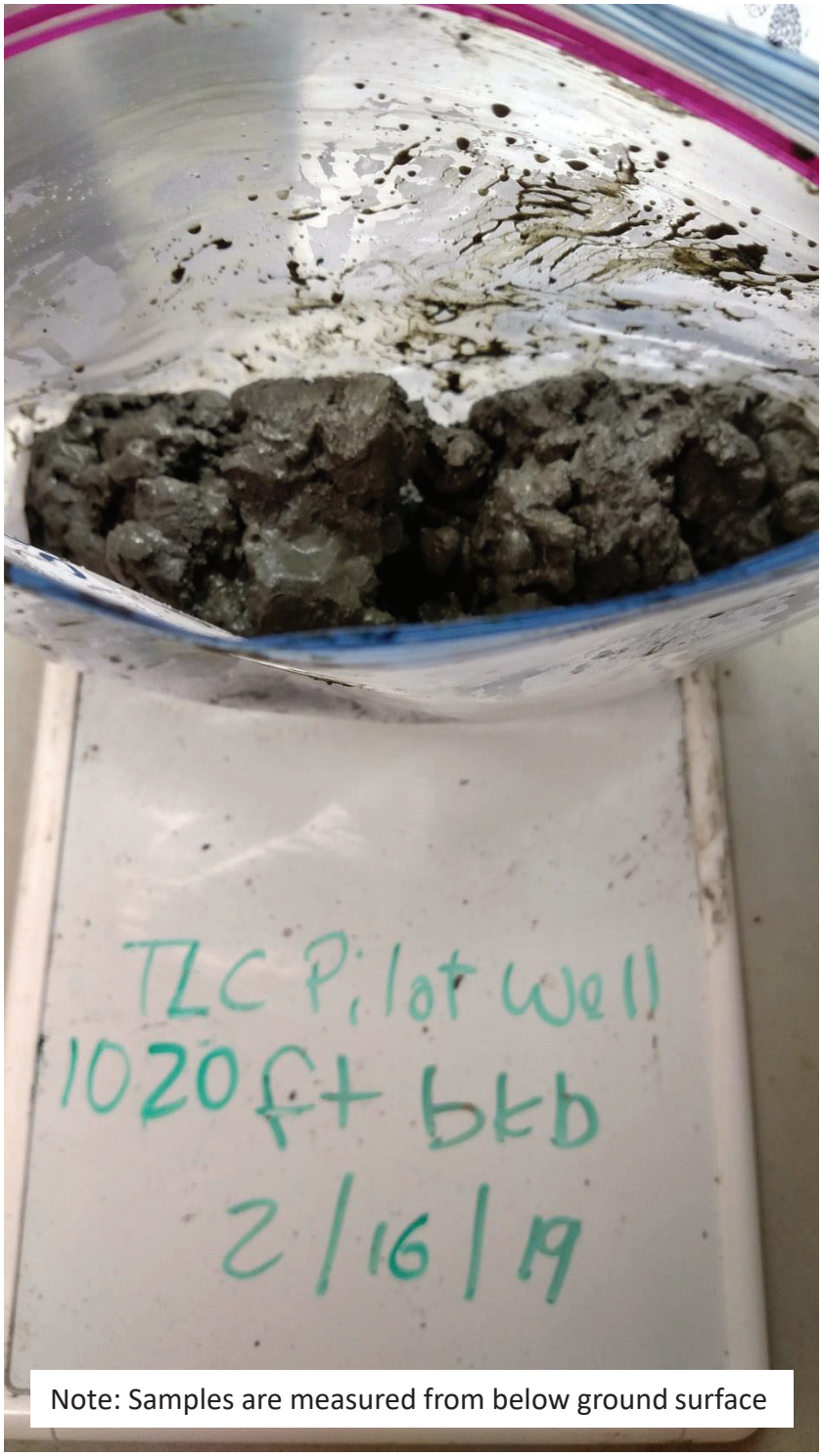
Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-192
Photograph of sample TLC Pilot Well 1015 ft

Brown AND Caldwell



Note: Samples are measured from below ground surface

Figure C-193
Photograph of sample TLC Pilot Well 1020 ft

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Appendix D: Lab Reports

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ELAP Certification Number: 2385

Monday, April 08, 2019

Lab Number: 190228_01-01 **Sample Description: Zone 1 Perforations**

Collection Date/Time: 2/28/2019 9:55 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 2/28/2019 11:49 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
1,2,3-Trichloropropane	SRL 524M	µg/L	ND	1	E	0.005	0.005	3/5/2019	17:52	
Alkalinity, Total (as CaCO3)	SM2320B	mg/L	289	1		10		3/1/2019	9:28	LM
Aluminum, Total	EPA200.8	µg/L	22	1		5	1000	3/14/2019	17:19	MW
Anion-Cation Balance	Calculation	%	1	1						
Antimony, Total	EPA200.8	µg/L	ND	1		0.5	6	3/7/2019	15:41	MW
Arsenic, Total	EPA200.8	µg/L	0.6	1		0.5	10	3/7/2019	15:41	MW
Asbestos	EPA100.2	mF/L	ND	1	E	0.2	7	3/7/2019	12:00	
Barium, Total	EPA200.8	µg/L	59.0	1		5	1000	3/7/2019	15:41	MW
Beryllium, Total	EPA200.8	µg/L	ND	1	IJ	0.5	4	3/7/2019	15:41	MW
IJ: LCS and/or LCSD above acceptance limits.										
Bicarbonate (as HCO3-)	SM2320B	mg/L	353	1		10				
Bromide	EPA300.0	mg/L	0.1	1	LN	0.1		2/28/2019	21:31	HM
LN: MS and/or MSD below acceptance limits.										
Cadmium, Total	EPA200.8	µg/L	ND	1		0.25	5	3/7/2019	15:41	MW
Calcium	EPA200.7	mg/L	89	1		1		3/6/2019	11:43	HM
Carbonate as CaCO3	SM2320B	mg/L	ND	1		10				
Chloride	EPA300.0	mg/L	48	1	IL	1	250	2/28/2019	21:31	HM
IL: RPD exceeds laboratory control limit.										
Chromium VI	EPA 218.7	µg/L	ND	1	E			3/7/2019	12:00	
Chromium, Total	EPA200.8	µg/L	ND	1		1	50	3/7/2019	15:41	MW
Color, Apparent (Unfiltered)	SM2120B	Color Units	10	1		3	15	2/28/2019	12:47	LM
Copper, Total	EPA200.7	µg/L	ND	1		10	1300	3/6/2019	11:43	HM
Cyanide, Available	OIA-1677-09	µg/L	ND	1	SS	2	150	3/6/2019	11:03	BS
SS: Second Source recovery exceeds method control limit.										
Dioxin	EPA 1613	pg/L	ND	1	E			3/12/2019	12:00	
2,3,7,8-TCDD										
Fluoride	EPA300.0	mg/L	0.3	1		0.1	2	2/28/2019	21:31	HM
Gross Alpha	EPA900.0	pCi/L	1.56±1.90	1	E			3/28/2019	9:38	
Gross Beta	EPA900.0	pCi/L	5.31±1.71	1	E			3/28/2019	12:02	
Hardness (as CaCO3)	SM2340B/Calc	mg/L	307	1		10				
Hydroxide	SM2320B	mg/L	ND	1		10				
Iron, Dissolved	EPA200.7	µg/L	57	1		10	300	3/6/2019	11:57	HM
Iron, Total	EPA200.7	µg/L	224	1		10	300	3/6/2019	11:43	HM
Langlier Index, 15°C	SM2330B	NA	0.25	1						
Langlier Index, 60°C	SM2330B	NA	1.08	1						
Lead, Total	EPA200.8	µg/L	ND	1		1	15	3/7/2019	15:41	MW

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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ELAP Certification Number: 2385

Monday, April 08, 2019

Lab Number: 190228_01-01 **Sample Description: Zone 1 Perforations**

Collection Date/Time: 2/28/2019 9:55 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 2/28/2019 11:49 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Magnesium	EPA200.7	mg/L	20	1		0.5		3/6/2019	11:43	HM
Manganese, Dissolved	EPA200.7	µg/L	223	1		10	50	3/6/2019	11:57	HM
Manganese, Total	EPA200.7	µg/L	234	1		10	50	3/6/2019	11:43	HM
MBAS (Surfactants)	SM5540C	mg/L	ND	1	IL	0.05		2/28/2019	15:18	LM
IL: RPD exceeds laboratory control limit										
Mercury, Total	EPA200.8	µg/L	ND	1	IH	0.2	2	3/7/2019	15:41	MW
IH: LCS and/or LCSD below acceptance limits.										
Nickel, Total	EPA200.8	µg/L	ND	1		5	100	3/7/2019	15:41	MW
Nitrate as N	EPA300.0	mg/L	ND	1		0.1	10	2/28/2019	21:31	HM
Nitrate+Nitrite as N	EPA300.0	mg/L	ND	1		0.1	10	2/28/2019	21:31	HM
Nitrite as N	EPA300.0	mg/L	ND	1		0.1	1	2/28/2019	21:31	HM
N-Nitrosodimethylamine	EPA 521	ng/l	ND	1	E	2		3/5/2019	1:29	
Odor Threshold at 60 C	SM2150B	TON	1	1		1	3	2/28/2019	12:59	LM
Odor: ND										
Orthophosphate as P	EPA300.0	mg/L	ND	1	LN	0.1		2/28/2019	21:31	HM
LN: MS and/or MSD below acceptance limits.										
Perchlorate	EPA314.0	µg/L	ND	1		2	6	3/5/2019	12:05	HM
pH (Field Test)	SM4500-H+B	pH	7.45	1				2/28/2019	9:55	
pH (Laboratory)	SM4500-H+B	pH (H)	7.6	1		0.1	8.5	2/28/2019	16:34	PS
Potassium	EPA200.7	mg/L	8.4	1		0.5		3/6/2019	11:43	HM
QC Anion Sum x 100	Calculation	%	107	1						
QC Cation Sum x 100	Calculation	%	110	1						
QC Ratio TDS/SEC	Calculation	NA	0.67	1						
Radium 226	EPA903.0	pCi/L	0.049±0.168	1	E			3/14/2019	16:00	
Radium 228	EPA903.0	pCi/L	0.000±0.610	1	E			3/17/2019	15:10	
Radon	SM7500-Rn	pCi/L	1600±135	1	E			3/12/2019	8:39	
Selenium, Total	EPA200.8	µg/L	ND	1		1	50	3/7/2019	15:41	MW
Silver, Total	EPA200.8	µg/L	ND	1		1	100	3/7/2019	15:41	MW
Sodium	EPA200.7	mg/L	69	1	MB	1		3/6/2019	11:43	HM
MB: Analyte present in the Continuing Calibration Verification Blank. (0.60mg/L)										
Specific Conductance (EC)	SM2510B	µmhos/cm	849	1		1	900	3/6/2019	14:15	HM
Strontium, Total	EPA200.8	µg/L	503	1		0.15		3/7/2019	15:41	MW
Sulfate	EPA300.0	mg/L	96	1	LN	1	250	2/28/2019	21:31	HM
LN: MS and/or MSD below acceptance limits.										
Synthetic Organic Compounds	External	µg/L	ND	1	E			3/25/2019	12:00	
Thallium, Total	EPA200.8	µg/L	ND	1		0.5	2	3/7/2019	15:41	MW

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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ELAP Certification Number: 2385

Monday, April 08, 2019

Lab Number: 190228_01-01 **Sample Description: Zone 1 Perforations**

Collection Date/Time: 2/28/2019 9:55 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 2/28/2019 11:49 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Total Dissolved Solids	SM2540C	mg/L	572	1		10	500	2/28/2019	16:07	LM
Tritium	EPA906.0	pCi/L	249±269	1	E			3/23/2019	13:37	
Turbidity	EPA180.1	NTU	0.70	1		0.05	1	2/28/2019	12:38	LM
Turbidity (Field)	EPA180.1	NTU	1.000	1		0.05		2/28/2019	9:55	
Uranium, Radiological	EPA200.8	pCi/L	ND	1		0.5	20	3/7/2019	15:41	MW
Uranium, Total	EPA200.8	µg/L	ND	1		0.5	30	3/7/2019	15:41	MW
Volatile Organic Compounds (DW)	EPA524	µg/L	attached	1	E			3/5/2019	12:00	
Zinc, Total	EPA200.7	µg/L	15	1		10	5000	3/6/2019	11:43	HM

Report Approved by:
David Holland, Laboratory Director

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level
H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance
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Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
QC19030124	190227_27-01: Duplicate 1	Alkalinity, Total (as CaCO3)	117.0	mg/L		0.9	0 - 10
	190228_07-01: Duplicate 2	Alkalinity, Total (as CaCO3)	277.0	mg/L		1.1	0 - 10
	CCVB 1	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
	LCS 1	Alkalinity, Total (as CaCO3)	41.0	mg/L	103		95 - 105
	LCSD 1	Alkalinity, Total (as CaCO3)	41.0	mg/L	103	< 0.1	0 - 10
	Method Blank 1	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
QC19031804	190304_27-09: MS 1	Aluminum, Total	61.41	ug/L	109		70 - 130
	190304_27-09: MSD 1	Aluminum, Total	61.94	ug/L	110	1.0	0 - 20
	CCVB 1	Aluminum, Total	ND	ug/L		< 0.1	
	LCB 1	Aluminum, Total	ND	ug/L		< 0.1	
	LCS 1	Aluminum, Total	43.0	ug/L	86		85 - 115
	LCSD 1	Aluminum, Total	43.94	ug/L	88	2.2	0 - 20
	LFB 1	Aluminum, Total	63.03	ug/L	126		70 - 130
	LFBD 1	Aluminum, Total	66.71	ug/L	133	5.7	0 - 20
	Method Blank 1	Aluminum, Total	ND	ug/L		< 0.1	
	QCS 1	Aluminum, Total	51.84	ug/L	104		85 - 115
QC19031112	190304_02-02: MS 1	Antimony, Total	52.52	ug/L	103		70 - 130
	190304_02-02: MSD 1	Antimony, Total	54.25	ug/L	107	3.3	0 - 20
	CCVB 1	Antimony, Total	ND	ug/L		< 0.1	
	LCB 1	Antimony, Total	ND	ug/L		< 0.1	
	LCS 1	Antimony, Total	50.08	ug/L	100		85 - 115
	LCSD 1	Antimony, Total	48.1	ug/L	96	4.0	0 - 20
	LFB 1	Antimony, Total	105.1	ug/L	105		70 - 130
	LFBD 1	Antimony, Total	105.2	ug/L	105	0.2	0 - 20
	Method Blank 1	Antimony, Total	ND	ug/L		< 0.1	
	QCS 1	Antimony, Total	45.34	ug/L	91		85 - 115
	190304_02-02: MS 1	Arsenic, Total	52.64	ug/L	105		70 - 130
	190304_02-02: MSD 1	Arsenic, Total	54.33	ug/L	108	3.2	0 - 20
	CCVB 1	Arsenic, Total	ND	ug/L		< 0.1	
	LCB 1	Arsenic, Total	ND	ug/L		< 0.1	
	LCS 1	Arsenic, Total	49.59	ug/L	99		85 - 115
	LCSD 1	Arsenic, Total	47.68	ug/L	95	3.9	0 - 20
	LFB 1	Arsenic, Total	110.0	ug/L	110		70 - 130
	LFBD 1	Arsenic, Total	109.9	ug/L	110	< 0.1	0 - 20
	Method Blank 1	Arsenic, Total	ND	ug/L		< 0.1	
	QCS 1	Arsenic, Total	48.96	ug/L	98		85 - 115

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ELAP Certification Number: 2385

Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	190304_02-02: MS 1	Barium, Total	52.73	ug/L	102		70 - 130
	190304_02-02: MSD 1	Barium, Total	54.71	ug/L	106	3.8	0 - 20
	CCVB 1	Barium, Total	ND	ug/L		< 0.1	
	LCB 1	Barium, Total	ND	ug/L		< 0.1	
	LCS 1	Barium, Total	49.5	ug/L	99		85 - 115
	LCSD 1	Barium, Total	49.07	ug/L	98	0.9	0 - 20
	LFB 1	Barium, Total	99.74	ug/L	100		70 - 130
	LFBD 1	Barium, Total	98.0	ug/L	98	1.8	0 - 20
	Method Blank 1	Barium, Total	ND	ug/L		< 0.1	
	QCS 1	Barium, Total	48.84	ug/L	98		85 - 115
	190304_02-02: MS 1	Beryllium, Total	61.98	ug/L	124		70 - 130
	190304_02-02: MSD 1	Beryllium, Total	65.0	ug/L	130	4.8	0 - 20
	CCVB 1	Beryllium, Total	ND	ug/L		< 0.1	
	LCB 1	Beryllium, Total	ND	ug/L		< 0.1	
	LCS 1	Beryllium, Total	49.44	ug/L	99		85 - 115
	LCSD 1	Beryllium, Total	58.15	ug/L	116	16.2	0 - 20
	Method Blank 1	Beryllium, Total	ND	ug/L		< 0.1	
QC19030101	190228_01-01: MS 1	Bromide	1.54	mg/L	71		80 - 120
	190228_01-01: MSD 1	Bromide	1.61	mg/L	75	5.4	0 - 10
	CCVB 1	Bromide	ND	mg/L		< 0.1	
	LCS 1	Bromide	1.84	mg/L	92		90 - 110
	LCSD 1	Bromide	1.81	mg/L	90	1.9	0 - 10
	LCSL 1	Bromide	0.15	mg/L	77		50 - 150
	Method Blank 1	Bromide	ND	mg/L		< 0.1	
QC19031112	190304_02-02: MS 1	Cadmium, Total	49.94	ug/L	100		70 - 130
	190304_02-02: MSD 1	Cadmium, Total	51.17	ug/L	102	2.4	0 - 20
	CCVB 1	Cadmium, Total	ND	ug/L		< 0.1	
	LCB 1	Cadmium, Total	ND	ug/L		< 0.1	
	LCS 1	Cadmium, Total	49.94	ug/L	100		85 - 115
	LCSD 1	Cadmium, Total	48.32	ug/L	97	3.3	0 - 20
	LFB 1	Cadmium, Total	108.9	ug/L	109		70 - 130
	LFBD 1	Cadmium, Total	109.4	ug/L	109	0.5	0 - 20
	Method Blank 1	Cadmium, Total	ND	ug/L		< 0.1	
	QCS 1	Cadmium, Total	48.93	ug/L	98		85 - 115
QC19030607	190228_01-01: MS 1	Calcium	137.0	mg/L	96		70 - 130
	190228_01-01: MSD 1	Calcium	137.7	mg/L	97	1.4	0 - 20

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Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	CCVB 1	Calcium	ND	mg/L		< 0.1	
	LCB 1	Calcium	ND	mg/L		< 0.1	
	LCS 1	Calcium	48.83	mg/L	98		95 - 105
	LCSD 1	Calcium	51.24	mg/L	102	4.8	0 - 10
	LFB 1	Calcium	51.47	mg/L	103		85 - 115
	LFBD 1	Calcium	50.77	mg/L	102	1.4	0 - 20
	Method Blank 1	Calcium	ND	mg/L		< 0.1	
	QCS 1	Calcium	47.97	mg/L	96		95 - 105
QC19030101	190228_01-01: MS 1	Chloride	64.02	mg/L	80		80 - 120
	190228_01-01: MSD 1	Chloride	67.81	mg/L	99	21.2	0 - 10
	CCVB 1	Chloride	ND	mg/L		< 0.1	
	LCS 1	Chloride	20.22	mg/L	101		90 - 110
	LCSD 1	Chloride	20.2	mg/L	101	0.1	0 - 10
	LCSL 1	Chloride	1.91	mg/L	96		50 - 150
	Method Blank 1	Chloride	ND	mg/L		< 0.1	
QC19031112	190304_02-02: MS 1	Chromium, Total	44.37	ug/L	86		70 - 130
	190304_02-02: MSD 1	Chromium, Total	46.12	ug/L	90	4.0	0 - 20
	CCVB 1	Chromium, Total	ND	ug/L		< 0.1	
	LCB 1	Chromium, Total	ND	ug/L		< 0.1	
	LCS 1	Chromium, Total	46.53	ug/L	93		85 - 115
	LCSD 1	Chromium, Total	43.37	ug/L	87	7.0	0 - 20
	LFB 1	Chromium, Total	104.5	ug/L	105		70 - 130
	LFBD 1	Chromium, Total	108.8	ug/L	109	4.0	0 - 20
	Method Blank 1	Chromium, Total	ND	ug/L		< 0.1	
	QCS 1	Chromium, Total	46.14	ug/L	92		85 - 115
QC19022802	190228_01-01: Duplicate 1	Color, Apparent (Unfiltered)	11.0	Color Units		9.5	0 - 25
	CCVB 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
	LCS 1	Color, Apparent (Unfiltered)	5.0	Color Units	100		80 - 120
	LCSD 1	Color, Apparent (Unfiltered)	5.0	Color Units	100	< 0.1	0 - 20
	Method Blank 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
QC19030607	190228_01-01: MS 1	Copper, Total	1018.0	µg/L	103		70 - 130
	190228_01-01: MSD 1	Copper, Total	1014.0	µg/L	102	0.4	0 - 20
	CCVB 1	Copper, Total	ND	µg/L		< 0.1	
	LCB 1	Copper, Total	ND	µg/L		< 0.1	
	LCS 1	Copper, Total	951.0	µg/L	95		95 - 105
	LCSD 1	Copper, Total	1025.0	µg/L	103	7.5	0 - 10

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QC Results

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	LFB 1	Copper, Total	1009.0	µg/L	101		85 - 115
	LFBD 1	Copper, Total	995.0	µg/L	100	1.4	0 - 20
	Method Blank 1	Copper, Total	ND	µg/L		< 0.1	
	QCS 1	Copper, Total	991.3	µg/L	99		95 - 105
QC19030704	190305_16-01: MS 1	Cyanide, Available	99.96	µg/L	101		80 - 120
	190305_16-01: MSD 1	Cyanide, Available	101.6	µg/L	103	1.6	0 - 20
	CCVB 1	Cyanide, Available	ND	µg/L		< 0.1	
	LCS 1	Cyanide, Available	99.48	µg/L	99		90 - 110
	LCSD 1	Cyanide, Available	102.8	µg/L	103	3.3	0 - 10
	LCSL 1	Cyanide, Available	1.68	µg/L	84		50 - 150
	Method Blank 1	Cyanide, Available	ND	µg/L		< 0.1	
	QCS 1	Cyanide, Available	132.5	µg/L	133		90 - 110
QC19030101	190228_01-01: MS 1	Fluoride	2.11	mg/L	90		80 - 120
	190228_01-01: MSD 1	Fluoride	2.24	mg/L	97	7.3	0 - 10
	CCVB 1	Fluoride	ND	mg/L		< 0.1	
	LCS 1	Fluoride	2.01	mg/L	100		90 - 110
	LCSD 1	Fluoride	1.96	mg/L	98	2.5	0 - 10
	LCSL 1	Fluoride	0.17	mg/L	85		50 - 150
	Method Blank 1	Fluoride	ND	mg/L		< 0.1	
QC19030607	190228_01-01: MS 1	Iron, Total	1242.0	µg/L	102		70 - 130
	190228_01-01: MSD 1	Iron, Total	1235.0	µg/L	101	0.7	0 - 20
	CCVB 1	Iron, Total	ND	µg/L		< 0.1	
	LCB 1	Iron, Total	ND	µg/L		< 0.1	
	LCS 1	Iron, Total	987.6	µg/L	99		95 - 105
	LCSD 1	Iron, Total	1045.0	µg/L	104	5.6	0 - 10
	LFB 1	Iron, Total	1044.0	µg/L	104		85 - 115
	LFBD 1	Iron, Total	1035.0	µg/L	104	0.9	0 - 20
	Method Blank 1	Iron, Total	ND	µg/L		< 0.1	
	QCS 1	Iron, Total	1015.0	µg/L	101		95 - 105
QC19031112	190304_02-02: MS 1	Lead, Total	47.09	ug/L	94		70 - 130
	190304_02-02: MSD 1	Lead, Total	47.79	ug/L	96	1.5	0 - 20
	CCVB 1	Lead, Total	ND	ug/L		< 0.1	
	LCB 1	Lead, Total	ND	ug/L		< 0.1	
	LCS 1	Lead, Total	46.02	ug/L	92		85 - 115
	LCSD 1	Lead, Total	47.81	ug/L	96	3.8	0 - 20
	LFB 1	Lead, Total	102.4	ug/L	102		70 - 130

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Monday, April 08, 2019

QC Results

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	LFBD 1	Lead, Total	104.3	ug/L	104	1.8	0 - 20
	Method Blank 1	Lead, Total	ND	ug/L		< 0.1	
	QCS 1	Lead, Total	46.29	ug/L	93		85 - 115
QC19030607	190228_01-01: MS 1	Magnesium	73.97	mg/L	107		70 - 130
	190228_01-01: MSD 1	Magnesium	74.09	mg/L	107	0.2	0 - 20
	CCVB 1	Magnesium	ND	mg/L		< 0.1	
	LCB 1	Magnesium	ND	mg/L		< 0.1	
	LCS 1	Magnesium	49.18	mg/L	98		95 - 105
	LCSD 1	Magnesium	51.58	mg/L	103	4.8	0 - 10
	LFB 1	Magnesium	52.52	mg/L	105		85 - 115
	LFBD 1	Magnesium	51.75	mg/L	103	1.5	0 - 20
	Method Blank 1	Magnesium	ND	mg/L		< 0.1	
	QCS 1	Magnesium	51.71	mg/L	103		95 - 105
	190228_01-01: MS 1	Manganese, Total	1260.0	µg/L	103		70 - 130
	190228_01-01: MSD 1	Manganese, Total	1253.0	µg/L	102	0.7	0 - 20
	CCVB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCS 1	Manganese, Total	989.4	µg/L	99		95 - 105
	LCSD 1	Manganese, Total	1056.0	µg/L	106	6.5	0 - 10
	LFB 1	Manganese, Total	1044.0	µg/L	104		85 - 115
	LFBD 1	Manganese, Total	1029.0	µg/L	103	1.4	0 - 20
	Method Blank 1	Manganese, Total	ND	µg/L		< 0.1	
	QCS 1	Manganese, Total	1009.0	µg/L	101		95 - 105
QC19022813	190227_03-04: MS 1	MBAS (Surfactants)	0.21	mg/L	85		80 - 120
	190227_03-04: MSD 1	MBAS (Surfactants)	0.22	mg/L	90	5.5	0 - 10
	CCVB 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
	CCVB 2	MBAS (Surfactants)	ND	mg/L		< 0.1	
	LCS 1	MBAS (Surfactants)	0.27	mg/L	106		80 - 120
	LCSD 1	MBAS (Surfactants)	0.23	mg/L	93	13.7	0 - 10
	LCSL 1	MBAS (Surfactants)	0.06	mg/L	112		50 - 150
	Method Blank 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
QC19031112	190304_02-02: MS 1	Mercury, Total	0.91	ug/L	91		70 - 130
	190304_02-02: MSD 1	Mercury, Total	0.97	ug/L	97	6.3	0 - 20
	CCVB 1	Mercury, Total	ND	ug/L		< 0.1	
	LCB 1	Mercury, Total	ND	ug/L		< 0.1	
	LCS 1	Mercury, Total	0.93	ug/L	93		85 - 115

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Monday, April 08, 2019

QC Results

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	LCSD 1	Mercury, Total	0.83	ug/L	83	11.6	0 - 20
	Method Blank 1	Mercury, Total	ND	ug/L		< 0.1	
	QCS 1	Mercury, Total	0.73	ug/L	73		85 - 115
	190304_02-02: MS 1	Nickel, Total	47.61	ug/L	94		70 - 130
	190304_02-02: MSD 1	Nickel, Total	48.77	ug/L	96	2.5	0 - 20
	CCVB 1	Nickel, Total	ND	ug/L		< 0.1	
	LCB 1	Nickel, Total	ND	ug/L		< 0.1	
	LCS 1	Nickel, Total	49.94	ug/L	100		85 - 115
	LCSD 1	Nickel, Total	47.48	ug/L	95	5.0	0 - 20
	LFB 1	Nickel, Total	100.0	ug/L	100		70 - 130
	Method Blank 1	Nickel, Total	ND	ug/L		< 0.1	
	QCS 1	Nickel, Total	49.66	ug/L	99		85 - 115
QC19030101	190228_01-01: MS 1	Nitrate as N	1.71	mg/L	85		80 - 120
	190228_01-01: MSD 1	Nitrate as N	1.81	mg/L	90	5.6	0 - 10
	CCVB 1	Nitrate as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate as N	2.0	mg/L	100		90 - 110
	LCSD 1	Nitrate as N	2.0	mg/L	100	0.1	0 - 10
	LCSL 1	Nitrate as N	0.17	mg/L	84		50 - 150
	Method Blank 1	Nitrate as N	ND	mg/L		< 0.1	
	190228_01-01: MS 1	Nitrate+Nitrite as N	3.32	mg/L	83		80 - 120
	190228_01-01: MSD 1	Nitrate+Nitrite as N	3.52	mg/L	88	5.9	0 - 10
	CCVB 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate+Nitrite as N	4.1	mg/L	102		90 - 110
	LCSD 1	Nitrate+Nitrite as N	3.92	mg/L	98	4.3	0 - 10
	LCSL 1	Nitrate+Nitrite as N	0.33	mg/L	82		50 - 150
	Method Blank 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	190228_01-01: MS 1	Nitrite as N	1.61	mg/L	80		80 - 120
	190228_01-01: MSD 1	Nitrite as N	1.71	mg/L	85	6.2	0 - 10
	CCVB 1	Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrite as N	2.1	mg/L	105		90 - 110
	LCSD 1	Nitrite as N	1.93	mg/L	96	8.5	0 - 10
	LCSL 1	Nitrite as N	0.16	mg/L	80		50 - 150
	Method Blank 1	Nitrite as N	ND	mg/L		< 0.1	
	190228_01-01: MS 1	Orthophosphate as P	1.53	mg/L	76		80 - 120
	190228_01-01: MSD 1	Orthophosphate as P	1.63	mg/L	81	6.1	0 - 10
	CCVB 1	Orthophosphate as P	ND	mg/L		< 0.1	

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QC Results

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	LCS 1	Orthophosphate as P	2.07	mg/L	104		90 - 110
	LCSD 1	Orthophosphate as P	2.08	mg/L	104	0.5	0 - 10
	LCSL 1	Orthophosphate as P	0.16	mg/L	82		50 - 150
	Method Blank 1	Orthophosphate as P	ND	mg/L		< 0.1	
QC19030502	190304_06-01: MS 1	Perchlorate	4.74	ug/L	95		85 - 115
	190304_06-01: MSD 1	Perchlorate	4.87	ug/L	97	2.7	0 - 10
	CCVB 1	Perchlorate	ND	µg/L		< 0.1	
	IPC 1	Perchlorate	4.22	µg/L	84		80 - 120
	LCS 1	Perchlorate	4.84	ug/L	97		90 - 110
	LCSD 1	Perchlorate	5.35	ug/L	107	10.0	0 - 10
	LCSL 1	Perchlorate	1.95	ug/L	98		75 - 125
	Method Blank 1	Perchlorate	ND	µg/L		< 0.1	
	QCS 1	Perchlorate	5.03	ug/L	101		90 - 110
QC19030128	190228_13-03: Duplicate 1	pH (Laboratory)	7.3	pH (H)		< 0.1	0 - 10
	LCS 1	pH (Laboratory)	6.86	pH (H)	100		95 - 105
QC19030607	190228_01-01: MS 1	Potassium	18.48	mg/L	101		70 - 130
	190228_01-01: MSD 1	Potassium	18.78	mg/L	104	2.9	0 - 20
	CCVB 1	Potassium	ND	mg/L		< 0.1	
	LCB 1	Potassium	ND	mg/L		< 0.1	
	LCS 1	Potassium	9.69	mg/L	97		95 - 105
	LCSD 1	Potassium	10.19	mg/L	102	5.0	0 - 10
	LFB 1	Potassium	10.15	mg/L	101		85 - 115
	LFBD 1	Potassium	10.04	mg/L	100	1.0	0 - 20
	Method Blank 1	Potassium	ND	mg/L		< 0.1	
	QCS 1	Potassium	9.84	mg/L	98		95 - 105
QC19031112	190304_02-02: MS 1	Selenium, Total	53.83	ug/L	107		70 - 130
	190304_02-02: MSD 1	Selenium, Total	56.56	ug/L	112	5.0	0 - 20
	CCVB 1	Selenium, Total	ND	ug/L		< 0.1	
	LCB 1	Selenium, Total	ND	ug/L		< 0.1	
	LCS 1	Selenium, Total	51.01	ug/L	102		85 - 115
	LCSD 1	Selenium, Total	48.15	ug/L	96	5.8	0 - 20
	LFB 1	Selenium, Total	127.8	ug/L	128		70 - 130
	LFBD 1	Selenium, Total	126.7	ug/L	127	0.8	0 - 20
	Method Blank 1	Selenium, Total	ND	ug/L		< 0.1	
	QCS 1	Selenium, Total	49.86	ug/L	100		85 - 115
	190304_02-02: MS 1	Silver, Total	38.25	ug/L	76		70 - 130

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Monday, April 08, 2019

QC Results

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	190304_02-02: MSD 1	Silver, Total	39.46	ug/L	79	3.1	0 - 20
	CCVB 1	Silver, Total	ND	ug/L		< 0.1	
	LCB 1	Silver, Total	ND	ug/L		< 0.1	
	LCS 1	Silver, Total	45.7	ug/L	91		85 - 115
	LCSD 1	Silver, Total	39.72	ug/L	79	14.0	0 - 20
	LFB 1	Silver, Total	98.78	ug/L	99		70 - 130
	LFBD 1	Silver, Total	112.7	ug/L	113	13.1	0 - 20
	Method Blank 1	Silver, Total	ND	ug/L		< 0.1	
	QCS 1	Silver, Total	44.37	ug/L	89		85 - 115
QC19030607	190228_01-01: MS 1	Sodium	117.7	mg/L	98		70 - 130
	190228_01-01: MSD 1	Sodium	118.4	mg/L	99	1.4	0 - 20
	CCVB 1	Sodium	0.6	mg/L	1	0.6	
	LCB 1	Sodium	ND	mg/L		< 0.1	
	LCS 1	Sodium	48.6	mg/L	97		95 - 105
	LCSD 1	Sodium	51.2	mg/L	102	5.2	0 - 10
	LFB 1	Sodium	57.38	mg/L	115		85 - 115
	LFBD 1	Sodium	55.52	mg/L	111	3.3	0 - 20
	Method Blank 1	Sodium	ND	mg/L		< 0.1	
	QCS 1	Sodium	48.84	mg/L	98		95 - 105
QC19030604	190304_05-01: Duplicate 1	Specific Conductance (EC)	1199.0	µmhos/cm		0.3	0 - 10
	190305_18-03: Duplicate 2	Specific Conductance (EC)	35.0	µmhos/cm		< 0.1	0 - 10
	LCS 1	Specific Conductance (EC)	1417.0	µmhos/cm	100		90 - 110
	LCSL 1	Specific Conductance (EC)	146.0	µmhos/cm	99		90 - 110
QC19031112	190304_02-02: MS 1	Strontium, Total	46.74	ug/L	86		70 - 130
	190304_02-02: MSD 1	Strontium, Total	47.55	ug/L	88	1.9	0 - 20
	CCVB 1	Strontium, Total	ND	ug/L		< 0.1	
	LCB 1	Strontium, Total	ND	ug/L		< 0.1	
	LCS 1	Strontium, Total	45.96	ug/L	92		85 - 115
	LCSD 1	Strontium, Total	42.73	ug/L	85	7.3	0 - 20
	LFB 1	Strontium, Total	101.8	ug/L	102		70 - 130
	LFBD 1	Strontium, Total	105.3	ug/L	105	3.4	0 - 20
	Method Blank 1	Strontium, Total	ND	ug/L		< 0.1	
	QCS 1	Strontium, Total	42.91	ug/L	86		85 - 115
QC19030101	190228_01-01: MS 1	Sulfate	108.8	mg/L	66		80 - 120
	190228_01-01: MSD 1	Sulfate	115.1	mg/L	97	38.4	0 - 10
	CCVB 1	Sulfate	ND	mg/L		< 0.1	

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Monday, April 08, 2019

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	LCS 1	Sulfate	20.21	mg/L	101		90 - 110
	LCSD 1	Sulfate	20.17	mg/L	101	0.2	0 - 10
	LCSL 1	Sulfate	1.82	mg/L	91		50 - 150
	Method Blank 1	Sulfate	ND	mg/L		< 0.1	
QC19031112	190304_02-02: MS 1	Thallium, Total	48.99	ug/L	98		70 - 130
	190304_02-02: MSD 1	Thallium, Total	49.71	ug/L	99	1.4	0 - 20
	CCVB 1	Thallium, Total	ND	ug/L		< 0.1	
	LCB 1	Thallium, Total	ND	ug/L		< 0.1	
	LCS 1	Thallium, Total	48.96	ug/L	98		85 - 115
	LCSD 1	Thallium, Total	49.89	ug/L	100	1.9	0 - 20
	LFB 1	Thallium, Total	101.8	ug/L	102		70 - 130
	LFBD 1	Thallium, Total	104.4	ug/L	104	2.5	0 - 20
	Method Blank 1	Thallium, Total	ND	ug/L		< 0.1	
	QCS 1	Thallium, Total	47.5	ug/L	95		85 - 115
QC19030404	190228_09-03: Duplicate 1	Total Dissolved Solids	1444.0	mg/L		3.5	0 - 5
	CCVB 1	Total Dissolved Solids	ND	mg/L		< 0.1	
	LCS 1	Total Dissolved Solids	464.0	mg/L	93		90 - 110
	LCSD 1	Total Dissolved Solids	476.0	mg/L	95	2.6	0 - 10
	LCSL 1	Total Dissolved Solids	44.0	mg/L	88		50 - 150
	Method Blank 1	Total Dissolved Solids	ND	mg/L		< 0.1	
QC19022801	190228_01-01: Duplicate 1	Turbidity	0.7	NTU		< 0.1	0 - 20
	CCVB 1	Turbidity	ND	NTU		< 0.1	
	LCS 1	Turbidity	1.03	NTU	103		95 - 105
	LCSD 1	Turbidity	1.03	NTU	103	< 0.1	0 - 20
	Method Blank 1	Turbidity	ND	NTU		< 0.1	
QC19031112	CCVB 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	LCB 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	Method Blank 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	190304_02-02: MS 1	Uranium, Total	57.9	ug/L	116		70 - 130
	190304_02-02: MSD 1	Uranium, Total	59.08	ug/L	118	2.0	0 - 20
	CCVB 1	Uranium, Total	ND	ug/L		< 0.1	
	LCB 1	Uranium, Total	ND	ug/L		< 0.1	
	LCS 1	Uranium, Total	50.74	ug/L	101		85 - 115
	LCSD 1	Uranium, Total	55.62	ug/L	111	9.2	0 - 20
	LFB 1	Uranium, Total	103.0	ug/L	103		70 - 130
	LFBD 1	Uranium, Total	105.1	ug/L	105	2.0	0 - 20

Maggiora Bros Drilling Inc.
Chris Duncan
595 Airport Blvd.
Watsonville, California 95076

Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS (6227)
www.MBASinc.com
ELAP Certification Number: 2385

Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	Method Blank 1	Uranium, Total	ND	ug/L		< 0.1	
	QCS 1	Uranium, Total	51.94	ug/L	104		85 - 115
QC19030607	190228_01-01: MS 1	Zinc, Total	1059.0	µg/L	104		70 - 130
	190228_01-01: MSD 1	Zinc, Total	1047.0	µg/L	103	1.2	0 - 20
	CCVB 1	Zinc, Total	ND	µg/L		< 0.1	
	LCB 1	Zinc, Total	ND	µg/L		< 0.1	
	LCS 1	Zinc, Total	968.7	µg/L	97		95 - 105
	LCSD 1	Zinc, Total	1055.0	µg/L	105	8.5	0 - 10
	LFB 1	Zinc, Total	1041.0	µg/L	104		85 - 115
	LFBD 1	Zinc, Total	1017.0	µg/L	102	2.3	0 - 20
	Method Blank 1	Zinc, Total	ND	µg/L		< 0.1	
	QCS 1	Zinc, Total	996.4	µg/L	100		95 - 105

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ELAP Certification Number: 2385

Monday, April 08, 2019

Sample Condition Upon Receipt

Order ID: 190228_01

Is there evidence of chilling? *NOTE: Systems are encouraged but not required to hold samples <10°C (Microbiology) or <6°C (Chemistry) during transit.	Yes (<2hrs)
Did bottle arrive intact?	Yes
Did bottle labels agree with COC?	Yes
Adequate sample volume?	Yes
Sample preservative (HNO3, NaOH, H2SO4, Na2S2O3, HCl, Other)	#01 = (2) 250mL preserved w/ HNO3 PS
Additional Comments	#01 = 250mL preserved w/ NaOH PS
Additional Comments	#01 = 250mL filtered w/ 0.45um PS

190228_01

Monterey Bay Analytical Services Chain Of Custody / Analysis Request

4 Justin Ct. Suite D • Monterey, Ca 93940 • (831) 375-MBAS (6227) • (831) 641-0734 (Fax)

MBAS
Monterey Bay Analytical Services

Client/Company Name: Maggiora Bros Drilling
Attention: Chris Duncan
Billing Address: 595 Airport Blvd Watsonville, Ca 95076
Project/System Information: Tule Lakes Church Injection Well Project Maggiora Bros Drilling
E-Mail Address(es): Watsonville@MaggioraBros.com
Contract/P.O. #:
Turn Around Time: STD (7-14 Days) ☒ 48-Hour ☐ 5-Day ☐ 24-Hour ☐
Phone # 831-724-1338
Fax #
For Regulatory Compliance? YES ☐ NO ☐
For State or Local Health Department reporting:
Electronic Data Transfer (EDT)? YES ☐ NO ☐
System ID Number:
Drinking water ☐ Wastewater ☐ Monitoring Well ☐ Soil ☐ Sludge ☐ Other ☐

MBAS Lab #	Project ID or Source Code #	Sample Site / Description (Well Name, APN#, Address, Stormdrain #)	Sampling Date	Sampling Time	Receiving Temp.	CL2 Residual	Coliform Analysis: Routine	Other	Repeat	Special	# Cont.	Container Type	Container Size	T22, 123TCP, Perchl.	CR6, Asbestos, VOC & 524 inc MTBE	SOC Full, Dioxin,	GA/GB, radium 226/228	U, Sr, radon, tritium	NDMA, Fe Diss, Mn Diss, As Diss
-01		Zone 1 Perforations	2/28/19	955	10.4									X	X	X	X	X	X

	Printed Name	Signature	Date	Time
Sampled by:	Dylan Jones			
Relinquished by:	Dylan Jones		2/28/19	1149
Received by:	Pauline Seto		2/28/19	1149
Relinquished by:				
Received by:				

Comments or Special Instructions:
field pH: 7.45
field turb: 1.00 NTU
sampling time & travel [redacted] 1 hrs

☐ Payment received Check # Amount: Receipt # Date:

LA Testing
520 Mission Street South Pasadena, CA 91030
Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com / pasadenalab@latesting.com

LA Testing Order ID: 321905393
Customer ID: MBAS42
Customer PO:
Project ID:

Attn: Sara Sugarman
Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Phone: (831) 375-6227
Fax: (831) 641-0734
Received: 03/01/2019
Analyzed: 03/07/2019

Proj: Twin Lakes Church Injection Well

Test Report: Determination of Asbestos Structures >10µm in Drinking Water Performed by the 100.2 Method (EPA 600/R-94/134)

Sample ID Client / EMSL	Sample Filtration Date/Time	Original Sample Vol. Filtered (ml)	Effective Filter Area (mm²)	Area Analyzed (mm²)	ASBESTOS Asbestos Types	Fibers Detected	Analytical Sensitivity	Concentration	Confidence Limits
								MFL (million fibers per liter)	
190228_01-01 321905393-0001	3/1/2019 02:40 PM	100	1288	0.0645	None Detected	ND	0.20	<0.20	0.00 - 0.74

Collection Date/Time: *02/28/2019 09:55*

Zone 1 Perforations

Analyst(s)
Kyeong Corbin (1)



Jerry Drapala Ph.D, Laboratory Manager
or Other Approved Signatory

Any questions please contact Jerry Drapala.

Initial report from: 03/07/2019 20:58:36

Sample collection and containers provided by the client, acceptable bottle blank level is defined as ≤0.01MFL>10um. ND=None Detected. This report relates only to those items tested. This report may not be reproduced, except in full, without written permission by LA Testing. Samples received in good condition unless otherwise noted.

Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283

OrderID: 321905393

Asbestos Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

#321905393

LA TESTING
520 MISSION STREET
S. PASADENA, CA 91030
PHONE: (323) 254-9960
FAX: (323) 254-9982

Company : Monterey Bay Analytical Services (+32MBAS66)		**LA Testing-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*	
Street: 4 Justin Court, Suite D			
City: Monterey	**State/Province: CA**	**Zip/Postal Code: 93940**	**Country: USA**
Report To (Name): Sara Sugarman		**Fax #: 831-641-0734**	
Telephone #: 831-375-6227		**Email Address: info@mbasinc.com**	
Project Name/Number: Twin Lakes Church Injection Well			
Please Provide Results: ☐ Fax ☒ Email	**Purchase Order:**	**U.S. State Samples Taken: Ca**	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hours through 6 hours, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with LA Testing's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☒ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ EPA Protocol (Semi-Quantitative)
- ☐ EPA Protocol (Quantitative)

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: Dylan Jones | **Samplers Signature:**

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
	Zone 1 Perforations	1L	2/28/19, 9:55

Client Sample # (s): 190228_01-01 - **Total # of Samples:** 1

Relinquished (Client): [signature] **Date:** 2/28/19 **Time:** 1600

Received (Lab): K. Zhao (CEMSL-FE) **Date:** 3/1/19 **Time:** 9:25AM

Comments/Special Instructions: Account: MBAS42. Please include sample description in report.

Temp: 18.1°C

Page 1 of _____ pages

Controlled Document – Asbestos COC – R2 – 1/12/2010

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders:	9C01034	**Report Date:**	3/13/2019
		Received Date:	3/1/2019
Project:	Twin Lakes Church Injection Well Project	**Turnaround Time:**	Normal
		Phones:	(831) 375-6227
		Fax:	(831) 641-0734
Attn:	David Holland	**P.O. #:**	
Client:	Monterey Bay Analytical Services 4 Justin Court, Suite D Monterey, CA 93940	**Billing Code:**	

ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO 17025 #L2457.01 • LACSD #10143 • NELAP-CA #04229CA • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear David Holland,

Enclosed are the results of analyses for samples received 3/01/19 with the Chain-of-Custody document. The samples were received in good condition, at 3.8 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Regina Giancola
Project Manager

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.weckabs.com

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/13/2019 11:03

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
Zone 1 Perforations, RegID: 190228_01-01	Dylan Jones	9C01034-01	Water	02/28/19 09:55	

Analyses Accreditation Summary

Analyte	CAS #	Not By NELAP	By ANAB
EPA 521 in Water			
N-Nitrosodimethylamine	62-75-9	✓	
NDMA-d6		✓	
SRL 524M-TCP in Water			
1,2,3-Trichloropropane	96-18-4	✓	

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Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/13/2019 11:03

Sample Results

Sample: Zone 1 Perforations, RegID: 190228_01-01
9C01034-01 (Water)

Sampled: 02/28/19 9:55 by Dylan Jones

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM						
Method: SRL 524M-TCP **Batch ID:** W9C0175 **Instr:** GCMS04		**Prepared:** 03/05/19 11:37			**Analyst:** enf	
1,2,3-Trichloropropane	ND	0.0050	ug/l	1	03/05/19 17:52	
Nitrosamines by CI GC/MS/MS, EPA 521						
Method: EPA 521 **Batch ID:** W9C0090 **Instr:** GCMS09		**Prepared:** 03/04/19 08:50			**Analyst:** mld	
N-Nitrosodimethylamine	ND	2.0	ng/l	1	03/05/19 01:29	
Surrogate(s)						
NDMA-d6	*81%*	*Conc: 20.3*			*03/05/19 01:29*	

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www.weckla

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported: 03/13/2019 11:03

Quality Control Results

Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0175 - SRL 524M-TCP										
Blank (W9C0175-BLK1)				**Prepared & Analyzed: 03/05/19**						
1,2,3-Trichloropropane	ND	0.0050	ug/l							
LCS (W9C0175-BS1)				**Prepared & Analyzed: 03/05/19**						
1,2,3-Trichloropropane	0.00481	0.0050	ug/l	0.00500		96	80-120			
LCS Dup (W9C0175-BSD1)				**Prepared & Analyzed: 03/05/19**						
1,2,3-Trichloropropane	0.00511	0.0050	ug/l	0.00500		102	80-120	6	20	
Duplicate (W9C0175-DUP1)	**Source: 9C04037-03**			**Prepared & Analyzed: 03/05/19**						
1,2,3-Trichloropropane	ND	0.0050	ug/l		ND				20	

Quality Control Results

Nitrosamines by CI GC/MS/MS, EPA 521

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0090 - EPA 521										
Blank (W9C0090-BLK1)				**Prepared: 03/04/19 Analyzed: 03/05/19**						
N-Nitrosodimethylamine	ND	2.0	ng/l							
Surrogate(s)										
NDMA-d6	*23.4*		*ng/l*	*25.0*		*93*	*70-130*			
LCS (W9C0090-BS1)				**Prepared & Analyzed: 03/04/19**						
N-Nitrosodimethylamine	1.87	2.0	ng/l	2.00		94	50-150			
Surrogate(s)										
NDMA-d6	*18.2*		*ng/l*	*25.0*		*73*	*70-130*			
LCS Dup (W9C0090-BSD1)				**Prepared & Analyzed: 03/04/19**						
N-Nitrosodimethylamine	1.92	2.0	ng/l	2.00		96	50-150	2	50	
Surrogate(s)										
NDMA-d6	*19.1*		*ng/l*	*25.0*		*77*	*70-130*			

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www.weckla

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/13/2019 11:03

Notes and Definitions

Item	Definition
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Source	Sample that was matrix spiked or duplicated.
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) and Detection Limit for Reporting (DLR)
MDA	Minimum Detectable Activity
NR	Not Reportable
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.
An Absence of Total Coliform meets the drinking water standards as established by the California State Water Resources Control Board (SWRCB)
All results are expressed on wet weight basis unless otherwise specified.
All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS 002.

CHAIN OF CUSTODY RECORD

Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964
14859 East Clark Avenue : Industry : CA 91745
Tel 626-336-2139 ♦ Fax 626-336-2634 ♦ www.wecklabs.com

STANDARD 9C01034

CLIENT NAME:	PROJECT:
Monterey Bay Analytical Svcs	Twin Lakes Church Injection Well Project
ADDRESS:	PHONE: 831-375-6227
4 Justin Court Suite D	FAX: 831-641-0734
Monterey CA 93940	EMAIL: info@mbasinc.com
PROJECT MANAGER	SAMPLER
David Holland	Dylan Jones

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 - 15 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	ANALYSES REQUESTED: 1,2,3-TCP	EPA 521 (NDMA)								
	02/28/19	9:55	DW	Zone 1 Perforations	4	X	X								190228_01-01

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	2/28/19 1400	GSO
GSO	3/1/19 1031	[signature]

SAMPLE CONDITION:

Actual Temperature: 3.8°C

Received On Ice	Y (N)
Preserved	(Y) N
Evidence Seals Present	(Y) N
Container Attacked	Y (N)
Preserved at Lab	Y (N)

T-0131

SAMPLE TYPE CODE:

- AQ=Aqueous
- NA= Non Aqueous
- SL = Sludge
- DW = Drinking Water
- WW = Waste Water
- RW = Rain Water
- GW = Ground Water
- SO = Soil
- SW = Solid Waste
- OL = Oil
- OT = Other Matrix

PRESCHEDULED RUSH ANALYSES WILL TAKE PRIORITY OVER UNSCHEDULED RUSH REQUESTS

Client agrees to Terms & Conditions at: www.wecklabs.com

SPECIAL REQUIREMENTS / BILLING INFORMATION

COC [illegible] 2707

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
559-497-2888 (Main)
559-485-6935 (FAX)

A9C0090
3/19/2019
Invoice: A906792

David Holland
Monterey Bay Analytical
4 Justin Court Suite D
Monterey, CA 93940

RE: Report for A9C0090 General

Dear David Holland,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 3/1/2019. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

This certificate of analysis shall not be reproduced except in full, without written approval of the laboratory.

If additional clarification of any information is required, please contact your Project Manager, Jaime Lee LaFave , at 559-497-2888.

Thank you again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Jaime Lee LaFave, Project Manager

Accredited in Accordance with NELAP
ORELAP #4021-009

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK ASSOCIATES

Case Narrative

Project and Report Details		Invoice Details	
Client:	Monterey Bay Analytical	**Invoice To:**	Monterey Bay Analytical
Report To:	David Holland	**Invoice Attn:**	David Holland
Project #:	Twin Lakes Church Injection Well	**Project PO#:**	-
Received:	3/01/2019 - 11:52		
Report Due:	3/22/2019		

Sample Receipt Conditions

Cooler: Default Cooler

Temperature on Receipt ºC: 3.4

Containers Intact
COC/Labels Agree
Received On Wet Ice
Packing Material - Bubble Wrap
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Data Qualifiers

The following qualifiers have been applied to one or more analytical results:

BS	Blank spike recoveries did not meet acceptance limits.
BS1.0	Blank spike recovery for this analyte was biased high; no material impact on reported result as sample is ND for this parameter.
CV0.0	CCV recovery was above method acceptance limits; no material impact on reported result as sample is ND for this parameter.
MS1.0	Matrix spike recoveries exceed control limits.
MS1.2	Matrix spike recovery exceeds lower control limit. Reported results for parent matrix should be considered estimated due to matrix interferences.

Report Distribution

Recipient(s)	Report Format	CC:
David Holland	FINAL.RPT	
Monterey Bay Analytical Services	FINAL.RPT	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hexavalent Chromium	EPA 218.7	ND	0.050	ug/L	1	A903179	03/07/19	03/07/19	

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
EDB and DBCP by GC-ECD									
Dibromochloropropane (DBCP)	EPA 504.1	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Ethylene Dibromide (EDB)	EPA 504.1	ND	0.020	ug/L	1	A902960	03/04/19	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 504.1	122 %	*Acceptable range: 70-130 %*						
Organohalide Pesticides and PCBs by GC-ECD									
Aldrin	EPA 505	ND	0.075	ug/L	1	A902960	03/04/19	03/06/19	
Chlordane	EPA 505	ND	0.10	ug/L	1	A902960	03/04/19	03/06/19	
Dieldrin	EPA 505	ND	0.020	ug/L	1	A902960	03/04/19	03/06/19	
Endrin	EPA 505	ND	0.10	ug/L	1	A902960	03/04/19	03/06/19	
Heptachlor	EPA 505	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Heptachlor Epoxide	EPA 505	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Hexachlorobenzene	EPA 505	ND	0.50	ug/L	1	A902960	03/04/19	03/06/19	
Hexachlorocyclopentadiene	EPA 505	ND	1.0	ug/L	1	A902960	03/04/19	03/06/19	
Lindane	EPA 505	ND	0.20	ug/L	1	A902960	03/04/19	03/06/19	
Methoxychlor	EPA 505	ND	10	ug/L	1	A902960	03/04/19	03/06/19	
PCB Aroclor Screen	EPA 505	ND	0.50	ug/L	1	A902960	03/04/19	03/06/19	
Toxaphene	EPA 505	ND	1.0	ug/L	1	A902960	03/04/19	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 505	122 %	*Acceptable range: 70-130 %*						
Chlorinated Acid Herbicides by GC-ECD									
2,4,5-T	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
2,4,5-TP (Silvex)	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
2,4-D	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/11/19	
Bentazon	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/11/19	
Dalapon	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/11/19	
Dicamba	EPA 515.4	ND	1.5	ug/L	1	A903254	03/11/19	03/11/19	
Dinoseb	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/11/19	
Pentachlorophenol	EPA 515.4	ND	0.20	ug/L	1	A903254	03/11/19	03/11/19	MS1.2
Picloram	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
Surrogate: DCPAA	EPA 515.4	112 %	*Acceptable range: 70-130 %*						
Volatile Organics by GC-MS									
1,1,1,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,1-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	

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Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
1,1-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,3-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,4-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,4-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3,5-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,4-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
2,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
2-Butanone	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
2-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
2-Hexanone	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
4-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
4-Methyl-2-pentanone	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
Acetone	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
Benzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromodichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromoform	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromomethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Carbon Tetrachloride	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0, CV0.0
Chloroform	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
cis-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
cis-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dibromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dibromomethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dichlorodifluoromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
Dichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Di-isopropyl ether (DIPE)	EPA 524.2	ND	3.0	ug/L	1	A903007	03/05/19	03/05/19	
Ethyl tert-Butyl Ether (ETBE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Ethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Hexachlorobutadiene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Isopropylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
m,p-Xylenes	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Methyl-t-butyl ether	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Naphthalene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	

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Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
n-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
n-Propylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
o-Xylene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
p-Isopropyltoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
sec-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Styrene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
tert-Amyl Methyl Ether (TAME)	EPA 524.2	ND	3.0	ug/L	1	A903007	03/05/19	03/05/19	
tert-Butyl alcohol (TBA)	EPA 524.2	ND	2.0	ug/L	1	A903007	03/05/19	03/05/19	
tert-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Tetrachloroethene (PCE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Toluene	EPA 524.2	**0.68**	0.50	ug/L	1	A903007	03/05/19	03/05/19	
trans-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
trans-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Trichloroethene (TCE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Trichlorofluoromethane	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
Vinyl Chloride	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
Surrogate: 1,2-Dichlorobenzene-d4	EPA 524.2	101 %	*Acceptable range: 70-130 %*						
Surrogate: Bromofluorobenzene	EPA 524.2	92 %	*Acceptable range: 70-130 %*						
Total 1,3-Dichloropropene		ND	0.50	ug/L					
Total Trihalomethanes		ND	0.50	ug/L					
Total Xylenes, EPA 524.2		ND	0.50	ug/L					
Carbamates by HPLC									
3-Hydroxycarbofuran	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	
Aldicarb	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	
Aldicarb Sulfone	EPA 531.1	ND	2.0	ug/L	1	A902963	03/04/19	03/05/19	
Aldicarb Sulfoxide	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	
Carbaryl	EPA 531.1	ND	5.0	ug/L	1	A902963	03/04/19	03/05/19	
Carbofuran	EPA 531.1	ND	5.0	ug/L	1	A902963	03/04/19	03/05/19	
Methomyl	EPA 531.1	ND	2.0	ug/L	1	A902963	03/04/19	03/05/19	
Oxamyl	EPA 531.1	ND	20	ug/L	1	A902963	03/04/19	03/05/19	
Glyphosate by HPLC									
Glyphosate	EPA 547	ND	25	ug/L	1	A902884	03/01/19	03/02/19	
Surrogate: AMPA	EPA 547	81 %	*Acceptable range: 70-130 %*						
Endothall by GC-MS									
Endothall	EPA 548.1	ND	45	ug/L	1	A903189	03/07/19	03/17/19	
Diquat by HPLC									
Diquat	EPA 549.2	ND	4.0	ug/L	1	A902905	03/04/19	03/06/19	

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BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 218.7 - Quality Control											
Batch: A903179										Prepared: 3/7/2019	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank (A903179-BLK1)											
Hexavalent Chromium	ND	0.050	ug/L							03/07/19	
Blank Spike (A903179-BS1)											
Hexavalent Chromium	0.059	0.050	ug/L	0.050	ND	118	50-150			03/07/19	
Matrix Spike (A903179-MS1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115			03/07/19	
Matrix Spike Dup (A903179-MSD1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115	0	15	03/07/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 504.1 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A902960-BLK1)											
Dibromochloropropane (DBCP)	ND	0.010	ug/L							03/06/19	
Ethylene Dibromide (EDB)	ND	0.020	ug/L							03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*112*	*70-130*			03/06/19	
Blank Spike (A902960-BS1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	115	70-130			03/06/19	
Ethylene Dibromide (EDB)	0.12	0.020	ug/L	0.10	ND	116	70-130			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*111*	*70-130*			03/06/19	
Blank Spike Dup (A902960-BSD1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	111	70-130	3	20	03/06/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	112	70-130	4	20	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*108*	*70-130*			03/06/19	
Matrix Spike (A902960-MS1), Source: A9B3314-06											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	113	65-135			03/06/19	
Ethylene Dibromide (EDB)	0.12	0.020	ug/L	0.10	ND	115	65-135			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.50*			*0.46*		*109*	*70-130*			03/06/19	
EPA 505 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A902960-BLK1)											
Aldrin	ND	0.075	ug/L							03/06/19	
Chlordane	ND	0.10	ug/L							03/06/19	
Dieldrin	ND	0.020	ug/L							03/06/19	
Endrin	ND	0.10	ug/L							03/06/19	
Heptachlor	ND	0.010	ug/L							03/06/19	
Heptachlor Epoxide	ND	0.010	ug/L							03/06/19	
Hexachlorobenzene	ND	0.50	ug/L							03/06/19	
Hexachlorocyclopentadiene	ND	1.0	ug/L							03/06/19	
Lindane	ND	0.20	ug/L							03/06/19	
Methoxychlor	ND	10	ug/L							03/06/19	
PCB Aroclor Screen	ND	0.50	ug/L							03/06/19	
Toxaphene	ND	1.0	ug/L							03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*112*	*70-130*			03/06/19	
Blank Spike (A902960-BS1)											
Aldrin	0.89	0.075	ug/L	0.74	ND	120	70-130			03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	112	70-130			03/06/19	
Endrin	0.11	0.10	ug/L	0.10	ND	109	70-130			03/06/19	
Heptachlor	0.12	0.010	ug/L	0.10	ND	118	70-130			03/06/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	111	70-130			03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 505 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank Spike (A902960-BS1)											
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	115	70-130			03/06/19	
Hexachlorocyclopentadiene	1.2	1.0	ug/L	1.0	ND	118	70-130			03/06/19	
Lindane	0.21	0.20	ug/L	0.20	ND	107	70-130			03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	117	70-130			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*111*	*70-130*			03/06/19	
Blank Spike Dup (A902960-BSD1)											
Aldrin	0.82	0.075	ug/L	0.74	ND	110	70-130	8	20	03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	110	70-130	2	20	03/06/19	
Endrin	0.10	0.10	ug/L	0.10	ND	102	70-130	6	20	03/06/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	114	70-130	4	20	03/06/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	110	70-130	1	20	03/06/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	110	70-130	4	20	03/06/19	
Hexachlorocyclopentadiene	1.0	1.0	ug/L	1.0	ND	101	70-130	16	20	03/06/19	
Lindane	0.21	0.20	ug/L	0.20	ND	103	70-130	3	20	03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	118	70-130	1	20	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*108*	*70-130*			03/06/19	
Matrix Spike (A902960-MS1), Source: A9B3314-06											
Aldrin	0.87	0.075	ug/L	0.75	ND	117	65-135			03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	107	65-135			03/06/19	
Endrin	0.11	0.10	ug/L	0.10	ND	106	65-135			03/06/19	
Heptachlor	0.12	0.010	ug/L	0.10	ND	120	65-135			03/06/19	
Heptachlor Epoxide	0.12	0.010	ug/L	0.10	ND	115	65-135			03/06/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	113	65-135			03/06/19	
Hexachlorocyclopentadiene	1.1	1.0	ug/L	1.0	ND	100	65-135			03/06/19	
Lindane	0.22	0.20	ug/L	0.20	ND	100	65-135			03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	119	65-135			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.50*			*0.46*		*109*	*70-130*			03/06/19	
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
2,4,5-T	ND	1.0	ug/L							03/11/19	
2,4,5-TP (Silvex)	ND	1.0	ug/L							03/11/19	
2,4-D	ND	10	ug/L							03/11/19	
Bentazon	ND	2.0	ug/L							03/11/19	
Dalapon	ND	10	ug/L							03/11/19	
Dicamba	ND	1.5	ug/L							03/11/19	
Dinoseb	ND	2.0	ug/L							03/11/19	
Pentachlorophenol	ND	0.20	ug/L							03/11/19	
Picloram	ND	1.0	ug/L							03/11/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
Surrogate: DCPAA	*34*			*36*		*94*	*70-130*			03/11/19	
Blank Spike (A903254-BS1)											
2,4,5-T	1.7	1.0	ug/L	1.6	ND	108	70-130			03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	102	70-130			03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	105	70-130			03/11/19	
Bentazon	2.0	2.0	ug/L	2.0	ND	99	70-130			03/11/19	
Dalapon	4.0	10	ug/L	4.0	ND	99	70-130			03/11/19	
Dicamba	0.77	1.5	ug/L	0.80	ND	96	70-130			03/11/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	95	70-130			03/11/19	
Pentachlorophenol	0.15	0.20	ug/L	0.16	ND	93	70-130			03/11/19	
Picloram	0.40	1.0	ug/L	0.40	ND	101	70-130			03/11/19	
Surrogate: DCPAA	*35*			*36*		*96*	*70-130*			03/11/19	
Blank Spike Dup (A903254-BSD1)											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	112	70-130	3	20	03/12/19	
2,4,5-TP (Silvex)	0.87	1.0	ug/L	0.80	ND	109	70-130	7	20	03/12/19	
2,4-D	0.45	10	ug/L	0.40	ND	111	70-130	6	20	03/12/19	
Bentazon	2.2	2.0	ug/L	2.0	ND	112	70-130	12	20	03/12/19	
Dalapon	4.0	10	ug/L	4.0	ND	101	70-130	2	20	03/12/19	
Dicamba	0.85	1.5	ug/L	0.80	ND	106	70-130	10	20	03/12/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	94	70-130	1	20	03/12/19	
Pentachlorophenol	0.16	0.20	ug/L	0.16	ND	97	70-130	4	20	03/12/19	
Picloram	0.43	1.0	ug/L	0.40	ND	108	70-130	7	20	03/12/19	
Surrogate: DCPAA	*38*			*36*		*104*	*70-130*			03/12/19	
Matrix Spike (A903254-MS1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130			03/11/19	
2,4,5-TP (Silvex)	0.85	1.0	ug/L	0.80	ND	106	70-130			03/11/19	
2,4-D	0.44	10	ug/L	0.40	ND	110	70-130			03/11/19	
Bentazon	1.8	2.0	ug/L	2.0	ND	88	70-130			03/11/19	
Dalapon	3.8	10	ug/L	4.0	ND	95	70-130			03/11/19	
Dicamba	0.76	1.5	ug/L	0.80	ND	94	70-130			03/11/19	
Dinoseb	0.71	2.0	ug/L	0.80	ND	83	70-130			03/11/19	
Pentachlorophenol	0.11	0.20	ug/L	0.16	ND	67	70-130			03/11/19	MS1.0 ***Low***
Picloram	0.37	1.0	ug/L	0.40	ND	93	70-130			03/11/19	
Surrogate: DCPAA	*42*			*36*		*118*	*70-130*			03/11/19	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130	0	30	03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	101	70-130	5	30	03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	106	70-130	4	30	03/11/19	
Bentazon	1.7	2.0	ug/L	2.0	ND	87	70-130	1	30	03/11/19	
Dalapon	3.7	10	ug/L	4.0	ND	93	70-130	2	30	03/11/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
Dicamba	0.73	1.5	ug/L	0.80	ND	91	70-130	4	30	03/11/19	
Dinoseb	0.69	2.0	ug/L	0.80	ND	79	70-130	4	30	03/11/19	
Pentachlorophenol	0.094	0.20	ug/L	0.16	ND	59	70-130	13	30	03/11/19	MS1.0 ***Low***
Picloram	0.36	1.0	ug/L	0.40	ND	90	70-130	3	30	03/11/19	
Surrogate: DCPAA	*41*			*36*		*113*	*70-130*			03/11/19	
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903007-BLK1)											
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L							03/05/19	
1,1,1-Trichloroethane	ND	0.50	ug/L							03/05/19	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L							03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	ug/L							03/05/19	
1,1,2-Trichloroethane	ND	0.50	ug/L							03/05/19	
1,1-Dichloroethane	ND	0.50	ug/L							03/05/19	
1,1-Dichloroethene	ND	0.50	ug/L							03/05/19	
1,1-Dichloropropene	ND	0.50	ug/L							03/05/19	
1,2,3-Trichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2,4-Trichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2,4-Trimethylbenzene	ND	0.50	ug/L							03/05/19	
1,2-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2-Dichloroethane	ND	0.50	ug/L							03/05/19	
1,2-Dichloropropane	ND	0.50	ug/L							03/05/19	
1,3,5-Trimethylbenzene	ND	0.50	ug/L							03/05/19	
1,3-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
1,3-Dichloropropane	ND	0.50	ug/L							03/05/19	
1,4-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
2,2-Dichloropropane	ND	0.50	ug/L							03/05/19	
2-Butanone	ND	5.0	ug/L							03/05/19	
2-Chlorotoluene	ND	0.50	ug/L							03/05/19	
2-Hexanone	ND	10	ug/L							03/05/19	
4-Chlorotoluene	ND	0.50	ug/L							03/05/19	
4-Methyl-2-pentanone	ND	5.0	ug/L							03/05/19	
Acetone	ND	10	ug/L							03/05/19	
Benzene	ND	0.50	ug/L							03/05/19	
Bromobenzene	ND	0.50	ug/L							03/05/19	
Bromochloromethane	ND	0.50	ug/L							03/05/19	
Bromodichloromethane	ND	0.50	ug/L							03/05/19	
Bromoform	ND	0.50	ug/L							03/05/19	
Bromomethane	ND	0.50	ug/L							03/05/19	
Carbon Tetrachloride	ND	0.50	ug/L							03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903007-BLK1)											
Chlorobenzene	ND	0.50	ug/L							03/05/19	
Chloroethane	ND	0.50	ug/L							03/05/19	
Chloroform	ND	0.50	ug/L							03/05/19	
Chloromethane	ND	0.50	ug/L							03/05/19	
cis-1,2-Dichloroethene	ND	0.50	ug/L							03/05/19	
cis-1,3-Dichloropropene	ND	0.50	ug/L							03/05/19	
Dibromochloromethane	ND	0.50	ug/L							03/05/19	
Dibromomethane	ND	0.50	ug/L							03/05/19	
Dichlorodifluoromethane	ND	0.50	ug/L							03/05/19	
Dichloromethane	ND	0.50	ug/L							03/05/19	
Di-isopropyl ether (DIPE)	ND	3.0	ug/L							03/05/19	
Ethyl tert-Butyl Ether (ETBE)	ND	0.50	ug/L							03/05/19	
Ethylbenzene	ND	0.50	ug/L							03/05/19	
Hexachlorobutadiene	ND	0.50	ug/L							03/05/19	
Isopropylbenzene	ND	0.50	ug/L							03/05/19	
m,p-Xylenes	ND	0.50	ug/L							03/05/19	
Methyl-t-butyl ether	ND	0.50	ug/L							03/05/19	
Naphthalene	ND	0.50	ug/L							03/05/19	
n-Butylbenzene	ND	0.50	ug/L							03/05/19	
n-Propylbenzene	ND	0.50	ug/L							03/05/19	
o-Xylene	ND	0.50	ug/L							03/05/19	
p-Isopropyltoluene	ND	0.50	ug/L							03/05/19	
sec-Butylbenzene	ND	0.50	ug/L							03/05/19	
Styrene	ND	0.50	ug/L							03/05/19	
tert-Amyl Methyl Ether (TAME)	ND	3.0	ug/L							03/05/19	
tert-Butyl alcohol (TBA)	ND	2.0	ug/L							03/05/19	
tert-Butylbenzene	ND	0.50	ug/L							03/05/19	
Tetrachloroethene (PCE)	ND	0.50	ug/L							03/05/19	
Toluene	ND	0.50	ug/L							03/05/19	
trans-1,2-Dichloroethene	ND	0.50	ug/L							03/05/19	
trans-1,3-Dichloropropene	ND	0.50	ug/L							03/05/19	
Trichloroethene (TCE)	ND	0.50	ug/L							03/05/19	
Trichlorofluoromethane	ND	5.0	ug/L							03/05/19	
Vinyl Chloride	ND	0.50	ug/L							03/05/19	
Surrogate: 1,2-Dichlorobenzene-d4	*53*			*50*		*107*	*70-130*			03/05/19	
Surrogate: Bromofluorobenzene	*52*			*50*		*104*	*70-130*			03/05/19	
Blank Spike (A903007-BS1)											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	110	70-130			03/05/19	
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	115	70-130			03/05/19	
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	108	70-130			03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	114	70-130			03/05/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	104	70-130			03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903007										Prepared: 3/5/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903007-BS1)												
1,1-Dichloroethane	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
1,1-Dichloroethene	12	0.50	ug/L	10	ND	117	70-130			03/05/19		
1,1-Dichloropropene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
1,2,3-Trichlorobenzene	10	0.50	ug/L	10	ND	101	70-130			03/05/19		
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
1,2-Dichlorobenzene	12	0.50	ug/L	10	ND	115	70-130			03/05/19		
1,2-Dichloroethane	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
1,2-Dichloropropane	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/05/19		
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
1,3-Dichloropropane	10	0.50	ug/L	10	ND	103	70-130			03/05/19		
1,4-Dichlorobenzene	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
2,2-Dichloropropane	14	0.50	ug/L	10	ND	137	70-130			03/05/19	BS	***High***
2-Butanone	9.4	5.0	ug/L	10	ND	94	70-130			03/05/19		
2-Chlorotoluene	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
2-Hexanone	8.7	10	ug/L	10	ND	87	70-130			03/05/19		
4-Chlorotoluene	12	0.50	ug/L	10	ND	116	70-130			03/05/19		
4-Methyl-2-pentanone	8.9	5.0	ug/L	10	ND	89	70-130			03/05/19		
Acetone	12	10	ug/L	10	ND	120	70-130			03/05/19		
Benzene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
Bromobenzene	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
Bromochloromethane	12	0.50	ug/L	10	ND	121	70-130			03/05/19		
Bromodichloromethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Bromoform	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
Bromomethane	12	0.50	ug/L	10	ND	123	70-130			03/05/19		
Carbon disulfide	12	10	ug/L	10	ND	122	70-130			03/05/19		
Carbon Tetrachloride	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
Chlorobenzene	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
Chloroethane	15	0.50	ug/L	10	ND	151	70-130			03/05/19	BS	***High***
Chloroform	11	0.50	ug/L	10	ND	107	70-130			03/05/19		
Chloromethane	14	0.50	ug/L	10	ND	142	70-130			03/05/19	BS	***High***
cis-1,2-Dichloroethene	12	0.50	ug/L	10	ND	117	70-130			03/05/19		
cis-1,3-Dichloropropene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Dibromochloromethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Dibromomethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Dichlorodifluoromethane	14	0.50	ug/L	10	ND	137	70-130			03/05/19	BS	***High***
Dichloromethane	12	0.50	ug/L	10	ND	122	70-130			03/05/19		
Di-isopropyl ether (DIPE)	10	3.0	ug/L	10	ND	101	70-130			03/05/19		
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	105	70-130			03/05/19		
Ethylbenzene	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
Hexachlorobutadiene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		
Isopropylbenzene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903007										Prepared: 3/5/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903007-BS1)												
m,p-Xylenes	21	0.50	ug/L	20	ND	104	70-130			03/05/19		
Methyl-t-butyl ether	23	0.50	ug/L	20	ND	115	70-130			03/05/19		
Naphthalene	8.6	0.50	ug/L	10	ND	86	70-130			03/05/19		
n-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
n-Propylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/05/19		
o-Xylene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
p-Isopropyltoluene	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
sec-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Styrene	9.8	0.50	ug/L	10	ND	98	70-130			03/05/19		
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	105	70-130			03/05/19		
tert-Butyl alcohol (TBA)	9.0	2.0	ug/L	10	ND	90	70-130			03/05/19		
tert-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Tetrachloroethene (PCE)	10	0.50	ug/L	10	ND	103	70-130			03/05/19		
Toluene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
trans-1,2-Dichloroethene	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
trans-1,3-Dichloropropene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
Trichlorofluoromethane	13	5.0	ug/L	10	ND	125	70-130			03/05/19		
Vinyl Chloride	14	0.50	ug/L	10	ND	139	70-130			03/05/19	BS	***High***
Surrogate: 1,2-Dichlorobenzene-d4	*58*			*50*		*116*	*70-130*			03/05/19		
Surrogate: Bromofluorobenzene	*59*			*50*		*119*	*70-130*			03/05/19		
Blank Spike Dup (A903007-BSD1)												
1,1,1,2-Tetrachloroethane	10	0.50	ug/L	10	ND	102	70-130	8	30	03/05/19		
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	107	70-130	7	30	03/05/19		
1,1,2,2-Tetrachloroethane	10	0.50	ug/L	10	ND	102	70-130	5	30	03/05/19		
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	107	70-130	6	30	03/05/19		
1,1,2-Trichloroethane	9.9	0.50	ug/L	10	ND	99	70-130	5	30	03/05/19		
1,1-Dichloroethane	11	0.50	ug/L	10	ND	108	70-130	10	30	03/05/19		
1,1-Dichloroethene	11	0.50	ug/L	10	ND	108	70-130	8	30	03/05/19		
1,1-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	2	30	03/05/19		
1,2,3-Trichlorobenzene	9.9	0.50	ug/L	10	ND	99	70-130	3	30	03/05/19		
1,2,4-Trichlorobenzene	10	0.50	ug/L	10	ND	100	70-130	5	30	03/05/19		
1,2,4-Trimethylbenzene	10	0.50	ug/L	10	ND	105	70-130	8	30	03/05/19		
1,2-Dichlorobenzene	10	0.50	ug/L	10	ND	104	70-130	10	30	03/05/19		
1,2-Dichloroethane	10	0.50	ug/L	10	ND	103	70-130	9	30	03/05/19		
1,2-Dichloropropane	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19		
1,3,5-Trimethylbenzene	10	0.50	ug/L	10	ND	103	70-130	7	30	03/05/19		
1,3-Dichlorobenzene	10	0.50	ug/L	10	ND	102	70-130	10	30	03/05/19		
1,3-Dichloropropane	10	0.50	ug/L	10	ND	100	70-130	4	30	03/05/19		
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	107	70-130	10	30	03/05/19		
2,2-Dichloropropane	13	0.50	ug/L	10	ND	125	70-130	9	30	03/05/19		
2-Butanone	10	5.0	ug/L	10	ND	103	70-130	9	30	03/05/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903007-BSD1)											
2-Chlorotoluene	10	0.50	ug/L	10	ND	105	70-130	7	30	03/05/19	
2-Hexanone	9.7	10	ug/L	10	ND	97	70-130	12	30	03/05/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	107	70-130	9	30	03/05/19	
4-Methyl-2-pentanone	9.2	5.0	ug/L	10	ND	92	70-130	3	30	03/05/19	
Acetone	13	10	ug/L	10	ND	127	70-130	6	30	03/05/19	
Benzene	10	0.50	ug/L	10	ND	102	70-130	4	30	03/05/19	
Bromobenzene	10	0.50	ug/L	10	ND	104	70-130	8	30	03/05/19	
Bromochloromethane	11	0.50	ug/L	10	ND	105	70-130	14	30	03/05/19	
Bromodichloromethane	10	0.50	ug/L	10	ND	102	70-130	9	30	03/05/19	
Bromoform	10	0.50	ug/L	10	ND	104	70-130	8	30	03/05/19	
Bromomethane	10	0.50	ug/L	10	ND	100	70-130	21	30	03/05/19	
Carbon disulfide	11	10	ug/L	10	ND	112	70-130	9	30	03/05/19	
Carbon Tetrachloride	11	0.50	ug/L	10	ND	108	70-130	6	30	03/05/19	
Chlorobenzene	11	0.50	ug/L	10	ND	105	70-130	8	30	03/05/19	
Chloroethane	13	0.50	ug/L	10	ND	129	70-130	16	30	03/05/19	
Chloroform	9.6	0.50	ug/L	10	ND	96	70-130	11	30	03/05/19	
Chloromethane	12	0.50	ug/L	10	ND	121	70-130	16	30	03/05/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	107	70-130	9	30	03/05/19	
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Dibromochloromethane	10	0.50	ug/L	10	ND	103	70-130	8	30	03/05/19	
Dibromomethane	10	0.50	ug/L	10	ND	102	70-130	9	30	03/05/19	
Dichlorodifluoromethane	12	0.50	ug/L	10	ND	124	70-130	10	30	03/05/19	
Dichloromethane	11	0.50	ug/L	10	ND	107	70-130	14	30	03/05/19	
Di-isopropyl ether (DIPE)	10	3.0	ug/L	10	ND	101	70-130	0	30	03/05/19	
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	105	70-130	0	30	03/05/19	
Ethylbenzene	10	0.50	ug/L	10	ND	103	70-130	7	30	03/05/19	
Hexachlorobutadiene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Isopropylbenzene	10	0.50	ug/L	10	ND	102	70-130	6	30	03/05/19	
m,p-Xylenes	19	0.50	ug/L	20	ND	96	70-130	7	30	03/05/19	
Methyl-t-butyl ether	23	0.50	ug/L	20	ND	115	70-130	0	30	03/05/19	
Naphthalene	8.7	0.50	ug/L	10	ND	87	70-130	2	30	03/05/19	
n-Butylbenzene	10	0.50	ug/L	10	ND	103	70-130	6	30	03/05/19	
n-Propylbenzene	10	0.50	ug/L	10	ND	104	70-130	6	30	03/05/19	
o-Xylene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
p-Isopropyltoluene	10	0.50	ug/L	10	ND	104	70-130	6	30	03/05/19	
sec-Butylbenzene	10	0.50	ug/L	10	ND	103	70-130	6	30	03/05/19	
Styrene	9.0	0.50	ug/L	10	ND	90	70-130	8	30	03/05/19	
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	103	70-130	2	30	03/05/19	
tert-Butyl alcohol (TBA)	10	2.0	ug/L	10	ND	102	70-130	13	30	03/05/19	
tert-Butylbenzene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
Tetrachloroethene (PCE)	10	0.50	ug/L	10	ND	104	70-130	1	30	03/05/19	
Toluene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	110	70-130	8	30	03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903007-BSD1)											
trans-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Trichloroethene (TCE)	10	0.50	ug/L	10	ND	104	70-130	1	30	03/05/19	
Trichlorofluoromethane	11	5.0	ug/L	10	ND	113	70-130	10	30	03/05/19	
Vinyl Chloride	12	0.50	ug/L	10	ND	123	70-130	12	30	03/05/19	
Surrogate: 1,2-Dichlorobenzene-d4	*55*			*50*		*110*	*70-130*			03/05/19	
Surrogate: Bromofluorobenzene	*57*			*50*		*113*	*70-130*			03/05/19	
Matrix Spike (A903007-MS1), Source: A9C0014-01											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	107	41-156			03/06/19	
1,1,1-Trichloroethane	12	0.50	ug/L	10	ND	116	48-160			03/06/19	
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	105	42-151			03/06/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	12	10	ug/L	10	ND	119	47-164			03/06/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	104	45-152			03/06/19	
1,1-Dichloroethane	11	0.50	ug/L	10	ND	110	48-157			03/06/19	
1,1-Dichloroethene	11	0.50	ug/L	10	ND	113	51-158			03/06/19	
1,1-Dichloropropene	11	0.50	ug/L	10	ND	109	46-162			03/06/19	
1,2,3-Trichlorobenzene	9.7	0.50	ug/L	10	ND	97	37-145			03/06/19	
1,2,4-Trichlorobenzene	9.3	0.50	ug/L	10	ND	93	33-149			03/06/19	
1,2,4-Trimethylbenzene	10	0.50	ug/L	10	ND	100	44-146			03/06/19	
1,2-Dichlorobenzene	11	0.50	ug/L	10	ND	108	44-146			03/06/19	
1,2-Dichloroethane	11	0.50	ug/L	10	ND	106	47-151			03/06/19	
1,2-Dichloropropane	11	0.50	ug/L	10	ND	106	47-155			03/06/19	
1,3,5-Trimethylbenzene	10	0.50	ug/L	10	ND	103	45-154			03/06/19	
1,3-Dichlorobenzene	10	0.50	ug/L	10	ND	103	44-146			03/06/19	
1,3-Dichloropropane	10	0.50	ug/L	10	ND	103	45-151			03/06/19	
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	111	43-146			03/06/19	
2,2-Dichloropropane	8.9	0.50	ug/L	10	ND	89	24-182			03/06/19	
2-Butanone	9.1	5.0	ug/L	10	ND	91	55-144			03/06/19	
2-Chlorotoluene	11	0.50	ug/L	10	ND	105	48-150			03/06/19	
2-Hexanone	8.7	10	ug/L	10	ND	87	40-159			03/06/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	109	43-150			03/06/19	
4-Methyl-2-pentanone	8.0	5.0	ug/L	10	ND	80	30-171			03/06/19	
Acetone	10	10	ug/L	10	ND	102	27-181			03/06/19	
Benzene	11	0.50	ug/L	10	ND	109	48-155			03/06/19	
Bromobenzene	10	0.50	ug/L	10	ND	104	43-151			03/06/19	
Bromochloromethane	11	0.50	ug/L	10	ND	106	48-161			03/06/19	
Bromodichloromethane	10	0.50	ug/L	10	ND	105	47-151			03/06/19	
Bromoform	10	0.50	ug/L	10	ND	102	29-162			03/06/19	
Bromomethane	10	0.50	ug/L	10	ND	104	10-200			03/06/19	
Carbon disulfide	12	10	ug/L	10	ND	117	57-161			03/06/19	
Carbon Tetrachloride	12	0.50	ug/L	10	ND	116	47-163			03/06/19	
Chlorobenzene	11	0.50	ug/L	10	ND	109	46-152			03/06/19	
Chloroethane	14	0.50	ug/L	10	ND	138	28-189			03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Matrix Spike (A903007-MS1), Source: A9C0014-01											
Chloroform	9.0	0.50	ug/L	10	ND	90	52-148			03/06/19	
Chloromethane	13	0.50	ug/L	10	ND	130	53-159			03/06/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	108	50-152			03/06/19	
cis-1,3-Dichloropropene	9.9	0.50	ug/L	10	ND	99	34-156			03/06/19	
Dibromochloromethane	10	0.50	ug/L	10	ND	105	44-149			03/06/19	
Dibromomethane	11	0.50	ug/L	10	ND	108	46-150			03/06/19	
Dichlorodifluoromethane	14	0.50	ug/L	10	ND	139	33-170			03/06/19	
Dichloromethane	11	0.50	ug/L	10	ND	110	47-156			03/06/19	
Di-isopropyl ether (DIPE)	9.4	3.0	ug/L	10	ND	94	41-159			03/06/19	
Ethyl tert-Butyl Ether (ETBE)	9.7	0.50	ug/L	10	ND	97	32-160			03/06/19	
Ethylbenzene	10	0.50	ug/L	10	ND	104	40-157			03/06/19	
Hexachlorobutadiene	11	0.50	ug/L	10	ND	108	38-151			03/06/19	
Isopropylbenzene	9.9	0.50	ug/L	10	ND	99	41-156			03/06/19	
m,p-Xylenes	20	0.50	ug/L	20	ND	98	49-154			03/06/19	
Methyl-t-butyl ether	21	0.50	ug/L	20	ND	105	41-156			03/06/19	
Naphthalene	8.0	0.50	ug/L	10	ND	77	35-154			03/06/19	
n-Butylbenzene	10	0.50	ug/L	10	ND	102	31-153			03/06/19	
n-Propylbenzene	10	0.50	ug/L	10	ND	105	39-156			03/06/19	
o-Xylene	9.6	0.50	ug/L	10	ND	96	27-164			03/06/19	
p-Isopropyltoluene	10	0.50	ug/L	10	ND	100	26-161			03/06/19	
sec-Butylbenzene	10	0.50	ug/L	10	ND	101	39-154			03/06/19	
Styrene	6.0	0.50	ug/L	10	ND	60	10-200			03/06/19	
tert-Amyl Methyl Ether (TAME)	9.4	3.0	ug/L	10	ND	94	24-161			03/06/19	
tert-Butyl alcohol (TBA)	9.5	2.0	ug/L	10	ND	95	22-174			03/06/19	
tert-Butylbenzene	10	0.50	ug/L	10	ND	102	40-153			03/06/19	
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	113	48-155			03/06/19	
Toluene	11	0.50	ug/L	10	ND	108	40-159			03/06/19	
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	111	52-157			03/06/19	
trans-1,3-Dichloropropene	9.7	0.50	ug/L	10	ND	97	28-160			03/06/19	
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	112	49-155			03/06/19	
Trichlorofluoromethane	13	5.0	ug/L	10	ND	126	47-169			03/06/19	
Vinyl Chloride	13	0.50	ug/L	10	ND	131	21-183			03/06/19	
Surrogate: 1,2-Dichlorobenzene-d4	*55*			*50*		*109*	*70-130*			03/06/19	
Surrogate: Bromofluorobenzene	*55*			*50*		*109*	*70-130*			03/06/19	
EPA 531.1 - Quality Control											
Batch: A902963										Prepared: 3/4/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Blank (A902963-BLK1)											
3-Hydroxycarbofuran	ND	2.0	ug/L							03/05/19	
Aldicarb	ND	2.0	ug/L							03/05/19	
Aldicarb Sulfone	ND	2.0	ug/L							03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 531.1 - Quality Control											
Batch: A902963										Prepared: 3/4/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Blank (A902963-BLK1)											
Aldicarb Sulfoxide	ND	2.0	ug/L							03/05/19	
Carbaryl	ND	2.0	ug/L							03/05/19	
Carbofuran	ND	2.0	ug/L							03/05/19	
Methomyl	ND	2.0	ug/L							03/05/19	
Oxamyl	ND	2.0	ug/L							03/05/19	
Blank Spike (A902963-BS1)											
3-Hydroxycarbofuran	9.6	2.0	ug/L	8.7	ND	110	80-120			03/05/19	
Aldicarb	4.5	2.0	ug/L	4.3	ND	104	80-120			03/05/19	
Aldicarb Sulfone	7.2	2.0	ug/L	7.0	ND	104	80-120			03/05/19	
Aldicarb Sulfoxide	4.5	2.0	ug/L	4.3	ND	104	80-120			03/05/19	
Carbaryl	8.3	2.0	ug/L	8.7	ND	95	80-120			03/05/19	
Carbofuran	9.2	2.0	ug/L	7.8	ND	117	80-120			03/05/19	
Methomyl	8.6	2.0	ug/L	8.7	ND	99	80-120			03/05/19	
Oxamyl	9.2	2.0	ug/L	8.7	ND	106	80-120			03/05/19	
Blank Spike Dup (A902963-BSD1)											
3-Hydroxycarbofuran	8.9	2.0	ug/L	8.7	ND	102	80-120	8	20	03/05/19	
Aldicarb	4.3	2.0	ug/L	4.3	ND	99	80-120	5	20	03/05/19	
Aldicarb Sulfone	7.2	2.0	ug/L	7.0	ND	104	80-120	0	20	03/05/19	
Aldicarb Sulfoxide	4.6	2.0	ug/L	4.3	ND	106	80-120	1	20	03/05/19	
Carbaryl	7.9	2.0	ug/L	8.7	ND	91	80-120	4	20	03/05/19	
Carbofuran	8.8	2.0	ug/L	7.8	ND	113	80-120	4	20	03/05/19	
Methomyl	8.8	2.0	ug/L	8.7	ND	102	80-120	3	20	03/05/19	
Oxamyl	9.2	2.0	ug/L	8.7	ND	105	80-120	1	20	03/05/19	
Matrix Spike (A902963-MS1), Source: A9B2862-01											
3-Hydroxycarbofuran	9.8	2.0	ug/L	8.7	ND	108	65-135			03/05/19	
Aldicarb	6.1	2.0	ug/L	4.3	ND	113	65-135			03/05/19	
Aldicarb Sulfone	7.3	2.0	ug/L	7.0	ND	105	65-135			03/05/19	
Aldicarb Sulfoxide	4.7	2.0	ug/L	4.3	ND	108	65-135			03/05/19	
Carbaryl	8.4	2.0	ug/L	8.7	ND	96	65-135			03/05/19	
Carbofuran	9.3	2.0	ug/L	7.8	ND	114	65-135			03/05/19	
Methomyl	8.2	2.0	ug/L	8.7	ND	94	65-135			03/05/19	
Oxamyl	9.3	2.0	ug/L	8.7	ND	106	65-135			03/05/19	
EPA 547 - Quality Control											
Batch: A902884										Prepared: 3/1/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank (A902884-BLK1)											
Glyphosate	ND	25	ug/L							03/01/19	
Surrogate: AMPA	*180*			*200*		*92*	*70-130*			03/01/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 547 - Quality Control											
Batch: A902884										Prepared: 3/1/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank Spike (A902884-BS1)											
Glyphosate	99	25	ug/L	100	ND	99	70-130			03/01/19	
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/01/19	
Blank Spike Dup (A902884-BSD1)											
Glyphosate	95	25	ug/L	100	ND	95	70-130	4	30	03/01/19	
Surrogate: AMPA	*190*			*200*		*94*	*70-130*			03/01/19	
Matrix Spike (A902884-MS1), Source: A9B2626-01											
Glyphosate	95	25	ug/L	100	ND	95	70-130			03/01/19	
Surrogate: AMPA	*180*			*200*		*88*	*70-130*			03/01/19	
Matrix Spike Dup (A902884-MSD1), Source: A9B2626-01											
Glyphosate	97	25	ug/L	100	ND	97	70-130	2	30	03/01/19	
Surrogate: AMPA	*170*			*200*		*86*	*70-130*			03/01/19	
EPA 548.1 - Quality Control											
Batch: A903189										Prepared: 3/7/2019	
Prep Method: EPA 548.1										Analyst: JKH	
Blank (A903189-BLK1)											
Endothall	ND	45	ug/L							03/17/19	
Blank Spike (A903189-BS1)											
Endothall	16	45	ug/L	20	ND	82	46-116			03/17/19	
Blank Spike Dup (A903189-BSD1)											
Endothall	17	45	ug/L	20	ND	84	46-116	2	30	03/17/19	
Matrix Spike (A903189-MS1), Source: A9C0014-01											
Endothall	1.6	45	ug/L	20	ND	8	46-116			03/17/19	MS1.0 ***Low***
EPA 549.2 - Quality Control											
Batch: A902905										Prepared: 3/4/2019	
Prep Method: EPA 549.2										Analyst: VTL	
Blank (A902905-BLK1)											
Diquat	ND	4.0	ug/L							03/06/19	
Blank Spike (A902905-BS1)											
Diquat	3.8	4.0	ug/L	4.0	ND	96	70-130			03/06/19	
Blank Spike Dup (A902905-BSD1)											
Diquat	3.6	4.0	ug/L	4.0	ND	89	70-130	7	30	03/06/19	
Matrix Spike (A902905-MS1), Source: A9B3307-01											

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 549.2 - Quality Control											
Batch: A902905										Prepared: 3/4/2019	
Prep Method: EPA 549.2										Analyst: VTL	
Matrix Spike (A902905-MS1), Source: A9B3307-01											
Diquat	3.5	4.0	ug/L	4.0	ND	87	70-130			03/06/19	

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Certificate of Analysis

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected below MRL/MDL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	PicoCuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit	U:	The analyte was not detected at or above the reported sample quantitation limit.

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters: **NA**

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing under each certification.**

Fresno

EPA - UCMR4	CA00079	Los Angeles CSD	9254479	NELAP certified	4021-011
State of California - ELAP	1180	State of Hawaii	4021	State of Nevada	CA000792019-1
State of Oregon - NELAP	4021-011	State of Washington	C997-18		

Sacramento

State of California - ELAP	2435				

San Bernardino

Los Angeles CSD	9254478	NELAP certified	4119-003	State of California - ELAP	2993
State of Oregon - NELAP	4119-003				

Vancouver

NELAP certified	WA100008-011	State of Oregon - NELAP	WA100008-011	State of Washington	C824-18b

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

A9C0090

03012019

Monte6227

Turnaround: Standard
Due Date: 3/15/2019

Monterey Bay Analytical

Printed: 3/1/2019 5:01:24PM
Page 1 of 1

BSK Associates Engineers & Laboratories
1414 Stanislaus St., Fresno, CA 93706
(559) 497-2888 · Fax (559) 497-2893
www.bskassociates.com

Turnaround Time Request
- [x] Standard - 10 business days
- [ ] Rush (Surcharge may apply)
- [ ] Date needed:

A9C0090 03/01/2019
Monte6227 10

*Required Fields Temp: 3.4 #55

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax:
Monterey Bay Analytical Services	Sara Sugarman Additional cc's: David Holland	David Holland PO#:	831-375-6227	831-641-0734
			E-mail*: info@mbasinc.com	

Address*:	City*:	State*:	Zip*:
4 Justin Court, Suite D	Monterey	CA	93940

Project: Twin Lakes Church Injection Well
Project #:
How would you like to receive your completed results?* [x] E-Mail [ ] Fax [ ] Mail

Reporting Options: [ ] Trace (J-Flag) [ ] Swamp [ ] EDD Type: _____

Regulatory Carbon Copies: [ ] SWRCB (Drinking Water) [ ] Merced Co [ ] Fresno Co [ ] Madera Co [ ] Tulare Co [ ] Other: _____

Regulatory Compliance: [ ] EDT to California SWRCB (Drinking Water) System Number*: _____ [ ] Geotracker #: _____

Sampler Name (Printed/Signature)*: Dylan Jones

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX	EPA 504	EPA 505	EPA 515	EPA 524	EPA 525	EPA 531, EPA 547	EPA 548, EPA 549	EPA 1613 (2,3,7,8 Dioxin)	Chromium 6
1.	Zone 1 Perforations	2/28/19	9:55	DW	190228_01-01	X	X	X	X	X	X	X	X	X

VLT 3.1.19

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
David Holland	MBAS	2/28	1600		
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date: 3.1.19	Time: 11:52	Payment Received at Delivery: Date:	Check / Cash Amount: PIA#: Init.

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Courier: _____ Custody Seal: Y / N
Cooling Method: Wet Blue None Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

SR-FL-0012-06

A9C0090 03/01/2019
Monte6227 10

BSK Associates SR-FL-0002-19

Sample Integrity

BSK Bottles: (Yes) No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 8°C	(Yes) No NA	Were correct containers and preservatives received for the tests requested?	(Yes) No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No (NA)	Bubbles Present VOAs (524.2/TCP/TTHM)? TB Received? (Check Method Below)	Yes (No) NA Yes (No) NA
Did all bottles arrive unbroken and intact?	(Yes) No	Was a sufficient amount of sample received?	(Yes) No
Did all bottle labels agree with COC?	(Yes) No	Do samples have a hold time <72 hours?	Yes (No)
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No (NA)	Was PM notified of discrepancies? PM: By/Time:	Yes No (NA)

Bottles Received ("_" means preservation/chlorine checks are either N/A or are performed in the lab)

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	
Bacti $Na_2S_2O_3$	—	—	
None (P) White Cap	—	—	
Cr6 (P) Lt. Green Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **DW**	Cl, pH > 8	(P) F	1A
Cr6 (P) Pink Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **WW**	pH 9.3-9.7	P F	
Cr6 (P) Black Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **7199** ***24 HOUR HOLD TIME***	pH 9.0-9.5	P F	
HNO_3 (P) Red Cap or HCl (P) Purple Cap/Lt. Blue Label	—	—	
H_2SO_4 (P) or (AG) Yellow Cap/Label	pH < 2	P F	
NaOH (P) Green Cap	Cl, pH >10	P F	
NaOH + ZnAc (P)	pH > 9	P F	
Dissolved Oxygen 300ml (g)	—	—	2C VCH 3-1-19
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—	2C
HCl (AG) Lt. Blue Label O&G, Diesel, **TCP**	—	—	
Ascorbic, EDTA, KH_2Ct (AG) Pink Label 525	—	—	2C
Na_2SO_3 250mL (AG) Neon Green Label 515	—	—	1A
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—	1C
$Na_2S_2O_3$ (AG) Blue Label 548, THM, 524	—	—	1A
$Na_2S_2O_3$ (CG) Blue Label 504, 505, 547	—	—	7V
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH < 3	(P) F	1V
NH_4Cl (AG) Purple Label 552	—	—	
EDA (AG) Brown Label **DBPs**	—	—	
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—	3V
Buffer pH 4 (CG)	—	—	
H_3PO_4 (CG) Salmon Label	—	—	
Other:			
Asbestos 1L (P) w/ Foil / LL Metals Bottle	—	—	
Bottled Water	—	—	
Clear Glass 250mL / 500mL / 1 Liter	—	—	
Solids: Brass / Steel / Plastic Bag	—	—	

VCH 3-1-19

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

✓ **Indicates Blanks Received**

504 __ 524.2 __ TCP __ TTHM __ 537 __

8260/624 __

Labeled by: VCH @ 16:24 Labels checked by: [illegible] @ 1644 RUSH Paged by: _____ @ _____

CERES Analytical Laboratory, Inc.
1919 Windplay Dr Suite L El Dorado Hills CA 95762

March 13, 2019

Ceres ID: 12680

BSK Associates
1414 Stanislaus St.
Fresno, CA 93706

The following report contains the results for the one drinking water sample received on March 6, 2019. This sample was analyzed for 2,3,7,8-TCDD by EPA method 1613B. Routine turn-around time was provided for this work.

This work was authorized under your Subcontract Order # A9C0090.

Continuing Calibration Verification (CCV) Requirements
All associated calibration verification standard(s) (CCV) met the acceptance criteria.

The report consists of a Cover Letter, Sample Inventory (Section I), Data Summary (Section II), Sample Tracking (Section VI), and Qualifiers/Abbreviations (Section VII). Raw Data (Section III), Continuing Calibration (Section IV), and Initial Calibration (Section V) are available in a full report (.pdf format) upon request.

If you have any questions regarding this report, please feel free to contact me at (916)932-5011.

Sincerely,

James M. Hedin
Director of Operations/CEO
jhedin@ceres-lab.com

Section I: Sample Inventory

Ceres Sample ID:	Sample ID	Date Received	Collection Date &Time
12680-001	Zone 1 Perforations A9C0090-01	3/6/2019	2/28/2019 9:55

Section II: Data Summary

CERES Analytical Laboratory, Inc.

EPA Method 1613B

Quality Assurance Sample Method Blank Project ID: A9C0090	QC Batch #: 1948 Matrix: Drinking Water Sample Size: 1.000 L	Date Received: NA Date Extracted: 3/8/2019 ZB-5MS Analysis: 3/12/2019

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.59	1.49	5.00		13C-2378-TCDD	76.0	31-137	
					CRS			
					37Cl4-2378-TCDD	61.8	35-197	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

EPA Method 1613B

Quality Assurance Sample Ongoing Precision and Recovery		Date Received: NA
	QC Batch #: 1948	Date Extracted: 3/8/2019
	Matrix: Drinking Water	ZB-5MS Analysis: 3/12/2019
Project ID: A9C0090	Sample Size: 1.000 L	

Analyte	Conc. (ng/mL)	Limits (a)	Labeled Standards	% Rec.	Limits (a)
2,3,7,8-TCDD	9.52	7.3-14.6	13C-2378-TCDD	82.0	25-141
			CRS		
			37Cl4-2378-TCDD	79.7	37-158

(a) Limits based on method acceptance criteria.

Analyst: JMH **Reviewed by: BS**

EPA Method 1613B

Client Sample ID: Zone 1 Perforations A9C0090-01		
Project ID: A9C0090	**Ceres Sample ID:** 12680-001	**Date Received:** 3/6/2019
	QC Batch #: 1948	**Date Extracted:** 3/8/2019
Date Collected: 2/28/2019	**Matrix:** Drinking Water	**ZB-5MS Analysis:** 3/12/2019
Time Collected: 9:55	**Sample Size:** 1.019 L	

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.68	1.49	4.91		13C-2378-TCDD	80.9	31-137	
					CRS			
					37Cl4-2378-TCDD	66.9	42-164	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

Section VI: Sample Tracking

ASSOCIATES

SUBCONTRACT ORDER

A9C0090

SENDING LABORATORY:

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
Phone: 559-497-2888
Fax: 559-485-6935
Project Manager: Jaime Lee LaFave
E-mail: jlafave@bskassociates.com

RECEIVING LABORATORY:

Ceres Analytical Laboratory, Inc
4919 Windplay Drive, Suite 1
El Dorado Hills, CA 95762
Phone :(916) 932-5011
Fax: -
Turnaround (Days): Standard
QC Deliverables: I Std III IV

Sample ID	Samp Desc		Sample Date
A9C0090-01	**Zone 1 Perforations**	**Client Matrix** Drinking Water	**02/28/2019 09:55**

Sample Alias: 190228_01-01
Lab Matrix: Water

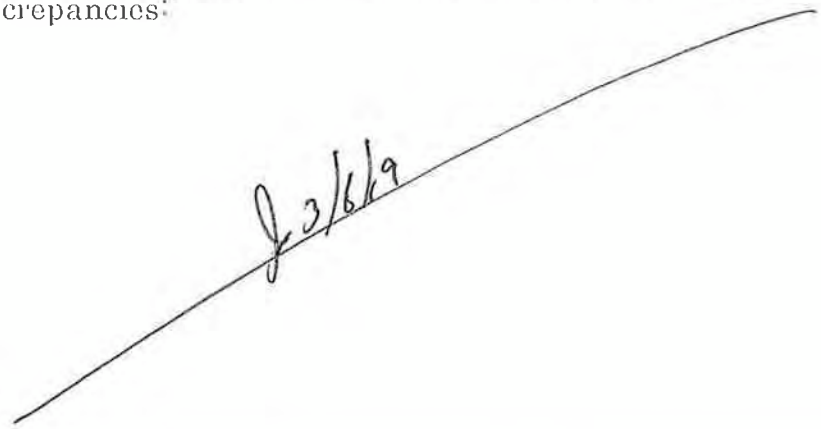
Analysis:
EXT-Dioxin-DW matrix, EPA 1613 2,3,7,8-TCDD

Released By	Date	Received By	Date
	3/5/19		3/6/19
Released By	Date	Received By	Date

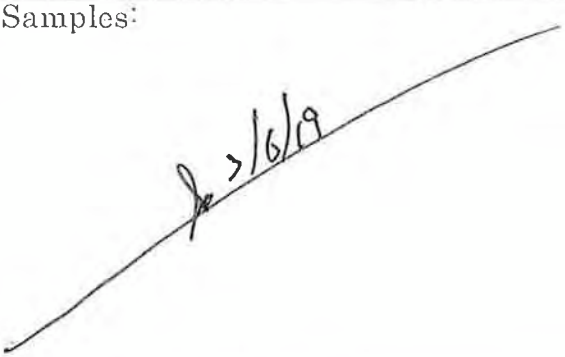
Sample Receipt Check List Logged by: _____ (initials)

Ceres ID: 12680		Date/Time: 3/6/19 11:38
Client Project ID: A9C0090		Received Temp: 3.3 °C Acceptable: (Y) / N
Chain of Custody Relinquished by signed?		(Y) / N
Chain of Custody Received by signed?		(Y) / N
Custody Seals?	Present?	Y / N
	Intact?	Y / N
	NA:	(NA)
Unlabeled / Illegible Samples		Y / (N)
Proper Containers:		(Y) / N
Preservation Acceptable (Chemical or Temperature)?		(Y) / N
Drinking Water, Sodium Thiosulfate present?		Y / N / (NA)
Residual Cl?		(Y) / N
Aqueous sample pH: 7		

List COC discrepancies:



List Damaged Samples:



Section VII: Qualifiers/Abbreviations

J	Concentration found below the lower quantitation limit but greater than zero.
B	Analyte present in the associated Method Blank.
E	Concentration found exceeds the Calibration range of the HRGC/HRMS.
D	This analyte concentration was calculated from a dilution.
X	The concentration found is the estimated maximum possible concentration due to chlorinated diphenyl ethers present in the sample.
H	Recovery limits exceeded. See cover letter.
*****	Results taken from dilution.
I	Interference. See cover letter.
Conc.	Concentration Found
DL	Calculated Detection Limit
ND	Non-Detect
% Rec.	Percent Recovery

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
559-497-2888 (Main)
559-485-6935 (FAX)

A9C0090
3/26/2019
Invoice: A906792

David Holland
Monterey Bay Analytical
4 Justin Court Suite D
Monterey, CA 93940

RE: Report for A9C0090 General

Dear David Holland,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 3/1/2019. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

This certificate of analysis shall not be reproduced except in full, without written approval of the laboratory.

If additional clarification of any information is required, please contact your Project Manager, Jaime Lee LaFave , at 559-497-2888.

Thank you again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Jaime Lee LaFave, Project Manager

Accredited in Accordance with NELAP
ORELAP #4021-009

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK ASSOCIATES

Case Narrative

Project and Report Details		Invoice Details	
Client:	Monterey Bay Analytical	**Invoice To:**	Monterey Bay Analytical
Report To:	David Holland	**Invoice Attn:**	David Holland
Project #:	Twin Lakes Church Injection Well	**Project PO#:**	-
Received:	3/01/2019 - 11:52		
Report Due:	3/22/2019		

Sample Receipt Conditions

Cooler: Default Cooler
Temperature on Receipt ºC: 3.4

Containers Intact
COC/Labels Agree
Received On Wet Ice
Packing Material - Bubble Wrap
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Data Qualifiers

The following qualifiers have been applied to one or more analytical results:

BS	Blank spike recoveries did not meet acceptance limits.
BS1.0	Blank spike recovery for this analyte was biased high; no material impact on reported result as sample is ND for this parameter.
BS1.3	Blank Spike recovery meets the wider acceptance criteria of 50-150% when the spike level is at or below the reporting limit (RL).
CV0.0	CCV recovery was above method acceptance limits; no material impact on reported result as sample is ND for this parameter.
HT1.2	Holding time exceeded. Sample was extracted past the holding time.
MS1.0	Matrix spike recoveries exceed control limits.
MS1.2	Matrix spike recovery exceeds lower control limit. Reported results for parent matrix should be considered estimated due to matrix interferences.

Report Distribution

Recipient(s)	Report Format	CC:
David Holland	FINAL.RPT	
Monterey Bay Analytical Services	FINAL.RPT	

Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hexavalent Chromium	EPA 218.7	ND	0.050	ug/L	1	A903179	03/07/19	03/07/19	

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
EDB and DBCP by GC-ECD									
Dibromochloropropane (DBCP)	EPA 504.1	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Ethylene Dibromide (EDB)	EPA 504.1	ND	0.020	ug/L	1	A902960	03/04/19	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 504.1	122 %	*Acceptable range: 70-130 %*						
Organohalide Pesticides and PCBs by GC-ECD									
Aldrin	EPA 505	ND	0.075	ug/L	1	A902960	03/04/19	03/06/19	
Chlordane	EPA 505	ND	0.10	ug/L	1	A902960	03/04/19	03/06/19	
Dieldrin	EPA 505	ND	0.020	ug/L	1	A902960	03/04/19	03/06/19	
Endrin	EPA 505	ND	0.10	ug/L	1	A902960	03/04/19	03/06/19	
Heptachlor	EPA 505	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Heptachlor Epoxide	EPA 505	ND	0.010	ug/L	1	A902960	03/04/19	03/06/19	
Hexachlorobenzene	EPA 505	ND	0.50	ug/L	1	A902960	03/04/19	03/06/19	
Hexachlorocyclopentadiene	EPA 505	ND	1.0	ug/L	1	A902960	03/04/19	03/06/19	
Lindane	EPA 505	ND	0.20	ug/L	1	A902960	03/04/19	03/06/19	
Methoxychlor	EPA 505	ND	10	ug/L	1	A902960	03/04/19	03/06/19	
PCB Aroclor Screen	EPA 505	ND	0.50	ug/L	1	A902960	03/04/19	03/06/19	
Toxaphene	EPA 505	ND	1.0	ug/L	1	A902960	03/04/19	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 505	122 %	*Acceptable range: 70-130 %*						
Chlorinated Acid Herbicides by GC-ECD									
2,4,5-T	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
2,4,5-TP (Silvex)	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
2,4-D	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/11/19	
Bentazon	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/11/19	
Dalapon	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/11/19	
Dicamba	EPA 515.4	ND	1.5	ug/L	1	A903254	03/11/19	03/11/19	
Dinoseb	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/11/19	
Pentachlorophenol	EPA 515.4	ND	0.20	ug/L	1	A903254	03/11/19	03/11/19	MS1.2
Picloram	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/11/19	
Surrogate: DCPAA	EPA 515.4	112 %	*Acceptable range: 70-130 %*						
Volatile Organics by GC-MS									
1,1,1,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,1-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
1,1,2-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
1,1-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,1-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,3-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,4-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2,4-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3,5-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,3-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
1,4-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
2,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
2-Butanone	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
2-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
2-Hexanone	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
4-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
4-Methyl-2-pentanone	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
Acetone	EPA 524.2	ND	10	ug/L	1	A903007	03/05/19	03/05/19	
Benzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromodichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromoform	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Bromomethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Carbon Tetrachloride	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chloroethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0, CV0.0
Chloroform	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Chloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
cis-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
cis-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dibromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dibromomethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Dichlorodifluoromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
Dichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Di-isopropyl ether (DIPE)	EPA 524.2	ND	3.0	ug/L	1	A903007	03/05/19	03/05/19	
Ethyl tert-Butyl Ether (ETBE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Ethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Hexachlorobutadiene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Isopropylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
m,p-Xylenes	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Methyl-t-butyl ether	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Naphthalene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	

Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
n-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
n-Propylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
o-Xylene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
p-Isopropyltoluene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
sec-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Styrene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
tert-Amyl Methyl Ether (TAME)	EPA 524.2	ND	3.0	ug/L	1	A903007	03/05/19	03/05/19	
tert-Butyl alcohol (TBA)	EPA 524.2	ND	2.0	ug/L	1	A903007	03/05/19	03/05/19	
tert-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Tetrachloroethene (PCE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Toluene	EPA 524.2	**0.68**	0.50	ug/L	1	A903007	03/05/19	03/05/19	
trans-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
trans-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Trichloroethene (TCE)	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	
Trichlorofluoromethane	EPA 524.2	ND	5.0	ug/L	1	A903007	03/05/19	03/05/19	
Vinyl Chloride	EPA 524.2	ND	0.50	ug/L	1	A903007	03/05/19	03/05/19	BS1.0
Surrogate: 1,2-Dichlorobenzene-d4	EPA 524.2	101 %	*Acceptable range: 70-130 %*						
Surrogate: Bromofluorobenzene	EPA 524.2	92 %	*Acceptable range: 70-130 %*						
Total 1,3-Dichloropropene		ND	0.50	ug/L					
Total Trihalomethanes		ND	0.50	ug/L					
Total Xylenes, EPA 524.2		ND	0.50	ug/L					
Semi-Volatile Organics by GC-MS								**Analysis Qualifier(s): HT1.2**	
Alachlor	EPA 525.3	ND	1.0	ug/L	1	A903993	03/24/19	03/25/19	
Atrazine	EPA 525.3	ND	0.50	ug/L	1	A903993	03/24/19	03/25/19	
Benzo(a)pyrene	EPA 525.3	ND	0.10	ug/L	1	A903993	03/24/19	03/25/19	
Bis(2-ethylhexyl) adipate	EPA 525.3	ND	3.0	ug/L	1	A903993	03/24/19	03/25/19	
Bis(2-ethylhexyl) phthalate	EPA 525.3	ND	3.0	ug/L	1	A903993	03/24/19	03/25/19	
Bromacil	EPA 525.3	ND	10	ug/L	1	A903993	03/24/19	03/25/19	
Butachlor	EPA 525.3	ND	0.38	ug/L	1	A903993	03/24/19	03/25/19	
Diazinon	EPA 525.3	ND	0.25	ug/L	1	A903993	03/24/19	03/25/19	
Dimethoate	EPA 525.3	ND	10	ug/L	1	A903993	03/24/19	03/25/19	
Metolachlor	EPA 525.3	ND	0.50	ug/L	1	A903993	03/24/19	03/25/19	
Metribuzin	EPA 525.3	ND	0.50	ug/L	1	A903993	03/24/19	03/25/19	
Molinate	EPA 525.3	ND	2.0	ug/L	1	A903993	03/24/19	03/25/19	
Propachlor	EPA 525.3	ND	0.50	ug/L	1	A903993	03/24/19	03/25/19	
Simazine	EPA 525.3	ND	1.0	ug/L	1	A903993	03/24/19	03/25/19	
Thiobencarb	EPA 525.3	ND	1.0	ug/L	1	A903993	03/24/19	03/25/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	EPA 525.3	88 %	*Acceptable range: 70-130 %*						
Surrogate: Benzo(a)pyrene-d12	EPA 525.3	102 %	*Acceptable range: 70-130 %*						
Surrogate: Triphenyl Phosphate	EPA 525.3	102 %	*Acceptable range: 70-130 %*						
Carbamates by HPLC									
3-Hydroxycarbofuran	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	

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Certificate of Analysis

Sample ID: A9C0090-01
Sampled By: Dylan Jones
Sample Description: Zone 1 Perforations // 190228_01-01

Sample Date - Time: 02/28/19 - 09:55
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Carbamates by HPLC									
Aldicarb	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	
Aldicarb Sulfone	EPA 531.1	ND	2.0	ug/L	1	A902963	03/04/19	03/05/19	
Aldicarb Sulfoxide	EPA 531.1	ND	3.0	ug/L	1	A902963	03/04/19	03/05/19	
Carbaryl	EPA 531.1	ND	5.0	ug/L	1	A902963	03/04/19	03/05/19	
Carbofuran	EPA 531.1	ND	5.0	ug/L	1	A902963	03/04/19	03/05/19	
Methomyl	EPA 531.1	ND	2.0	ug/L	1	A902963	03/04/19	03/05/19	
Oxamyl	EPA 531.1	ND	20	ug/L	1	A902963	03/04/19	03/05/19	
Glyphosate by HPLC									
Glyphosate	EPA 547	ND	25	ug/L	1	A902884	03/01/19	03/02/19	
Surrogate: AMPA	EPA 547	81 %	*Acceptable range: 70-130 %*						
Endothall by GC-MS									
Endothall	EPA 548.1	ND	45	ug/L	1	A903189	03/07/19	03/17/19	
Diquat by HPLC									
Diquat	EPA 549.2	ND	4.0	ug/L	1	A902905	03/04/19	03/06/19	

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 218.7 - Quality Control											
Batch: A903179										Prepared: 3/7/2019	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank (A903179-BLK1)											
Hexavalent Chromium	ND	0.050	ug/L							03/07/19	
Blank Spike (A903179-BS1)											
Hexavalent Chromium	0.059	0.050	ug/L	0.050	ND	118	50-150			03/07/19	
Matrix Spike (A903179-MS1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115			03/07/19	
Matrix Spike Dup (A903179-MSD1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115	0	15	03/07/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 504.1 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A902960-BLK1)											
Dibromochloropropane (DBCP)	ND	0.010	ug/L							03/06/19	
Ethylene Dibromide (EDB)	ND	0.020	ug/L							03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*112*	*70-130*			03/06/19	
Blank Spike (A902960-BS1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	115	70-130			03/06/19	
Ethylene Dibromide (EDB)	0.12	0.020	ug/L	0.10	ND	116	70-130			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*111*	*70-130*			03/06/19	
Blank Spike Dup (A902960-BSD1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	111	70-130	3	20	03/06/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	112	70-130	4	20	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*108*	*70-130*			03/06/19	
Matrix Spike (A902960-MS1), Source: A9B3314-06											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	113	65-135			03/06/19	
Ethylene Dibromide (EDB)	0.12	0.020	ug/L	0.10	ND	115	65-135			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.50*			*0.46*		*109*	*70-130*			03/06/19	
EPA 505 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A902960-BLK1)											
Aldrin	ND	0.075	ug/L							03/06/19	
Chlordane	ND	0.10	ug/L							03/06/19	
Dieldrin	ND	0.020	ug/L							03/06/19	
Endrin	ND	0.10	ug/L							03/06/19	
Heptachlor	ND	0.010	ug/L							03/06/19	
Heptachlor Epoxide	ND	0.010	ug/L							03/06/19	
Hexachlorobenzene	ND	0.50	ug/L							03/06/19	
Hexachlorocyclopentadiene	ND	1.0	ug/L							03/06/19	
Lindane	ND	0.20	ug/L							03/06/19	
Methoxychlor	ND	10	ug/L							03/06/19	
PCB Aroclor Screen	ND	0.50	ug/L							03/06/19	
Toxaphene	ND	1.0	ug/L							03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*112*	*70-130*			03/06/19	
Blank Spike (A902960-BS1)											
Aldrin	0.89	0.075	ug/L	0.74	ND	120	70-130			03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	112	70-130			03/06/19	
Endrin	0.11	0.10	ug/L	0.10	ND	109	70-130			03/06/19	
Heptachlor	0.12	0.010	ug/L	0.10	ND	118	70-130			03/06/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	111	70-130			03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 505 - Quality Control											
Batch: A902960										Prepared: 3/4/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank Spike (A902960-BS1)											
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	115	70-130			03/06/19	
Hexachlorocyclopentadiene	1.2	1.0	ug/L	1.0	ND	118	70-130			03/06/19	
Lindane	0.21	0.20	ug/L	0.20	ND	107	70-130			03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	117	70-130			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.51*			*0.46*		*111*	*70-130*			03/06/19	
Blank Spike Dup (A902960-BSD1)											
Aldrin	0.82	0.075	ug/L	0.74	ND	110	70-130	8	20	03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	110	70-130	2	20	03/06/19	
Endrin	0.10	0.10	ug/L	0.10	ND	102	70-130	6	20	03/06/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	114	70-130	4	20	03/06/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	110	70-130	1	20	03/06/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	110	70-130	4	20	03/06/19	
Hexachlorocyclopentadiene	1.0	1.0	ug/L	1.0	ND	101	70-130	16	20	03/06/19	
Lindane	0.21	0.20	ug/L	0.20	ND	103	70-130	3	20	03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	118	70-130	1	20	03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*108*	*70-130*			03/06/19	
Matrix Spike (A902960-MS1), Source: A9B3314-06											
Aldrin	0.87	0.075	ug/L	0.75	ND	117	65-135			03/06/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	107	65-135			03/06/19	
Endrin	0.11	0.10	ug/L	0.10	ND	106	65-135			03/06/19	
Heptachlor	0.12	0.010	ug/L	0.10	ND	120	65-135			03/06/19	
Heptachlor Epoxide	0.12	0.010	ug/L	0.10	ND	115	65-135			03/06/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	113	65-135			03/06/19	
Hexachlorocyclopentadiene	1.1	1.0	ug/L	1.0	ND	100	65-135			03/06/19	
Lindane	0.22	0.20	ug/L	0.20	ND	100	65-135			03/06/19	
Methoxychlor	1.2	10	ug/L	1.0	ND	119	65-135			03/06/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.50*			*0.46*		*109*	*70-130*			03/06/19	
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
2,4,5-T	ND	1.0	ug/L							03/11/19	
2,4,5-TP (Silvex)	ND	1.0	ug/L							03/11/19	
2,4-D	ND	10	ug/L							03/11/19	
Bentazon	ND	2.0	ug/L							03/11/19	
Dalapon	ND	10	ug/L							03/11/19	
Dicamba	ND	1.5	ug/L							03/11/19	
Dinoseb	ND	2.0	ug/L							03/11/19	
Pentachlorophenol	ND	0.20	ug/L							03/11/19	
Picloram	ND	1.0	ug/L							03/11/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
Surrogate: DCPAA	*34*			*36*		*94*	*70-130*			03/11/19	
Blank Spike (A903254-BS1)											
2,4,5-T	1.7	1.0	ug/L	1.6	ND	108	70-130			03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	102	70-130			03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	105	70-130			03/11/19	
Bentazon	2.0	2.0	ug/L	2.0	ND	99	70-130			03/11/19	
Dalapon	4.0	10	ug/L	4.0	ND	99	70-130			03/11/19	
Dicamba	0.77	1.5	ug/L	0.80	ND	96	70-130			03/11/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	95	70-130			03/11/19	
Pentachlorophenol	0.15	0.20	ug/L	0.16	ND	93	70-130			03/11/19	
Picloram	0.40	1.0	ug/L	0.40	ND	101	70-130			03/11/19	
Surrogate: DCPAA	*35*			*36*		*96*	*70-130*			03/11/19	
Blank Spike Dup (A903254-BSD1)											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	112	70-130	3	20	03/12/19	
2,4,5-TP (Silvex)	0.87	1.0	ug/L	0.80	ND	109	70-130	7	20	03/12/19	
2,4-D	0.45	10	ug/L	0.40	ND	111	70-130	6	20	03/12/19	
Bentazon	2.2	2.0	ug/L	2.0	ND	112	70-130	12	20	03/12/19	
Dalapon	4.0	10	ug/L	4.0	ND	101	70-130	2	20	03/12/19	
Dicamba	0.85	1.5	ug/L	0.80	ND	106	70-130	10	20	03/12/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	94	70-130	1	20	03/12/19	
Pentachlorophenol	0.16	0.20	ug/L	0.16	ND	97	70-130	4	20	03/12/19	
Picloram	0.43	1.0	ug/L	0.40	ND	108	70-130	7	20	03/12/19	
Surrogate: DCPAA	*38*			*36*		*104*	*70-130*			03/12/19	
Matrix Spike (A903254-MS1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130			03/11/19	
2,4,5-TP (Silvex)	0.85	1.0	ug/L	0.80	ND	106	70-130			03/11/19	
2,4-D	0.44	10	ug/L	0.40	ND	110	70-130			03/11/19	
Bentazon	1.8	2.0	ug/L	2.0	ND	88	70-130			03/11/19	
Dalapon	3.8	10	ug/L	4.0	ND	95	70-130			03/11/19	
Dicamba	0.76	1.5	ug/L	0.80	ND	94	70-130			03/11/19	
Dinoseb	0.71	2.0	ug/L	0.80	ND	83	70-130			03/11/19	
Pentachlorophenol	0.11	0.20	ug/L	0.16	ND	67	70-130			03/11/19	MS1.0 ***Low***
Picloram	0.37	1.0	ug/L	0.40	ND	93	70-130			03/11/19	
Surrogate: DCPAA	*42*			*36*		*118*	*70-130*			03/11/19	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130	0	30	03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	101	70-130	5	30	03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	106	70-130	4	30	03/11/19	
Bentazon	1.7	2.0	ug/L	2.0	ND	87	70-130	1	30	03/11/19	
Dalapon	3.7	10	ug/L	4.0	ND	93	70-130	2	30	03/11/19	

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A9C0090 Final FINAL 03 26 2019 1928 03262019 1928

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
Dicamba	0.73	1.5	ug/L	0.80	ND	91	70-130	4	30	03/11/19	
Dinoseb	0.69	2.0	ug/L	0.80	ND	79	70-130	4	30	03/11/19	
Pentachlorophenol	0.094	0.20	ug/L	0.16	ND	59	70-130	13	30	03/11/19	MS1.0 ***Low***
Picloram	0.36	1.0	ug/L	0.40	ND	90	70-130	3	30	03/11/19	
Surrogate: DCPAA	*41*			*36*		*113*	*70-130*			03/11/19	
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903007-BLK1)											
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L							03/05/19	
1,1,1-Trichloroethane	ND	0.50	ug/L							03/05/19	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L							03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	ug/L							03/05/19	
1,1,2-Trichloroethane	ND	0.50	ug/L							03/05/19	
1,1-Dichloroethane	ND	0.50	ug/L							03/05/19	
1,1-Dichloroethene	ND	0.50	ug/L							03/05/19	
1,1-Dichloropropene	ND	0.50	ug/L							03/05/19	
1,2,3-Trichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2,4-Trichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2,4-Trimethylbenzene	ND	0.50	ug/L							03/05/19	
1,2-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
1,2-Dichloroethane	ND	0.50	ug/L							03/05/19	
1,2-Dichloropropane	ND	0.50	ug/L							03/05/19	
1,3,5-Trimethylbenzene	ND	0.50	ug/L							03/05/19	
1,3-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
1,3-Dichloropropane	ND	0.50	ug/L							03/05/19	
1,4-Dichlorobenzene	ND	0.50	ug/L							03/05/19	
2,2-Dichloropropane	ND	0.50	ug/L							03/05/19	
2-Butanone	ND	5.0	ug/L							03/05/19	
2-Chlorotoluene	ND	0.50	ug/L							03/05/19	
2-Hexanone	ND	10	ug/L							03/05/19	
4-Chlorotoluene	ND	0.50	ug/L							03/05/19	
4-Methyl-2-pentanone	ND	5.0	ug/L							03/05/19	
Acetone	ND	10	ug/L							03/05/19	
Benzene	ND	0.50	ug/L							03/05/19	
Bromobenzene	ND	0.50	ug/L							03/05/19	
Bromochloromethane	ND	0.50	ug/L							03/05/19	
Bromodichloromethane	ND	0.50	ug/L							03/05/19	
Bromoform	ND	0.50	ug/L							03/05/19	
Bromomethane	ND	0.50	ug/L							03/05/19	
Carbon Tetrachloride	ND	0.50	ug/L							03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903007-BLK1)											
Chlorobenzene	ND	0.50	ug/L							03/05/19	
Chloroethane	ND	0.50	ug/L							03/05/19	
Chloroform	ND	0.50	ug/L							03/05/19	
Chloromethane	ND	0.50	ug/L							03/05/19	
cis-1,2-Dichloroethene	ND	0.50	ug/L							03/05/19	
cis-1,3-Dichloropropene	ND	0.50	ug/L							03/05/19	
Dibromochloromethane	ND	0.50	ug/L							03/05/19	
Dibromomethane	ND	0.50	ug/L							03/05/19	
Dichlorodifluoromethane	ND	0.50	ug/L							03/05/19	
Dichloromethane	ND	0.50	ug/L							03/05/19	
Di-isopropyl ether (DIPE)	ND	3.0	ug/L							03/05/19	
Ethyl tert-Butyl Ether (ETBE)	ND	0.50	ug/L							03/05/19	
Ethylbenzene	ND	0.50	ug/L							03/05/19	
Hexachlorobutadiene	ND	0.50	ug/L							03/05/19	
Isopropylbenzene	ND	0.50	ug/L							03/05/19	
m,p-Xylenes	ND	0.50	ug/L							03/05/19	
Methyl-t-butyl ether	ND	0.50	ug/L							03/05/19	
Naphthalene	ND	0.50	ug/L							03/05/19	
n-Butylbenzene	ND	0.50	ug/L							03/05/19	
n-Propylbenzene	ND	0.50	ug/L							03/05/19	
o-Xylene	ND	0.50	ug/L							03/05/19	
p-Isopropyltoluene	ND	0.50	ug/L							03/05/19	
sec-Butylbenzene	ND	0.50	ug/L							03/05/19	
Styrene	ND	0.50	ug/L							03/05/19	
tert-Amyl Methyl Ether (TAME)	ND	3.0	ug/L							03/05/19	
tert-Butyl alcohol (TBA)	ND	2.0	ug/L							03/05/19	
tert-Butylbenzene	ND	0.50	ug/L							03/05/19	
Tetrachloroethene (PCE)	ND	0.50	ug/L							03/05/19	
Toluene	ND	0.50	ug/L							03/05/19	
trans-1,2-Dichloroethene	ND	0.50	ug/L							03/05/19	
trans-1,3-Dichloropropene	ND	0.50	ug/L							03/05/19	
Trichloroethene (TCE)	ND	0.50	ug/L							03/05/19	
Trichlorofluoromethane	ND	5.0	ug/L							03/05/19	
Vinyl Chloride	ND	0.50	ug/L							03/05/19	
Surrogate: 1,2-Dichlorobenzene-d4	*53*			*50*		*107*	*70-130*			03/05/19	
Surrogate: Bromofluorobenzene	*52*			*50*		*104*	*70-130*			03/05/19	
Blank Spike (A903007-BS1)											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	110	70-130			03/05/19	
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	115	70-130			03/05/19	
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	108	70-130			03/05/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	114	70-130			03/05/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	104	70-130			03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903007										Prepared: 3/5/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903007-BS1)												
1,1-Dichloroethane	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
1,1-Dichloroethene	12	0.50	ug/L	10	ND	117	70-130			03/05/19		
1,1-Dichloropropene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
1,2,3-Trichlorobenzene	10	0.50	ug/L	10	ND	101	70-130			03/05/19		
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
1,2-Dichlorobenzene	12	0.50	ug/L	10	ND	115	70-130			03/05/19		
1,2-Dichloroethane	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
1,2-Dichloropropane	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/05/19		
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
1,3-Dichloropropane	10	0.50	ug/L	10	ND	103	70-130			03/05/19		
1,4-Dichlorobenzene	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
2,2-Dichloropropane	14	0.50	ug/L	10	ND	137	70-130			03/05/19	BS	***High***
2-Butanone	9.4	5.0	ug/L	10	ND	94	70-130			03/05/19		
2-Chlorotoluene	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
2-Hexanone	8.7	10	ug/L	10	ND	87	70-130			03/05/19		
4-Chlorotoluene	12	0.50	ug/L	10	ND	116	70-130			03/05/19		
4-Methyl-2-pentanone	8.9	5.0	ug/L	10	ND	89	70-130			03/05/19		
Acetone	12	10	ug/L	10	ND	120	70-130			03/05/19		
Benzene	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
Bromobenzene	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
Bromochloromethane	12	0.50	ug/L	10	ND	121	70-130			03/05/19		
Bromodichloromethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Bromoform	11	0.50	ug/L	10	ND	113	70-130			03/05/19		
Bromomethane	12	0.50	ug/L	10	ND	123	70-130			03/05/19		
Carbon disulfide	12	10	ug/L	10	ND	122	70-130			03/05/19		
Carbon Tetrachloride	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
Chlorobenzene	11	0.50	ug/L	10	ND	114	70-130			03/05/19		
Chloroethane	15	0.50	ug/L	10	ND	151	70-130			03/05/19	BS	***High***
Chloroform	11	0.50	ug/L	10	ND	107	70-130			03/05/19		
Chloromethane	14	0.50	ug/L	10	ND	142	70-130			03/05/19	BS	***High***
cis-1,2-Dichloroethene	12	0.50	ug/L	10	ND	117	70-130			03/05/19		
cis-1,3-Dichloropropene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Dibromochloromethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Dibromomethane	11	0.50	ug/L	10	ND	112	70-130			03/05/19		
Dichlorodifluoromethane	14	0.50	ug/L	10	ND	137	70-130			03/05/19	BS	***High***
Dichloromethane	12	0.50	ug/L	10	ND	122	70-130			03/05/19		
Di-isopropyl ether (DIPE)	10	3.0	ug/L	10	ND	101	70-130			03/05/19		
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	105	70-130			03/05/19		
Ethylbenzene	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
Hexachlorobutadiene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		
Isopropylbenzene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903007										Prepared: 3/5/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903007-BS1)												
m,p-Xylenes	21	0.50	ug/L	20	ND	104	70-130			03/05/19		
Methyl-t-butyl ether	23	0.50	ug/L	20	ND	115	70-130			03/05/19		
Naphthalene	8.6	0.50	ug/L	10	ND	86	70-130			03/05/19		
n-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
n-Propylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/05/19		
o-Xylene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
p-Isopropyltoluene	11	0.50	ug/L	10	ND	110	70-130			03/05/19		
sec-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Styrene	9.8	0.50	ug/L	10	ND	98	70-130			03/05/19		
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	105	70-130			03/05/19		
tert-Butyl alcohol (TBA)	9.0	2.0	ug/L	10	ND	90	70-130			03/05/19		
tert-Butylbenzene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
Tetrachloroethene (PCE)	10	0.50	ug/L	10	ND	103	70-130			03/05/19		
Toluene	11	0.50	ug/L	10	ND	109	70-130			03/05/19		
trans-1,2-Dichloroethene	12	0.50	ug/L	10	ND	119	70-130			03/05/19		
trans-1,3-Dichloropropene	11	0.50	ug/L	10	ND	108	70-130			03/05/19		
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	106	70-130			03/05/19		
Trichlorofluoromethane	13	5.0	ug/L	10	ND	125	70-130			03/05/19		
Vinyl Chloride	14	0.50	ug/L	10	ND	139	70-130			03/05/19	BS	***High***
Surrogate: 1,2-Dichlorobenzene-d4	*58*			*50*		*116*	*70-130*			03/05/19		
Surrogate: Bromofluorobenzene	*59*			*50*		*119*	*70-130*			03/05/19		
Blank Spike Dup (A903007-BSD1)												
1,1,1,2-Tetrachloroethane	10	0.50	ug/L	10	ND	102	70-130	8	30	03/05/19		
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	107	70-130	7	30	03/05/19		
1,1,2,2-Tetrachloroethane	10	0.50	ug/L	10	ND	102	70-130	5	30	03/05/19		
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	107	70-130	6	30	03/05/19		
1,1,2-Trichloroethane	9.9	0.50	ug/L	10	ND	99	70-130	5	30	03/05/19		
1,1-Dichloroethane	11	0.50	ug/L	10	ND	108	70-130	10	30	03/05/19		
1,1-Dichloroethene	11	0.50	ug/L	10	ND	108	70-130	8	30	03/05/19		
1,1-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	2	30	03/05/19		
1,2,3-Trichlorobenzene	9.9	0.50	ug/L	10	ND	99	70-130	3	30	03/05/19		
1,2,4-Trichlorobenzene	10	0.50	ug/L	10	ND	100	70-130	5	30	03/05/19		
1,2,4-Trimethylbenzene	10	0.50	ug/L	10	ND	105	70-130	8	30	03/05/19		
1,2-Dichlorobenzene	10	0.50	ug/L	10	ND	104	70-130	10	30	03/05/19		
1,2-Dichloroethane	10	0.50	ug/L	10	ND	103	70-130	9	30	03/05/19		
1,2-Dichloropropane	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19		
1,3,5-Trimethylbenzene	10	0.50	ug/L	10	ND	103	70-130	7	30	03/05/19		
1,3-Dichlorobenzene	10	0.50	ug/L	10	ND	102	70-130	10	30	03/05/19		
1,3-Dichloropropane	10	0.50	ug/L	10	ND	100	70-130	4	30	03/05/19		
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	107	70-130	10	30	03/05/19		
2,2-Dichloropropane	13	0.50	ug/L	10	ND	125	70-130	9	30	03/05/19		
2-Butanone	10	5.0	ug/L	10	ND	103	70-130	9	30	03/05/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

EPA 524.2 - Quality Control

Batch: A903007 Prepared: 3/5/2019

Prep Method: EPA 524.2 Analyst: ANM

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Blank Spike Dup (A903007-BSD1)											
2-Chlorotoluene	10	0.50	ug/L	10	ND	105	70-130	7	30	03/05/19	
2-Hexanone	9.7	10	ug/L	10	ND	97	70-130	12	30	03/05/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	107	70-130	9	30	03/05/19	
4-Methyl-2-pentanone	9.2	5.0	ug/L	10	ND	92	70-130	3	30	03/05/19	
Acetone	13	10	ug/L	10	ND	127	70-130	6	30	03/05/19	
Benzene	10	0.50	ug/L	10	ND	102	70-130	4	30	03/05/19	
Bromobenzene	10	0.50	ug/L	10	ND	104	70-130	8	30	03/05/19	
Bromochloromethane	11	0.50	ug/L	10	ND	105	70-130	14	30	03/05/19	
Bromodichloromethane	10	0.50	ug/L	10	ND	102	70-130	9	30	03/05/19	
Bromoform	10	0.50	ug/L	10	ND	104	70-130	8	30	03/05/19	
Bromomethane	10	0.50	ug/L	10	ND	100	70-130	21	30	03/05/19	
Carbon disulfide	11	10	ug/L	10	ND	112	70-130	9	30	03/05/19	
Carbon Tetrachloride	11	0.50	ug/L	10	ND	108	70-130	6	30	03/05/19	
Chlorobenzene	11	0.50	ug/L	10	ND	105	70-130	8	30	03/05/19	
Chloroethane	13	0.50	ug/L	10	ND	129	70-130	16	30	03/05/19	
Chloroform	9.6	0.50	ug/L	10	ND	96	70-130	11	30	03/05/19	
Chloromethane	12	0.50	ug/L	10	ND	121	70-130	16	30	03/05/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	107	70-130	9	30	03/05/19	
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Dibromochloromethane	10	0.50	ug/L	10	ND	103	70-130	8	30	03/05/19	
Dibromomethane	10	0.50	ug/L	10	ND	102	70-130	9	30	03/05/19	
Dichlorodifluoromethane	12	0.50	ug/L	10	ND	124	70-130	10	30	03/05/19	
Dichloromethane	11	0.50	ug/L	10	ND	107	70-130	14	30	03/05/19	
Di-isopropyl ether (DIPE)	10	3.0	ug/L	10	ND	101	70-130	0	30	03/05/19	
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	105	70-130	0	30	03/05/19	
Ethylbenzene	10	0.50	ug/L	10	ND	103	70-130	7	30	03/05/19	
Hexachlorobutadiene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Isopropylbenzene	10	0.50	ug/L	10	ND	102	70-130	6	30	03/05/19	
m,p-Xylenes	19	0.50	ug/L	20	ND	96	70-130	7	30	03/05/19	
Methyl-t-butyl ether	23	0.50	ug/L	20	ND	115	70-130	0	30	03/05/19	
Naphthalene	8.7	0.50	ug/L	10	ND	87	70-130	2	30	03/05/19	
n-Butylbenzene	10	0.50	ug/L	10	ND	103	70-130	6	30	03/05/19	
n-Propylbenzene	10	0.50	ug/L	10	ND	104	70-130	6	30	03/05/19	
o-Xylene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
p-Isopropyltoluene	10	0.50	ug/L	10	ND	104	70-130	6	30	03/05/19	
sec-Butylbenzene	10	0.50	ug/L	10	ND	103	70-130	6	30	03/05/19	
Styrene	9.0	0.50	ug/L	10	ND	90	70-130	8	30	03/05/19	
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	103	70-130	2	30	03/05/19	
tert-Butyl alcohol (TBA)	10	2.0	ug/L	10	ND	102	70-130	13	30	03/05/19	
tert-Butylbenzene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
Tetrachloroethene (PCE)	10	0.50	ug/L	10	ND	104	70-130	1	30	03/05/19	
Toluene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/05/19	
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	110	70-130	8	30	03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903007-BSD1)											
trans-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130	4	30	03/05/19	
Trichloroethene (TCE)	10	0.50	ug/L	10	ND	104	70-130	1	30	03/05/19	
Trichlorofluoromethane	11	5.0	ug/L	10	ND	113	70-130	10	30	03/05/19	
Vinyl Chloride	12	0.50	ug/L	10	ND	123	70-130	12	30	03/05/19	
Surrogate: 1,2-Dichlorobenzene-d4	*55*			*50*		*110*	*70-130*			03/05/19	
Surrogate: Bromofluorobenzene	*57*			*50*		*113*	*70-130*			03/05/19	
Matrix Spike (A903007-MS1), Source: A9C0014-01											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	107	41-156			03/06/19	
1,1,1-Trichloroethane	12	0.50	ug/L	10	ND	116	48-160			03/06/19	
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	105	42-151			03/06/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	12	10	ug/L	10	ND	119	47-164			03/06/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	104	45-152			03/06/19	
1,1-Dichloroethane	11	0.50	ug/L	10	ND	110	48-157			03/06/19	
1,1-Dichloroethene	11	0.50	ug/L	10	ND	113	51-158			03/06/19	
1,1-Dichloropropene	11	0.50	ug/L	10	ND	109	46-162			03/06/19	
1,2,3-Trichlorobenzene	9.7	0.50	ug/L	10	ND	97	37-145			03/06/19	
1,2,4-Trichlorobenzene	9.3	0.50	ug/L	10	ND	93	33-149			03/06/19	
1,2,4-Trimethylbenzene	10	0.50	ug/L	10	ND	100	44-146			03/06/19	
1,2-Dichlorobenzene	11	0.50	ug/L	10	ND	108	44-146			03/06/19	
1,2-Dichloroethane	11	0.50	ug/L	10	ND	106	47-151			03/06/19	
1,2-Dichloropropane	11	0.50	ug/L	10	ND	106	47-155			03/06/19	
1,3,5-Trimethylbenzene	10	0.50	ug/L	10	ND	103	45-154			03/06/19	
1,3-Dichlorobenzene	10	0.50	ug/L	10	ND	103	44-146			03/06/19	
1,3-Dichloropropane	10	0.50	ug/L	10	ND	103	45-151			03/06/19	
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	111	43-146			03/06/19	
2,2-Dichloropropane	8.9	0.50	ug/L	10	ND	89	24-182			03/06/19	
2-Butanone	9.1	5.0	ug/L	10	ND	91	55-144			03/06/19	
2-Chlorotoluene	11	0.50	ug/L	10	ND	105	48-150			03/06/19	
2-Hexanone	8.7	10	ug/L	10	ND	87	40-159			03/06/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	109	43-150			03/06/19	
4-Methyl-2-pentanone	8.0	5.0	ug/L	10	ND	80	30-171			03/06/19	
Acetone	10	10	ug/L	10	ND	102	27-181			03/06/19	
Benzene	11	0.50	ug/L	10	ND	109	48-155			03/06/19	
Bromobenzene	10	0.50	ug/L	10	ND	104	43-151			03/06/19	
Bromochloromethane	11	0.50	ug/L	10	ND	106	48-161			03/06/19	
Bromodichloromethane	10	0.50	ug/L	10	ND	105	47-151			03/06/19	
Bromoform	10	0.50	ug/L	10	ND	102	29-162			03/06/19	
Bromomethane	10	0.50	ug/L	10	ND	104	10-200			03/06/19	
Carbon disulfide	12	10	ug/L	10	ND	117	57-161			03/06/19	
Carbon Tetrachloride	12	0.50	ug/L	10	ND	116	47-163			03/06/19	
Chlorobenzene	11	0.50	ug/L	10	ND	109	46-152			03/06/19	
Chloroethane	14	0.50	ug/L	10	ND	138	28-189			03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903007										Prepared: 3/5/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Matrix Spike (A903007-MS1), Source: A9C0014-01											
Chloroform	9.0	0.50	ug/L	10	ND	90	52-148			03/06/19	
Chloromethane	13	0.50	ug/L	10	ND	130	53-159			03/06/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	108	50-152			03/06/19	
cis-1,3-Dichloropropene	9.9	0.50	ug/L	10	ND	99	34-156			03/06/19	
Dibromochloromethane	10	0.50	ug/L	10	ND	105	44-149			03/06/19	
Dibromomethane	11	0.50	ug/L	10	ND	108	46-150			03/06/19	
Dichlorodifluoromethane	14	0.50	ug/L	10	ND	139	33-170			03/06/19	
Dichloromethane	11	0.50	ug/L	10	ND	110	47-156			03/06/19	
Di-isopropyl ether (DIPE)	9.4	3.0	ug/L	10	ND	94	41-159			03/06/19	
Ethyl tert-Butyl Ether (ETBE)	9.7	0.50	ug/L	10	ND	97	32-160			03/06/19	
Ethylbenzene	10	0.50	ug/L	10	ND	104	40-157			03/06/19	
Hexachlorobutadiene	11	0.50	ug/L	10	ND	108	38-151			03/06/19	
Isopropylbenzene	9.9	0.50	ug/L	10	ND	99	41-156			03/06/19	
m,p-Xylenes	20	0.50	ug/L	20	ND	98	49-154			03/06/19	
Methyl-t-butyl ether	21	0.50	ug/L	20	ND	105	41-156			03/06/19	
Naphthalene	8.0	0.50	ug/L	10	ND	77	35-154			03/06/19	
n-Butylbenzene	10	0.50	ug/L	10	ND	102	31-153			03/06/19	
n-Propylbenzene	10	0.50	ug/L	10	ND	105	39-156			03/06/19	
o-Xylene	9.6	0.50	ug/L	10	ND	96	27-164			03/06/19	
p-Isopropyltoluene	10	0.50	ug/L	10	ND	100	26-161			03/06/19	
sec-Butylbenzene	10	0.50	ug/L	10	ND	101	39-154			03/06/19	
Styrene	6.0	0.50	ug/L	10	ND	60	10-200			03/06/19	
tert-Amyl Methyl Ether (TAME)	9.4	3.0	ug/L	10	ND	94	24-161			03/06/19	
tert-Butyl alcohol (TBA)	9.5	2.0	ug/L	10	ND	95	22-174			03/06/19	
tert-Butylbenzene	10	0.50	ug/L	10	ND	102	40-153			03/06/19	
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	113	48-155			03/06/19	
Toluene	11	0.50	ug/L	10	ND	108	40-159			03/06/19	
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	111	52-157			03/06/19	
trans-1,3-Dichloropropene	9.7	0.50	ug/L	10	ND	97	28-160			03/06/19	
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	112	49-155			03/06/19	
Trichlorofluoromethane	13	5.0	ug/L	10	ND	126	47-169			03/06/19	
Vinyl Chloride	13	0.50	ug/L	10	ND	131	21-183			03/06/19	
Surrogate: 1,2-Dichlorobenzene-d4	*55*			*50*		*109*	*70-130*			03/06/19	
Surrogate: Bromofluorobenzene	*55*			*50*		*109*	*70-130*			03/06/19	
EPA 525.3 - Quality Control											
Batch: A903993										Prepared: 3/24/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank (A903993-BLK1)											
Alachlor	ND	1.0	ug/L							03/25/19	
Atrazine	ND	0.50	ug/L							03/25/19	
Benzo(a)pyrene	ND	0.10	ug/L							03/25/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

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EPA 525.3 - Quality Control											
Batch: A903993										Prepared: 3/24/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank (A903993-BLK1)											
Bis(2-ethylhexyl) adipate	ND	3.0	ug/L							03/25/19	
Bis(2-ethylhexyl) phthalate	ND	3.0	ug/L							03/25/19	
Bromacil	ND	10	ug/L							03/25/19	
Butachlor	ND	0.38	ug/L							03/25/19	
Diazinon	ND	0.25	ug/L							03/25/19	
Dimethoate	ND	10	ug/L							03/25/19	
Metolachlor	ND	0.50	ug/L							03/25/19	
Metribuzin	ND	0.50	ug/L							03/25/19	
Molinate	ND	2.0	ug/L							03/25/19	
Propachlor	ND	0.50	ug/L							03/25/19	
Simazine	ND	1.0	ug/L							03/25/19	
Thiobencarb	ND	1.0	ug/L							03/25/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.0*			*1.0*		*100*	*70-130*			03/25/19	
Surrogate: Benzo(a)pyrene-d12	*1.0*			*1.0*		*104*	*70-130*			03/25/19	
Surrogate: Triphenyl Phosphate	*1.1*			*1.0*		*107*	*70-130*			03/25/19	
Blank Spike (A903993-BS1)											
Alachlor	0.22	1.0	ug/L	0.20	ND	110	70-130			03/25/19	
Atrazine	0.12	0.50	ug/L	0.10	ND	116	70-130			03/25/19	
Benzo(a)pyrene	0.019	0.10	ug/L	0.020	ND	96	70-130			03/25/19	
Bis(2-ethylhexyl) adipate	0.57	3.0	ug/L	0.40	ND	143	70-130			03/25/19	BS1.3 ***High***
Bis(2-ethylhexyl) phthalate	0.82	3.0	ug/L	0.60	ND	136	70-130			03/25/19	BS1.3 ***High***
Bromacil	0.26	10	ug/L	0.20	ND	128	70-130			03/25/19	
Butachlor	0.26	0.38	ug/L	0.20	ND	132	70-130			03/25/19	BS1.3 ***High***
Diazinon	0.27	0.25	ug/L	0.25	ND	107	70-130			03/25/19	
Dimethoate	0.45	10	ug/L	0.40	ND	113	70-130			03/25/19	
Metolachlor	0.27	0.50	ug/L	0.25	ND	109	70-130			03/25/19	
Metribuzin	0.24	0.50	ug/L	0.20	ND	119	70-130			03/25/19	
Molinate	0.41	2.0	ug/L	0.40	ND	103	70-130			03/25/19	
Propachlor	0.11	0.50	ug/L	0.10	ND	108	70-130			03/25/19	
Simazine	0.080	1.0	ug/L	0.070	ND	114	70-130			03/25/19	
Thiobencarb	0.22	1.0	ug/L	0.20	ND	112	70-130			03/25/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.97*			*1.0*		*97*	*70-130*			03/25/19	
Surrogate: Benzo(a)pyrene-d12	*1.0*			*1.0*		*100*	*70-130*			03/25/19	
Surrogate: Triphenyl Phosphate	*1.1*			*1.0*		*106*	*70-130*			03/25/19	
Blank Spike Dup (A903993-BSD1)											
Alachlor	0.22	1.0	ug/L	0.20	ND	111	70-130	0	30	03/25/19	
Atrazine	0.12	0.50	ug/L	0.10	ND	115	70-130	1	30	03/25/19	
Benzo(a)pyrene	0.019	0.10	ug/L	0.020	ND	97	70-130	1	30	03/25/19	
Bis(2-ethylhexyl) adipate	0.57	3.0	ug/L	0.40	ND	143	70-130	0	30	03/25/19	BS1.3 ***High***
Bis(2-ethylhexyl) phthalate	0.89	3.0	ug/L	0.60	ND	149	70-130	9	30	03/25/19	BS1.3 ***High***
Bromacil	0.26	10	ug/L	0.20	ND	128	70-130	1	30	03/25/19	
Butachlor	0.26	0.38	ug/L	0.20	ND	130	70-130	1	30	03/25/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 525.3 - Quality Control											
Batch: A903993										Prepared: 3/24/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank Spike Dup (A903993-BSD1)											
Diazinon	0.27	0.25	ug/L	0.25	ND	107	70-130	0	30	03/25/19	
Dimethoate	0.47	10	ug/L	0.40	ND	119	70-130	5	30	03/25/19	
Metolachlor	0.27	0.50	ug/L	0.25	ND	109	70-130	0	30	03/25/19	
Metribuzin	0.23	0.50	ug/L	0.20	ND	116	70-130	2	30	03/25/19	
Molinate	0.41	2.0	ug/L	0.40	ND	103	70-130	0	30	03/25/19	
Propachlor	0.11	0.50	ug/L	0.10	ND	110	70-130	2	30	03/25/19	
Simazine	0.080	1.0	ug/L	0.070	ND	114	70-130	0	30	03/25/19	
Thiobencarb	0.23	1.0	ug/L	0.20	ND	114	70-130	1	30	03/25/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.96*			*1.0*		*96*	*70-130*			03/25/19	
Surrogate: Benzo(a)pyrene-d12	*1.0*			*1.0*		*100*	*70-130*			03/25/19	
Surrogate: Triphenyl Phosphate	*1.1*			*1.0*		*105*	*70-130*			03/25/19	
Matrix Spike (A903993-MS1), Source: A9C1409-01											
Alachlor	1.0	1.0	ug/L	0.95	ND	105	70-130			03/25/19	
Atrazine	0.49	0.50	ug/L	0.48	ND	102	70-130			03/25/19	
Benzo(a)pyrene	0.091	0.10	ug/L	0.095	ND	96	70-130			03/25/19	
Bis(2-ethylhexyl) adipate	2.2	3.0	ug/L	1.9	ND	116	70-130			03/25/19	
Bis(2-ethylhexyl) phthalate	3.0	3.0	ug/L	2.9	ND	107	70-130			03/25/19	
Bromacil	1.2	10	ug/L	0.95	ND	130	70-130			03/25/19	
Butachlor	1.1	0.38	ug/L	0.95	ND	119	70-130			03/25/19	
Diazinon	1.3	0.25	ug/L	1.2	ND	104	70-130			03/25/19	
Dimethoate	2.2	10	ug/L	1.9	ND	116	70-130			03/25/19	
Metolachlor	1.3	0.50	ug/L	1.2	ND	106	70-130			03/25/19	
Metribuzin	1.1	0.50	ug/L	0.95	ND	115	70-130			03/25/19	
Molinate	1.8	2.0	ug/L	1.9	ND	97	70-130			03/25/19	
Propachlor	0.52	0.50	ug/L	0.48	ND	110	70-130			03/25/19	
Simazine	0.33	1.0	ug/L	0.33	ND	100	70-130			03/25/19	
Thiobencarb	1.0	1.0	ug/L	0.95	ND	106	70-130			03/25/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.91*			*0.95*		*95*	*70-130*			03/25/19	
Surrogate: Benzo(a)pyrene-d12	*0.96*			*0.95*		*100*	*70-130*			03/25/19	
Surrogate: Triphenyl Phosphate	*1.0*			*0.95*		*106*	*70-130*			03/25/19	
EPA 531.1 - Quality Control											
Batch: A902963										Prepared: 3/4/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Blank (A902963-BLK1)											
3-Hydroxycarbofuran	ND	2.0	ug/L							03/05/19	
Aldicarb	ND	2.0	ug/L							03/05/19	
Aldicarb Sulfone	ND	2.0	ug/L							03/05/19	
Aldicarb Sulfoxide	ND	2.0	ug/L							03/05/19	
Carbaryl	ND	2.0	ug/L							03/05/19	
Carbofuran	ND	2.0	ug/L							03/05/19	
Methomyl	ND	2.0	ug/L							03/05/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 531.1 - Quality Control											
Batch: A902963										Prepared: 3/4/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Blank (A902963-BLK1)											
Oxamyl	ND	2.0	ug/L							03/05/19	
Blank Spike (A902963-BS1)											
3-Hydroxycarbofuran	9.6	2.0	ug/L	8.7	ND	110	80-120			03/05/19	
Aldicarb	4.5	2.0	ug/L	4.3	ND	104	80-120			03/05/19	
Aldicarb Sulfone	7.2	2.0	ug/L	7.0	ND	104	80-120			03/05/19	
Aldicarb Sulfoxide	4.5	2.0	ug/L	4.3	ND	104	80-120			03/05/19	
Carbaryl	8.3	2.0	ug/L	8.7	ND	95	80-120			03/05/19	
Carbofuran	9.2	2.0	ug/L	7.8	ND	117	80-120			03/05/19	
Methomyl	8.6	2.0	ug/L	8.7	ND	99	80-120			03/05/19	
Oxamyl	9.2	2.0	ug/L	8.7	ND	106	80-120			03/05/19	
Blank Spike Dup (A902963-BSD1)											
3-Hydroxycarbofuran	8.9	2.0	ug/L	8.7	ND	102	80-120	8	20	03/05/19	
Aldicarb	4.3	2.0	ug/L	4.3	ND	99	80-120	5	20	03/05/19	
Aldicarb Sulfone	7.2	2.0	ug/L	7.0	ND	104	80-120	0	20	03/05/19	
Aldicarb Sulfoxide	4.6	2.0	ug/L	4.3	ND	106	80-120	1	20	03/05/19	
Carbaryl	7.9	2.0	ug/L	8.7	ND	91	80-120	4	20	03/05/19	
Carbofuran	8.8	2.0	ug/L	7.8	ND	113	80-120	4	20	03/05/19	
Methomyl	8.8	2.0	ug/L	8.7	ND	102	80-120	3	20	03/05/19	
Oxamyl	9.2	2.0	ug/L	8.7	ND	105	80-120	1	20	03/05/19	
Matrix Spike (A902963-MS1), Source: A9B2862-01											
3-Hydroxycarbofuran	9.8	2.0	ug/L	8.7	ND	108	65-135			03/05/19	
Aldicarb	6.1	2.0	ug/L	4.3	ND	113	65-135			03/05/19	
Aldicarb Sulfone	7.3	2.0	ug/L	7.0	ND	105	65-135			03/05/19	
Aldicarb Sulfoxide	4.7	2.0	ug/L	4.3	ND	108	65-135			03/05/19	
Carbaryl	8.4	2.0	ug/L	8.7	ND	96	65-135			03/05/19	
Carbofuran	9.3	2.0	ug/L	7.8	ND	114	65-135			03/05/19	
Methomyl	8.2	2.0	ug/L	8.7	ND	94	65-135			03/05/19	
Oxamyl	9.3	2.0	ug/L	8.7	ND	106	65-135			03/05/19	
EPA 547 - Quality Control											
Batch: A902884										Prepared: 3/1/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank (A902884-BLK1)											
Glyphosate	ND	25	ug/L							03/01/19	
Surrogate: AMPA	*180*			*200*		*92*	*70-130*			03/01/19	
Blank Spike (A902884-BS1)											
Glyphosate	99	25	ug/L	100	ND	99	70-130			03/01/19	
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/01/19	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 547 - Quality Control											
Batch: A902884										Prepared: 3/1/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank Spike Dup (A902884-BSD1)											
Glyphosate	95	25	ug/L	100	ND	95	70-130	4	30	03/01/19	
Surrogate: AMPA	*190*			*200*		*94*	*70-130*			03/01/19	
Matrix Spike (A902884-MS1), Source: A9B2626-01											
Glyphosate	95	25	ug/L	100	ND	95	70-130			03/01/19	
Surrogate: AMPA	*180*			*200*		*88*	*70-130*			03/01/19	
Matrix Spike Dup (A902884-MSD1), Source: A9B2626-01											
Glyphosate	97	25	ug/L	100	ND	97	70-130	2	30	03/01/19	
Surrogate: AMPA	*170*			*200*		*86*	*70-130*			03/01/19	
EPA 548.1 - Quality Control											
Batch: A903189										Prepared: 3/7/2019	
Prep Method: EPA 548.1										Analyst: JKH	
Blank (A903189-BLK1)											
Endothall	ND	45	ug/L							03/17/19	
Blank Spike (A903189-BS1)											
Endothall	16	45	ug/L	20	ND	82	46-116			03/17/19	
Blank Spike Dup (A903189-BSD1)											
Endothall	17	45	ug/L	20	ND	84	46-116	2	30	03/17/19	
Matrix Spike (A903189-MS1), Source: A9C0014-01											
Endothall	1.6	45	ug/L	20	ND	8	46-116			03/17/19	MS1.0 ***Low***
EPA 549.2 - Quality Control											
Batch: A902905										Prepared: 3/4/2019	
Prep Method: EPA 549.2										Analyst: VTL	
Blank (A902905-BLK1)											
Diquat	ND	4.0	ug/L							03/06/19	
Blank Spike (A902905-BS1)											
Diquat	3.8	4.0	ug/L	4.0	ND	96	70-130			03/06/19	
Blank Spike Dup (A902905-BSD1)											
Diquat	3.6	4.0	ug/L	4.0	ND	89	70-130	7	30	03/06/19	
Matrix Spike (A902905-MS1), Source: A9B3307-01											
Diquat	3.5	4.0	ug/L	4.0	ND	87	70-130			03/06/19	

Certificate of Analysis

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Field tests are outside the scope of laboratory accreditation and there is no certification available for field testing.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected below MRL/MDL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	PicoCuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit	U:	The analyte was not detected at or above the reported sample quantitation limit.

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters:

Chlorothalonil

Trifluralin

Certificate of Analysis

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing under each certification.**

Fresno

State of California - ELAP	1180	State of Hawaii	4021
Los Angeles CSD	9254479	NELAP certified	4021-011
State of Nevada	CA000792019-1	State of Oregon - NELAP	4021-011
EPA - UCMR4	CA00079	State of Washington	C997-18

Sacramento

State of California - ELAP	2435		

San Bernardino

State of California - ELAP	2993	Los Angeles CSD	9254478
NELAP certified	4119-003	State of Oregon - NELAP	4119-003

Vancouver

NELAP certified	WA100008-011	State of Oregon - NELAP	WA100008-011
State of Washington	C824-18b		

A9C0090

03012019

Monte6227

Turnaround: Standard
Due Date: 3/15/2019

Monterey Bay Analytical

"_" means preservation/ch								
	$Na_2S_2O_3$ (CG) Blue Label 504, 505, 547	—	—	4V				
	$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH < 3	P F	1V				
	NH_4Cl (AG) Purple Label 552	—	—					
	EDA (AG) Brown Label DBPs	—	—					
	HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—	3V				
	Buffer pH 4 (CG)	—	—					
	H_3PO_4 (CG) Salmon Label	—	—					
	Other:							

Split		Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
	S P				S P			
	S P				S P			

✓ **Indicates Blanks Received**

Printed: 3/1/2019 5:01:24PM

BSK Associates Engineers & Laboratories
1414 Stanislaus St., Fresno, CA 93706
(559) 497-2888 · Fax (559) 497-2893
www.bskassociates.com

Turnaround Time Request
☒ Standard - 10 business days
☐ Rush (Surcharge may apply)
Date needed:

A9C0090 03/01/2019
Monte6227 10

*Required Fields Temp: 3.4 #55

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax:
Monterey Bay Analytical Services	Sara Sugarman Additional cc's: David Holland	David Holland PO#:	831-375-6227	831-641-0734
			E-mail*: info@mbasinc.com	

Address*:	City*:	State*:	Zip*:
4 Justin Court, Suite D	Monterey	CA	93940

Project: Twin Lakes Church Injection Well
Project #:
How would you like to receive your completed results?* ☒ E-Mail ☐ Fax ☐ Mail

Reporting Options: ☐ Trace (J-Flag) ☐ Swamp ☐ EDD Type: _____

Sampler Name (Printed/Signature)*: Dylan Jones

Regulatory Carbon Copies: ☐ SWRCB (Drinking Water) ☐ Merced Co ☐ Fresno Co ☐ Madera Co ☐ Tulare Co ☐ Other: _____

Regulatory Compliance: ☐ EDT to California SWRCB (Drinking Water) System Number*: _____ ☐ Geotracker #: _____

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX	EPA 504	EPA 505	EPA 515	EPA 524	EPA 525	EPA 531, EPA 547	EPA 548, EPA 549	EPA 1613 (2,3,7,8 Dioxin)	Chromium 6
1.	Zone 1 Perforations	2/28/19	9:55	DW	190228_01-01	X	X	X	X	X	X	X	X	X

VLT 3.1.19

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
David Holland	MBAS	2/28	1600		
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date: 3.1.19	Time: 11:52	Payment Received at Delivery: Date:	Check / Cash Amount: PIA#: Init.

Shipping Method: QNTRAC UPS GSO WALK-IN FED EX Courier: _____ Custody Seal: Y / N
Cooling Method: Wet Blue None Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

SR-FL-0012-06

A9C0090 03/01/2019
Monte6227 10

BSK Associates SR-FL-0002-19

Sample Integrity

BSK Bottles: (Yes) No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 8°C	(Yes) No NA	Were correct containers and preservatives received for the tests requested?	(Yes) No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No (NA)	Bubbles Present VOAs (524.2/TCP/TTHM)? TB Received? (Check Method Below)	Yes (No) NA Yes (No) NA
Did all bottles arrive unbroken and intact?	(Yes) No	Was a sufficient amount of sample received?	(Yes) No
Did all bottle labels agree with COC?	(Yes) No	Do samples have a hold time <72 hours?	Yes (No)
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No (NA)	Was PM notified of discrepancies? PM: By/Time:	Yes No (NA)

Bottles Received ("_" means preservation/chlorine checks are either N/A or are performed in the lab)

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	
Bacti $Na_2S_2O_3$	—	—	
None (P) White Cap	—	—	
Cr6 (P) Lt. Green Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **DW**	Cl, pH > 8	(P) F	1A
Cr6 (P) Pink Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **WW**	pH 9.3-9.7	P F	
Cr6 (P) Black Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ **7199** ***24 HOUR HOLD TIME***	pH 9.0-9.5	P F	
HNO_3 (P) Red Cap or HCl (P) Purple Cap/Lt. Blue Label	—	—	
H_2SO_4 (P) or (AG) Yellow Cap/Label	pH < 2	P F	
NaOH (P) Green Cap	Cl, pH >10	P F	
NaOH + ZnAc (P)	pH > 9	P F	
Dissolved Oxygen 300ml (g)	—	—	2C VCH 3-1-19
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—	2C
HCl (AG) Lt. Blue Label O&G, Diesel, **TCP**	—	—	
Ascorbic, EDTA, KH_2Ct (AG) Pink Label 525	—	—	2C
Na_2SO_3 250mL (AG) Neon Green Label 515	—	—	1A
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—	1C
$Na_2S_2O_3$ (AG) Blue Label 548, THM, 524	—	—	1A
$Na_2S_2O_3$ (CG) Blue Label 504, 505, 547	—	—	7V
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH < 3	(P) F	1V
NH_4Cl (AG) Purple Label 552	—	—	
EDA (AG) Brown Label DBPs	—	—	
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—	3V
Buffer pH 4 (CG)	—	—	
H_3PO_4 (CG) Salmon Label	—	—	
Other:			
Asbestos 1L (P) w/ Foil / LL Metals Bottle	—	—	
Bottled Water	—	—	
Clear Glass 250mL / 500mL / 1 Liter	—	—	
Solids: Brass / Steel / Plastic Bag	—	—	

VCH 3-1-19

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

✓ **Indicates Blanks Received**

504 __ 524.2 __ TCP __ TTHM __ 537 __

8260/624 __

Labeled by: VCH @ 16:24 Labels checked by: [illegible] @ 1644 RUSH Paged by:_____@_____

CERES Analytical Laboratory, Inc.
1919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

March 13, 2019

Ceres ID: 12680

BSK Associates
1414 Stanislaus St.
Fresno, CA 93706

The following report contains the results for the one drinking water sample received on March 6, 2019. This sample was analyzed for 2,3,7,8-TCDD by EPA method 1613B. Routine turn-around time was provided for this work.

This work was authorized under your Subcontract Order # A9C0090.

Continuing Calibration Verification (CCV) Requirements
All associated calibration verification standard(s) (CCV) met the acceptance criteria.

The report consists of a Cover Letter, Sample Inventory (Section I), Data Summary (Section II), Sample Tracking (Section VI), and Qualifiers/Abbreviations (Section VII). Raw Data (Section III), Continuing Calibration (Section IV), and Initial Calibration (Section V) are available in a full report (.pdf format) upon request.

If you have any questions regarding this report, please feel free to contact me at (916)932-5011.

Sincerely,

James M. Hedin
Director of Operations/CEO
jhedin@ceres-lab.com

Section I: Sample Inventory

Ceres Sample ID:	Sample ID	Date Received	Collection Date &Time
12680-001	Zone 1 Perforations A9C0090-01	3/6/2019	2/28/2019 9:55

Section II: Data Summary

EPA Method 1613B

Quality Assurance Sample **Method Blank** **Project ID:** A9C0090	**QC Batch #:** 1948 **Matrix:** Drinking Water **Sample Size:** 1.000 L	**Date Received:** NA **Date Extracted:** 3/8/2019 **ZB-5MS Analysis:** 3/12/2019

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.59	1.49	5.00		13C-2378-TCDD	76.0	31-137	
					CRS			
					37Cl4-2378-TCDD	61.8	35-197	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

EPA Method 1613B

Quality Assurance Sample Ongoing Precision and Recovery		Date Received: NA
	QC Batch #: 1948	Date Extracted: 3/8/2019
	Matrix: Drinking Water	ZB-5MS Analysis: 3/12/2019
Project ID: A9C0090	Sample Size: 1.000 L	

Analyte	Conc. (ng/mL)	Limits (a)	Labeled Standards	% Rec.	Limits (a)
2,3,7,8-TCDD	9.52	7.3-14.6	13C-2378-TCDD	82.0	25-141
			CRS		
			37Cl4-2378-TCDD	79.7	37-158

(a) Limits based on method acceptance criteria.

Analyst: JMH **Reviewed by: BS**

CERES Analytical Laboratory, Inc.

EPA Method 1613B

Client Sample ID: Zone 1 Perforations A9C0090-01		
Project ID: A9C0090	**Ceres Sample ID:** 12680-001	**Date Received:** 3/6/2019
	QC Batch #: 1948	**Date Extracted:** 3/8/2019
Date Collected: 2/28/2019	**Matrix:** Drinking Water	**ZB-5MS Analysis:** 3/12/2019
Time Collected: 9:55	**Sample Size:** 1.019 L	

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.68	1.49	4.91		13C-2378-TCDD	80.9	31-137	
					CRS			
					37Cl4-2378-TCDD	66.9	42-164	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

Section VI: Sample Tracking

ASSOCIATES

SUBCONTRACT ORDER

A9C0090

SENDING LABORATORY:

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
Phone: 559-497-2888
Fax: 559-485-6935
Project Manager: Jaime Lee LaFave
E-mail: jlafave@bskassociates.com

RECEIVING LABORATORY:

Ceres Analytical Laboratory, Inc
4919 Windplay Drive, Suite 1
El Dorado Hills, CA 95762
Phone :(916) 932-5011
Fax: -
Turnaround (Days): Standard
QC Deliverables: I Std III IV

Sample ID	Samp Desc		Sample Date
A9C0090-01	**Zone 1 Perforations**	**Client Matrix** Drinking Water	**02/28/2019 09:55**

Sample Alias: 190228_01-01
Lab Matrix: Water

Analysis:
EXT-Dioxin-DW matrix, EPA 1613 2,3,7,8-TCDD

Released By	Date	Received By	Date
[signature]	3/5/19	[signature]	3/6/19
Released By	Date	Received By	Date

Sample Receipt Check List Logged by: JL (initials)

Ceres ID: 12680		Date/Time: 3/6/19 11:38
Client Project ID: A9C0090		Received Temp: 3.3 °C Acceptable: (Y) / N
Chain of Custody Relinquished by signed?		(Y) / N
Chain of Custody Received by signed?		(Y) / N
Custody Seals?	Present?	Y / N
	Intact?	Y / N
	NA:	(NA)
Unlabeled / Illegible Samples		Y / (N)
Proper Containers:		(Y) / N
Preservation Acceptable (Chemical or Temperature)?		(Y) / N
Drinking Water, Sodium Thiosulfate present?		Y / N / (NA)
Residual Cl?		(Y) / N
Aqueous sample pH: 7		

List COC discrepancies:

JL 3/6/19

List Damaged Samples:

JL 3/6/19

Section VII: Qualifiers/Abbreviations

J	Concentration found below the lower quantitation limit but greater than zero.
B	Analyte present in the associated Method Blank.
E	Concentration found exceeds the Calibration range of the HRGC/HRMS.
D	This analyte concentration was calculated from a dilution.
X	The concentration found is the estimated maximum possible concentration due to chlorinated diphenyl ethers present in the sample.
H	Recovery limits exceeded. See cover letter.
*****	Results taken from dilution.
I	Interference. See cover letter.
Conc.	Concentration Found
DL	Calculated Detection Limit
ND	Non-Detect
% Rec.	Percent Recovery

April 4, 2019

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Lab ID : SP 1902830
Customer : 2-19144

Laboratory Report

Introduction: This report package contains total of 5 pages divided into 3 sections:

Case Narrative	(2 pages)	: An overview of the work performed at FGL.
Sample Results	(1 page)	: Results for each sample submitted.
Quality Control	(2 pages)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
Zone 1 Perforations	02/28/2019	03/01/2019	SP 1902830-001	DW

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived at 5 °C. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Radio QC

900.0	03/28/2019:204406 All analysis quality controls are within established criteria
	03/28/2019:204527 All analysis quality controls are within established criteria
	03/26/2019:203250 All preparation quality controls are within established criteria
903.0	03/14/2019:203742 All analysis quality controls are within established criteria
	03/11/2019:202601 All preparation quality controls are within established criteria
906.0	03/23/2019:204308 All analysis quality controls are within established criteria
	03/19/2019:202959 All preparation quality controls are within established criteria
Ra - 05	03/17/2019:203855 All analysis quality controls are within established criteria

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 4, 2019 Lab ID : SP 1902830
Monterey Bay Analytical Services Customer : 2-19144

Radio QC

Ra - 05	03/12/2019:202600 All preparation quality controls are within established criteria
SM7500Rn	03/12/2019:203466 All analysis quality controls are within established criteria
	03/01/2019:202324 All preparation quality controls are within established criteria

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-04-05

April 4, 2019

Lab ID : SP 1902830-001
Customer ID : 2-19144

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Sampled On : February 28, 2019-09:55
Sampled By : Dylan Jones
Received On : March 1, 2019-10:22
Matrix : Drinking Water

Description : Zone 1 Perforations
Project : Twin Lakes Church Injection Well

Sample Result - Radio

Constituent	Result ± Error	MDA	Units	MCL/AL	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Radio Chemistry								
Gross Alpha	1.56 ± 1.90	2.26	pCi/L		900.0	03/26/19-10:06 2P1903250	900.0	03/28/19-09:38 2A1904406
Gross Beta	5.31 ± 1.74	1.60	pCi/L		900.0	03/26/19-10:06 2P1903250	900.0	03/28/19-12:02 2A1904527
Radon-222	1600 ± 135	16.2	pCi/L		SM7500Rn	03/01/19-11:50 2P1902324	SM7500Rn	03/12/19-08:39 2A1903466
Total Alpha Radium (226)	0.049 ± 0.168	0.547	pCi/L		903.0	03/11/19-17:50 2P1902601	903.0	03/14/19-16:00 2A1903742
Tritium	249 ± 269	434	pCi/L		906.0	03/19/19-09:30 2P1902959	906.0	03/23/19-01:37 2A1904308
Ra 228	0.000 ± 0.610	0.383	pCi/L		Ra - 05	03/12/19-16:00 2P1902600	Ra - 05	03/17/19-15:10 2A1903855

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:
Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
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April 4, 2019 Lab ID : SP 1902830
Monterey Bay Analytical Services Customer : 2-19144

Quality Control - Radio

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Radio								
Alpha	900.0	03/28/19:204406IWC	CCV	cpm	8289	37.3 %	35-47	
			CCB	cpm		0.0800	0.14	
Beta	900.0	03/28/19:204527JCA	CCV	cpm	8290	87.9 %	83-94	
			CCB	cpm		0.4800	0.58	
Gross Alpha	900.0	03/26/19:203250IWC	Blank	pCi/L		0.90	3	
			LCS	pCi/L	130.0	98.2 %	75-125	
			MS	pCi/L	130.0	106 %	60-140	
		(SP 1903908-001)	MSD	pCi/L	130.0	102 %	60-140	
			MSRPD	pCi/L	130.0	4.2%	≤30	
Gross Beta	900.0	03/26/19:203250IWC	Blank	pCi/L		0.15	4	
			LCS	pCi/L	69.10	127 %	84-160	
			MS	pCi/L	69.10	95.6 %	80-130	
		(SP 1903908-001)	MSD	pCi/L	69.10	103 %	80-130	
			MSRPD	pCi/L	130.0	7.2%	≤30	
Alpha	903.0	03/14/19:203742emv	CCV	cpm	8299	38.2 %	37-46	
			CCB	cpm		0.0400	0.12	
Total Alpha Radium (226)	903.0	03/11/19:202601emv	RgBlk	pCi/L		-0.004	2	
			LCS	pCi/L	23.33	81.4 %	52-107	
			BS	pCi/L	23.33	69.8 %	43-111	
			BSD	pCi/L	23.33	83.7 %	43-111	
			BSRPD	pCi/L	23.33	18.1%	≤35.5	
Tritium	906.0	03/19/19:202959JCA	Blank	pCi/L		137	<300	
			LCS	pCi/L	1666	92.1 %	75-125	
			BS	pCi/L	1666	94.4 %	75-125	
			BSD	pCi/L	1666	98.5 %	75-125	
			BSRPD	pCi/L	1666	3.9%	≤25	
	906.0	03/23/19:204308JCA	CCV	pCi/L	26150	106 %	90-110	
			CCB	pCi/L		70	500	
Beta	Ra - 05	03/17/19:203855emv	CCV	cpm	8297	88.5 %	84-94	
			CCB	cpm		0.4200	0.51	
Ra 228	Ra - 05	03/12/19:202600emv	RgBlk	pCi/L		0.03	3	
			LRS	pCi/L	12.05	77.0 %	65-108	
			BS	pCi/L	12.05	86.6 %	75-125	
			BSD	pCi/L	12.05	92.1 %	75-125	
			BSRPD	pCi/L	12.05	0.66	≤3	
Radon	SM7500Rn	(SP 1902830-001)	Dup	pCi/L		10.2%	25	
	SM7500Rn	03/12/19:203466JCA	CCV	pCi/L	2582	93.9 %	90-110	
			CCB	pCi/L		-7.4	20	

Definition

CCV	: Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
CCB	: Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
Blank	: Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
RgBlk	: Method Reagent Blank - Prepared to correct for any reagent contributions to sample result.
LCS	: Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
LRS	: Laboratory Recovery Standard - Prepared to establish the batch recovery factor used in result calculations.
MS	: Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD	: Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
BS	: Blank Spikes - A blank is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
BSD	: Blank Spike Duplicate of BS/BSD pair - A blank duplicate is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
Dup	: Duplicate Sample - A random sample with each batch is prepared and analyzed in duplicate. The relative percent difference is an indication of precision for the preparation and analysis.

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Quality Control - Radio

Definition	
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
BSRPD	: BS/BSD Relative Percent Difference (RPD) - The BS relative percent difference is an indication of precision for the preparation and analysis.
ND	: Non-detect - Result was below the DQO listed for the analyte.
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.

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CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT

Client: Monterey Bay Analytical Services
Customer Number: 2019144
Address: 4 Justin Court
Monterey, CA 93940

Phone: (831)375-6227 Fax: (831)641-0734
Email Address: info@mbasinc.com
Contact Person: David Holland
Project Name: Twin Lakes Church Injection Well
Purchase Order Number:
Quote Number:

Rush Analysis: ☐ 5 Day ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 24 hour
Rush pre-approval by lab (initals): _____
Electronic Data Transfer: ☑ No ☐ State ☐ Client Other: _____

Sampler(s): Dylan Jones

Sampling Fee: _____ Pickup Fee: _____
Compositor Setup Date: _____ Time: _____

Lab Number: 190228-30

TEST DESCRIPTION AND ANALYSES REQUESTED

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite (C) Grab (G)	Number of Containers	Type of Containers: (G)Glass (P)Plastic (V)VOA (MT)Metal Tube	Potable (P) Non-Potable (NP) Ag Water (AgW)	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (WW) Waste Water (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	Bact: (Sys) System (SRC) Source (W) Waste	Bact: (ROUT)Routine (RPT)Repeat (OTH)Other (RPL)Replace	(LT) Leaf Tissue (PET) Petiole Tissue (PRO) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other_____	Gross Alpha	Gross Beta	Radium 226	Radium 228	Radon	Tritium
1.	Zone 1 Perforations	2/28/19	9:55	G	6	var	P	DW						X	X	X	X	X	X
																			X

Remarks
190228_01-01

5439460945

Relinquished	Date:	Time:
DHolland	2/28	1600

Received By:	Date:	Time:

Relinquished	Date:	Time:
GSO	3/1/19	1055

Received By:	Date:	Time:
	3/1/19	1055

Relinquished	Date:	Time:

Received By:	Date:	Time:

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Condition Upon Receipt (Attach to COC)

Sample Receipt at SP:

1. Number of ice chests/packages received: **1**
2. Shipper tracking numbers **543946945**
3. Were samples received in a chilled condition?
   Temps: **5** / _____ / _____ / _____ / _____ / _____ / _____
4. Surface water (SWTR) bact samples: A sample that has a temperature upon receipt of >10C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.
5. Do the number of bottles received agree with the COC? **Yes** / **No** / **N/A**
6. Verify sample date, time, sampler **Yes** / **No** / **N/A**
7. Were the samples received intact? (i.e. no broken bottles, leaks, etc.) **Yes** / **No**
8. Were sample custody seals intact? **Yes** / **No** / **N/A**

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? **Yes** / **No**
2. Did bottle labels correspond with the client's ID's? **Yes** / **No**
3. Were all bottles requiring sample preservation properly preserved? **Yes** / **No** / **N/A** **FGL**
   [Exception: Oil & Grease, VOA and CrVI verified in lab]
4. VOAs checked for Headspace? **Yes** / **No** / **N/A**
5. Were all analyses within holding times at time of receipt? **Yes** / **No**
6. Have rush or project due dates been checked and accepted? **Yes** / **No** / **N/A**

Include a copy of the COC for lab delivery. (Bacti. Inorganics and Radio)

Sample Receipt, Login and Verification completed by: Reviewed and Approved By **Inez Covarrubias** Digitally signed by Inez Covarrubias Title: Sample Receiving Date: 03/07/2019-09:10:36

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: _____ Phone Number: _____
   Initiated By: _____ Date: _____
   Problem:

   Resolution:

2. Person Contacted: _____ Phone Number: _____
   Initiated By: _____ Date: _____
   Problem:

   Resolution:

(2019144)
Monterey Bay Analytical Services
SP 1902830
IV-03/07/2019-09:10:36

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Chris Duncan
595 Airport Blvd.
Watsonville, California 95076

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ELAP Certification Number: 2385

Friday, April 12, 2019

Lab Number: 190304_06-01 **Sample Description: Sample Set Zone 2 (581' - 601')**

Collection Date/Time: 3/4/2019 09:30 Sample Collector: Matsushima L Client Sample #:

Submittal Date/Time: 3/4/2019 10:59 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
1,2,3-Trichloropropane	SRL 524M	µg/L	ND	1	E	0.005	0.005	3/7/2019	18:53	
Alkalinity, Total (as CaCO3)	SM2320B	mg/L	230	1		10		3/7/2019	10:00	BS
Aluminum, Total	EPA200.8	µg/L	32	1	SS,	5	1000	3/7/2019	16:24	MW
SS: Second Source recovery below method control limit.; LN: MS and/or MSD below acceptance limits.										
Anion-Cation Balance	Calculation	%	0	1						
Antimony, Total	EPA200.8	µg/L	ND	1		0.5	6	3/7/2019	16:24	MW
Arsenic, Total	EPA200.8	µg/L	0.6	1		0.5	10	3/7/2019	16:24	MW
Asbestos	EPA100.2	mF/L	ND	1	E	0.2	7	3/10/2019	12:00	
Barium, Total	EPA200.8	µg/L	45.6	1		5	1000	3/7/2019	16:24	MW
Beryllium, Total	EPA200.8	µg/L	ND	1		0.5	4	3/7/2019	16:24	MW
Bicarbonate (as HCO3-)	SM2320B	mg/L	281	1		10				
Bromide	EPA300.0	mg/L	0.1	1		0.1		3/4/2019	18:18	HM
Cadmium, Total	EPA200.8	µg/L	ND	1		0.25	5	3/7/2019	16:24	MW
Calcium	EPA200.7	mg/L	55	1		1		3/6/2019	13:05	HM
Carbonate as CaCO3	SM2320B	mg/L	ND	1		10				
Chloride	EPA300.0	mg/L	54	1		1	250	3/4/2019	18:18	HM
Chromium VI	EPA 218.7	µg/L	ND	1	E			3/7/2019	12:00	
Chromium, Total	EPA200.8	µg/L	1.5	1		1	50	3/7/2019	16:24	MW
Color, Apparent (Unfiltered)	SM2120B	Color Units	5	1		3	15	3/5/2019	11:58	PS
Copper, Total	EPA200.7	µg/L	ND	1		10	1300	3/6/2019	13:05	HM
Cyanide, Available	OIA-1677-09	µg/L	ND	1	SS	2	150	3/6/2019	11:05	BS
SS: Second Source recovery exceeds method control limit.										
Dioxin *2,3,7,8-TCDD*	EPA 1613	pg/L	ND	1	E			3/21/2019	12:00	
Fluoride	EPA300.0	mg/L	0.2	1		0.1	2	3/4/2019	18:18	HM
Gross Alpha	EPA900.0	pCi/L	10.4±1.63	1	E			4/12/2019	10:40	
Gross Beta	EPA900.0	pCi/L	1.10±1.20	1	E			4/12/2019	10:40	
Hardness (as CaCO3)	SM2340B/Calc	mg/L	185	1		10				
Hydroxide	SM2320B	mg/L	ND	1		10				
Iron, Dissolved	EPA200.7	µg/L	46	1		10	300	3/6/2019	13:02	HM
Iron, Total	EPA200.7	µg/L	157	1		10	300	3/6/2019	13:05	HM
Langlier Index, 15°C	SM2330B	NA	0.04	1						
Langlier Index, 60°C	SM2330B	NA	0.87	1						
Lead, Total	EPA200.8	µg/L	ND	1		1	15	3/7/2019	16:24	MW
Magnesium	EPA200.7	mg/L	12	1		0.5		3/6/2019	13:05	HM

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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Friday, April 12, 2019

Lab Number: 190304_06-01 **Sample Description: Sample Set Zone 2 (581' - 601')**

Collection Date/Time: 3/4/2019 09:30 Sample Collector: Matsushima L Client Sample #:

Submittal Date/Time: 3/4/2019 10:59 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Manganese, Dissolved	EPA200.7	µg/L	48	1		10	50	3/6/2019	13:02	HM
Manganese, Total	EPA200.7	µg/L	47	1		10	50	3/6/2019	13:05	HM
MBAS (Surfactants)	SM5540C	mg/L	ND	1		0.05		3/5/2019	15:17	HM
Mercury, Total	EPA200.8	µg/L	ND	1	SS	0.2	2	3/7/2019	16:24	MW
SS: Second Source recovery below method control limit										
Nickel, Total	EPA200.8	µg/L	ND	1		5	100	3/7/2019	16:24	MW
Nitrate as N	EPA300.0	mg/L	ND	1		0.1	10	3/4/2019	18:18	HM
Nitrate+Nitrite as N	EPA300.0	mg/L	ND	1		0.1	10	3/4/2019	18:18	HM
Nitrite as N	EPA300.0	mg/L	ND	1		0.1	1	3/4/2019	18:18	HM
N-Nitrosodimethylamine	EPA 521	ng/l	ND	1	E	2		3/8/2019	21:08	
Odor Threshold at 60 C	SM2150B	TON	1	1		1	3	3/5/2019	09:11	PS
Odor: ND										
Orthophosphate as P	EPA300.0	mg/L	ND	1		0.1		3/4/2019	18:18	HM
Perchlorate	EPA314.0	µg/L	ND	1		2	6	3/5/2019	12:53	HM
pH (Laboratory)	SM4500-H+B	pH (H)	7.7	1		0.1	8.5	3/4/2019	16:36	PS
Potassium	EPA200.7	mg/L	5.9	1		0.5		3/6/2019	13:05	HM
QC Anion Sum x 100	Calculation	%	105	1						
QC Cation Sum x 100	Calculation	%	105	1						
QC Ratio TDS/SEC	Calculation	NA	0.69	1						
Radium 226	EPA 903.1	pCi/L	0.101±0.105	1	E		5	3/18/2019	10:00	
Radium 228	EPA903.0	pCi/L	0.094±0.557	1	E			3/19/2019	18:10	
Radon	SM7500-Rn	pCi/L	299±30.0	1	E			3/8/2019	01:11	
Selenium, Total	EPA200.8	µg/L	ND	1		1	50	3/7/2019	16:24	MW
Silver, Total	EPA200.8	µg/L	ND	1	LN, IH	1	100	3/7/2019	16:24	MW
LN: MS and/or MSD below acceptance limits.; IH: LCS and/or LCSD below acceptance limits.										
Sodium	EPA200.7	mg/L	104	1	MB	1		3/6/2019	13:05	HM
MB: Analyte present in the Continuing Calibration Verification Blank. (0.76mg/L)										
Specific Conductance (EC)	SM2510B	µmhos/cm	802	1		1	900	3/6/2019	14:15	HM
Strontium, Total	EPA200.8	µg/L	503	1	IL	0.15		3/7/2019	16:24	MW
IL: RPD exceeds laboratory control limit										
Sulfate	EPA300.0	mg/L	110	1		1	250	3/4/2019	18:18	HM
Synthetic Organic Compounds	External	µg/L	ND	1	E			3/23/2019	12:00	
Thallium, Total	EPA200.8	µg/L	ND	1		0.5	2	3/7/2019	16:24	MW
Total Dissolved Solids	SM2540C	mg/L	554	1		10	500	3/4/2019	15:03	LM
Tritium	EPA906.0	pCi/L	126±265	1	E			3/23/2019	05:01	
Turbidity	EPA180.1	NTU	1.10	1		0.05	1	3/5/2019	10:18	PS

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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ELAP Certification Number: 2385

Friday, April 12, 2019

Lab Number: 190304_06-01 **Sample Description: Sample Set Zone 2 (581' - 601')**

Collection Date/Time: 3/4/2019 09:30 Sample Collector: Matsushima L Client Sample #:

Submittal Date/Time: 3/4/2019 10:59 System ID: Twin Lakes Church Injection Well

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Uranium, Radiological	EPA200.8	pCi/L	ND	1		0.5	20	3/7/2019	16:24	MW
Uranium, Total	EPA200.8	µg/L	ND	1		0.5	30	3/7/2019	16:24	MW
Volatile Organic Compounds (DW)	EPA524	µg/L	ND	1	E			3/6/2019	12:00	
Zinc, Total	EPA200.7	µg/L	ND	1		10	5000	3/6/2019	13:05	HM

Report Approved by:
David Holland, Laboratory Director

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level
H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance
MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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Friday, April 12, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
QC19030703	190306_15-01: Duplicate 1	Alkalinity, Total (as CaCO3)	101.0	mg/L		2.0	0 - 10
	LCS 1	Alkalinity, Total (as CaCO3)	42.0	mg/L	105		95 - 105
	Method Blank 1	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
QC19031113	190221_09-01: MS 1	Aluminum, Total	31.45	ug/L	63		70 - 130
	190221_09-01: MSD 1	Aluminum, Total	29.36	ug/L	59	6.9	0 - 20
	CCVB 1	Aluminum, Total	ND	ug/L		< 0.1	
	LCS 1	Aluminum, Total	41.23	ug/L	82		85 - 115
	LCSD 1	Aluminum, Total	40.95	ug/L	82	0.7	0 - 20
	Method Blank 1	Aluminum, Total	ND	ug/L		< 0.1	
	QCS 1	Aluminum, Total	37.78	ug/L	76		85 - 115
	190221_09-01: MS 1	Antimony, Total	50.03	ug/L	100		70 - 130
	190221_09-01: MSD 1	Antimony, Total	48.49	ug/L	97	3.1	0 - 20
	CCVB 1	Antimony, Total	ND	ug/L		< 0.1	
	LCS 1	Antimony, Total	50.08	ug/L	100		85 - 115
	LCSD 1	Antimony, Total	48.02	ug/L	96	4.2	0 - 20
	Method Blank 1	Antimony, Total	ND	ug/L		< 0.1	
	QCS 1	Antimony, Total	45.34	ug/L	91		85 - 115
	190221_09-01: MS 1	Arsenic, Total	52.85	ug/L	104		70 - 130
	190221_09-01: MSD 1	Arsenic, Total	51.83	ug/L	102	2.0	0 - 20
	CCVB 1	Arsenic, Total	ND	ug/L		< 0.1	
	LCS 1	Arsenic, Total	49.59	ug/L	99		85 - 115
	LCSD 1	Arsenic, Total	48.39	ug/L	97	2.4	0 - 20
	Method Blank 1	Arsenic, Total	ND	ug/L		< 0.1	
	QCS 1	Arsenic, Total	48.96	ug/L	98		85 - 115
	190221_09-01: MS 1	Barium, Total	117.5	ug/L	105		70 - 130
	190221_09-01: MSD 1	Barium, Total	112.7	ug/L	95	9.6	0 - 20
	CCVB 1	Barium, Total	ND	ug/L		< 0.1	
	LCS 1	Barium, Total	49.5	ug/L	99		85 - 115
	LCSD 1	Barium, Total	48.92	ug/L	98	1.2	0 - 20
	Method Blank 1	Barium, Total	ND	ug/L		< 0.1	
	QCS 1	Barium, Total	48.84	ug/L	98		85 - 115
	190221_09-01: MS 1	Beryllium, Total	60.55	ug/L	121		70 - 130
	190221_09-01: MSD 1	Beryllium, Total	58.91	ug/L	118	2.7	0 - 20
	CCVB 1	Beryllium, Total	ND	ug/L		< 0.1	
	LCS 1	Beryllium, Total	49.44	ug/L	99		85 - 115
	LCSD 1	Beryllium, Total	58.0	ug/L	116	15.9	0 - 20

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Friday, April 12, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	Method Blank 1	Beryllium, Total	ND	ug/L		< 0.1	
QC19030501	190304_06-01: MS 1	Bromide	1.81	mg/L	84		80 - 120
	190304_06-01: MSD 1	Bromide	1.8	mg/L	83	0.3	0 - 10
	CCVB 1	Bromide	ND	mg/L		< 0.1	
	LCS 1	Bromide	1.94	mg/L	97		90 - 110
	LCSD 1	Bromide	1.93	mg/L	96	0.6	0 - 10
	LCSL 1	Bromide	0.16	mg/L	81		50 - 150
	Method Blank 1	Bromide	ND	mg/L		< 0.1	
QC19031113	190221_09-01: MS 1	Cadmium, Total	48.18	ug/L	96		70 - 130
	190221_09-01: MSD 1	Cadmium, Total	46.38	ug/L	93	3.8	0 - 20
	CCVB 1	Cadmium, Total	ND	ug/L		< 0.1	
	LCS 1	Cadmium, Total	49.94	ug/L	100		85 - 115
	LCSD 1	Cadmium, Total	48.3	ug/L	97	3.3	0 - 20
	Method Blank 1	Cadmium, Total	ND	ug/L		< 0.1	
	QCS 1	Cadmium, Total	48.93	ug/L	98		85 - 115
QC19030609	190304_06-01: MS 1	Calcium	104.3	mg/L	99		70 - 130
	190304_06-01: MSD 1	Calcium	102.9	mg/L	96	2.7	0 - 20
	CCVB 1	Calcium	ND	mg/L		< 0.1	
	LCB 1	Calcium	ND	mg/L		< 0.1	
	LCS 1	Calcium	48.83	mg/L	98		95 - 105
	LCSD 1	Calcium	47.71	mg/L	95	2.3	0 - 10
	LFB 1	Calcium	51.47	mg/L	103		85 - 115
	LFBD 1	Calcium	50.77	mg/L	102	1.4	0 - 20
	Method Blank 1	Calcium	ND	mg/L		< 0.1	
	QCS 1	Calcium	47.97	mg/L	96		95 - 105
QC19030501	190304_06-01: MS 1	Chloride	73.47	mg/L	99		80 - 120
	190304_06-01: MSD 1	Chloride	73.56	mg/L	99	0.4	0 - 10
	CCVB 1	Chloride	ND	mg/L		< 0.1	
	LCS 1	Chloride	20.38	mg/L	102		90 - 110
	LCSD 1	Chloride	20.39	mg/L	102	< 0.1	0 - 10
	LCSL 1	Chloride	1.93	mg/L	97		50 - 150
	Method Blank 1	Chloride	ND	mg/L		< 0.1	
QC19031113	190221_09-01: MS 1	Chromium, Total	47.19	ug/L	91		70 - 130
	190221_09-01: MSD 1	Chromium, Total	45.59	ug/L	88	3.6	0 - 20
	CCVB 1	Chromium, Total	ND	ug/L		< 0.1	
	LCS 1	Chromium, Total	46.53	ug/L	93		85 - 115

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	LCSD 1	Chromium, Total	46.15	ug/L	92	0.8	0 - 20
	Method Blank 1	Chromium, Total	ND	ug/L		< 0.1	
	QCS 1	Chromium, Total	46.14	ug/L	92		85 - 115
QC19031107	190304_06-01: Duplicate 1	Color, Apparent (Unfiltered)	5.0	Color Units		< 0.1	0 - 25
	190305_16-01: Duplicate 2	Color, Apparent (Unfiltered)	5.0	Color Units		< 0.1	0 - 25
	CCVB 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
	LCS 1	Color, Apparent (Unfiltered)	5.0	Color Units	100		80 - 120
	LCSD 1	Color, Apparent (Unfiltered)	5.0	Color Units	100	< 0.1	0 - 20
	Method Blank 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
QC19030609	190304_06-01: MS 1	Copper, Total	986.0	µg/L	99		70 - 130
	190304_06-01: MSD 1	Copper, Total	977.9	µg/L	98	0.8	0 - 20
	CCVB 1	Copper, Total	ND	µg/L		< 0.1	
	LCB 1	Copper, Total	ND	µg/L		< 0.1	
	LCS 1	Copper, Total	951.0	µg/L	95		95 - 105
	LCSD 1	Copper, Total	975.6	µg/L	98	2.6	0 - 10
	LFB 1	Copper, Total	1009.0	µg/L	101		85 - 115
	LFBD 1	Copper, Total	995.0	µg/L	100	1.4	0 - 20
	Method Blank 1	Copper, Total	ND	µg/L		< 0.1	
	QCS 1	Copper, Total	991.3	µg/L	99		95 - 105
QC19030704	190305_16-01: MS 1	Cyanide, Available	99.96	µg/L	101		80 - 120
	190305_16-01: MSD 1	Cyanide, Available	101.6	µg/L	103	1.6	0 - 20
	CCVB 1	Cyanide, Available	ND	µg/L		< 0.1	
	LCS 1	Cyanide, Available	99.48	µg/L	99		90 - 110
	LCSD 1	Cyanide, Available	102.8	µg/L	103	3.3	0 - 10
	LCSL 1	Cyanide, Available	1.68	µg/L	84		50 - 150
	Method Blank 1	Cyanide, Available	ND	µg/L		< 0.1	
	QCS 1	Cyanide, Available	132.5	µg/L	133		90 - 110
QC19030501	190304_06-01: MS 1	Fluoride	2.1	mg/L	94		80 - 120
	190304_06-01: MSD 1	Fluoride	2.22	mg/L	100	6.1	0 - 10
	CCVB 1	Fluoride	ND	mg/L		< 0.1	
	LCS 1	Fluoride	2.01	mg/L	101		90 - 110
	LCSD 1	Fluoride	2.0	mg/L	100	0.6	0 - 10
	LCSL 1	Fluoride	0.18	mg/L	88		50 - 150
	Method Blank 1	Fluoride	ND	mg/L		< 0.1	
QC19030609	190304_06-01: MS 1	Iron, Total	1167.0	µg/L	101		70 - 130
	190304_06-01: MSD 1	Iron, Total	1174.0	µg/L	102	0.8	0 - 20

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Friday, April 12, 2019

QC Results

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	CCVB 1	Iron, Total	ND	µg/L		< 0.1	
	LCB 1	Iron, Total	ND	µg/L		< 0.1	
	LCS 1	Iron, Total	987.6	µg/L	99		95 - 105
	LCSD 1	Iron, Total	1001.0	µg/L	100	1.3	0 - 10
	LFB 1	Iron, Total	1044.0	µg/L	104		85 - 115
	LFBD 1	Iron, Total	1035.0	µg/L	104	0.9	0 - 20
	Method Blank 1	Iron, Total	ND	µg/L		< 0.1	
	QCS 1	Iron, Total	1015.0	µg/L	101		95 - 105
QC19031113	190221_09-01: MS 1	Lead, Total	43.21	ug/L	86		70 - 130
	190221_09-01: MSD 1	Lead, Total	41.84	ug/L	84	3.2	0 - 20
	CCVB 1	Lead, Total	ND	ug/L		< 0.1	
	LCS 1	Lead, Total	46.02	ug/L	92		85 - 115
	LCSD 1	Lead, Total	46.56	ug/L	93	1.2	0 - 20
	Method Blank 1	Lead, Total	ND	ug/L		< 0.1	
	QCS 1	Lead, Total	46.29	ug/L	93		85 - 115
QC19030609	190304_06-01: MS 1	Magnesium	65.03	mg/L	107		70 - 130
	190304_06-01: MSD 1	Magnesium	64.81	mg/L	106	0.4	0 - 20
	CCVB 1	Magnesium	ND	mg/L		< 0.1	
	LCB 1	Magnesium	ND	mg/L		< 0.1	
	LCS 1	Magnesium	49.18	mg/L	98		95 - 105
	LCSD 1	Magnesium	52.45	mg/L	105	6.4	0 - 10
	LFB 1	Magnesium	52.52	mg/L	105		85 - 115
	LFBD 1	Magnesium	51.75	mg/L	103	1.5	0 - 20
	Method Blank 1	Magnesium	ND	mg/L		< 0.1	
	QCS 1	Magnesium	51.71	mg/L	103		95 - 105
	190304_06-01: MS 1	Manganese, Total	1066.0	µg/L	102		70 - 130
	190304_06-01: MSD 1	Manganese, Total	1061.0	µg/L	101	0.5	0 - 20
	CCVB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCS 1	Manganese, Total	989.4	µg/L	99		95 - 105
	LCSD 1	Manganese, Total	1003.0	µg/L	100	1.4	0 - 10
	LFB 1	Manganese, Total	1044.0	µg/L	104		85 - 115
	LFBD 1	Manganese, Total	1029.0	µg/L	103	1.4	0 - 20
	Method Blank 1	Manganese, Total	ND	µg/L		< 0.1	
	QCS 1	Manganese, Total	1009.0	µg/L	101		95 - 105
QC19030603	190304_17-01: MS 1	MBAS (Surfactants)	0.25	mg/L	99		80 - 120

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Friday, April 12, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	190304_17-01: MSD 1	MBAS (Surfactants)	0.25	mg/L	102	2.4	0 - 10
	CCVB 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
	LCS 1	MBAS (Surfactants)	0.23	mg/L	92		80 - 120
	LCSD 1	MBAS (Surfactants)	0.25	mg/L	98	7.2	0 - 10
	LCSL 1	MBAS (Surfactants)	0.06	mg/L	122		50 - 150
	Method Blank 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
QC19031113	190221_09-01: MS 1	Mercury, Total	0.89	ug/L	89		70 - 130
	190221_09-01: MSD 1	Mercury, Total	0.89	ug/L	89	< 0.1	0 - 20
	CCVB 1	Mercury, Total	ND	ug/L		< 0.1	
	LCS 1	Mercury, Total	0.93	ug/L	93		85 - 115
	LCSD 1	Mercury, Total	0.87	ug/L	87	7.3	0 - 20
	Method Blank 1	Mercury, Total	ND	ug/L		< 0.1	
	QCS 1	Mercury, Total	0.73	ug/L	73		85 - 115
	190221_09-01: MS 1	Nickel, Total	46.54	ug/L	90		70 - 130
	190221_09-01: MSD 1	Nickel, Total	45.82	ug/L	89	1.6	0 - 20
	CCVB 1	Nickel, Total	ND	ug/L		< 0.1	
	LCS 1	Nickel, Total	49.94	ug/L	100		85 - 115
	LCSD 1	Nickel, Total	48.96	ug/L	98	2.0	0 - 20
	Method Blank 1	Nickel, Total	ND	ug/L		< 0.1	
	QCS 1	Nickel, Total	49.66	ug/L	99		85 - 115
QC19030501	190304_06-01: MS 1	Nitrate as N	1.8	mg/L	90		80 - 120
	190304_06-01: MSD 1	Nitrate as N	1.79	mg/L	90	< 0.1	0 - 10
	CCVB 1	Nitrate as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate as N	1.97	mg/L	98		90 - 110
	LCSD 1	Nitrate as N	1.96	mg/L	98	0.2	0 - 10
	LCSL 1	Nitrate as N	0.17	mg/L	83		50 - 150
	Method Blank 1	Nitrate as N	ND	mg/L		< 0.1	
	190304_06-01: MS 1	Nitrate+Nitrite as N	3.61	mg/L	90		80 - 120
	190304_06-01: MSD 1	Nitrate+Nitrite as N	3.61	mg/L	90	< 0.1	0 - 10
	CCVB 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate+Nitrite as N	4.0	mg/L	100		90 - 110
	LCSD 1	Nitrate+Nitrite as N	3.99	mg/L	100	0.1	0 - 10
	LCSL 1	Nitrate+Nitrite as N	0.34	mg/L	84		50 - 150
	Method Blank 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	190304_06-01: MS 1	Nitrite as N	1.82	mg/L	91		80 - 120
	190304_06-01: MSD 1	Nitrite as N	1.82	mg/L	91	< 0.1	0 - 10

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Friday, April 12, 2019

QC Results

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	CCVB 1	Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrite as N	2.03	mg/L	102		90 - 110
	LCSD 1	Nitrite as N	2.03	mg/L	101	< 0.1	0 - 10
	LCSL 1	Nitrite as N	0.17	mg/L	85		50 - 150
	Method Blank 1	Nitrite as N	ND	mg/L		< 0.1	
	190304_06-01: MS 1	Orthophosphate as P	1.71	mg/L	86		80 - 120
	190304_06-01: MSD 1	Orthophosphate as P	1.71	mg/L	86	< 0.1	0 - 10
	CCVB 1	Orthophosphate as P	ND	mg/L		< 0.1	
	LCS 1	Orthophosphate as P	2.17	mg/L	108		90 - 110
	LCSD 1	Orthophosphate as P	2.14	mg/L	107	1.1	0 - 10
	LCSL 1	Orthophosphate as P	0.19	mg/L	95		50 - 150
	Method Blank 1	Orthophosphate as P	ND	mg/L		< 0.1	
QC19030502	190304_06-01: MS 1	Perchlorate	4.74	ug/L	95		85 - 115
	190304_06-01: MSD 1	Perchlorate	4.87	ug/L	97	2.7	0 - 10
	CCVB 1	Perchlorate	ND	µg/L		< 0.1	
	IPC 1	Perchlorate	4.22	µg/L	84		80 - 120
	LCS 1	Perchlorate	4.84	ug/L	97		90 - 110
	LCSD 1	Perchlorate	5.35	ug/L	107	10.0	0 - 10
	LCSL 1	Perchlorate	1.95	ug/L	98		75 - 125
	Method Blank 1	Perchlorate	ND	µg/L		< 0.1	
	QCS 1	Perchlorate	5.03	ug/L	101		90 - 110
QC19030411	190304_17-01: Duplicate 1	pH (Laboratory)	7.0	pH (H)		< 0.1	0 - 10
	LCS 1	pH (Laboratory)	6.86	pH (H)	100		95 - 105
QC19030609	190304_06-01: MS 1	Potassium	15.97	mg/L	100		70 - 130
	190304_06-01: MSD 1	Potassium	15.89	mg/L	100	0.8	0 - 20
	CCVB 1	Potassium	ND	mg/L		< 0.1	
	LCB 1	Potassium	ND	mg/L		< 0.1	
	LCS 1	Potassium	9.69	mg/L	97		95 - 105
	LCSD 1	Potassium	9.93	mg/L	99	2.4	0 - 10
	LFB 1	Potassium	10.15	mg/L	101		85 - 115
	LFBD 1	Potassium	10.04	mg/L	100	1.0	0 - 20
	Method Blank 1	Potassium	ND	mg/L		< 0.1	
	QCS 1	Potassium	9.84	mg/L	98		95 - 105
QC19031113	190221_09-01: MS 1	Selenium, Total	52.72	ug/L	103		70 - 130
	190221_09-01: MSD 1	Selenium, Total	51.41	ug/L	100	2.6	0 - 20
	CCVB 1	Selenium, Total	ND	ug/L		< 0.1	

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Friday, April 12, 2019

QC Results

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	LCS 1	Selenium, Total	51.01	ug/L	102		85 - 115
	LCSD 1	Selenium, Total	47.94	ug/L	96	6.2	0 - 20
	Method Blank 1	Selenium, Total	ND	ug/L		< 0.1	
	QCS 1	Selenium, Total	49.86	ug/L	100		85 - 115
	190221_09-01: MS 1	Silver, Total	35.75	ug/L	71		70 - 130
	190221_09-01: MSD 1	Silver, Total	33.91	ug/L	68	5.3	0 - 20
	CCVB 1	Silver, Total	ND	ug/L		< 0.1	
	LCS 1	Silver, Total	45.7	ug/L	91		85 - 115
	LCSD 1	Silver, Total	39.31	ug/L	79	15.0	0 - 20
	Method Blank 1	Silver, Total	ND	ug/L		< 0.1	
	QCS 1	Silver, Total	44.37	ug/L	89		85 - 115
QC19030609	190304_06-01: MS 1	Sodium	151.7	mg/L	95		70 - 130
	190304_06-01: MSD 1	Sodium	150.1	mg/L	92	3.4	0 - 20
	CCVB 1	Sodium	0.76	mg/L	1	0.8	
	LCB 1	Sodium	ND	mg/L		< 0.1	
	LCS 1	Sodium	48.6	mg/L	97		95 - 105
	LCSD 1	Sodium	50.08	mg/L	100	3.0	0 - 10
	LFB 1	Sodium	50.7	mg/L	101		85 - 115
	LFBD 1	Sodium	50.3	mg/L	101	0.8	0 - 20
	Method Blank 1	Sodium	ND	mg/L		< 0.1	
	QCS 1	Sodium	48.84	mg/L	98		95 - 105
QC19030604	190304_05-01: Duplicate 1	Specific Conductance (EC)	1199.0	µmhos/cm		0.3	0 - 10
	190305_18-03: Duplicate 2	Specific Conductance (EC)	35.0	µmhos/cm		< 0.1	0 - 10
	LCS 1	Specific Conductance (EC)	1417.0	µmhos/cm	100		90 - 110
	LCSL 1	Specific Conductance (EC)	146.0	µmhos/cm	99		90 - 110
QC19031113	190221_09-01: MS 1	Strontium, Total	362.3	ug/L	103		70 - 130
	190221_09-01: MSD 1	Strontium, Total	347.4	ug/L	73	34.0	0 - 20
	CCVB 1	Strontium, Total	ND	ug/L		< 0.1	
	LCS 1	Strontium, Total	45.96	ug/L	92		85 - 115
	LCSD 1	Strontium, Total	49.04	ug/L	98	6.5	0 - 20
	Method Blank 1	Strontium, Total	ND	ug/L		< 0.1	
	QCS 1	Strontium, Total	42.91	ug/L	86		85 - 115
QC19030501	190304_06-01: MS 1	Sulfate	129.3	mg/L	99		80 - 120
	190304_06-01: MSD 1	Sulfate	129.4	mg/L	99	0.7	0 - 10
	CCVB 1	Sulfate	ND	mg/L		< 0.1	
	LCS 1	Sulfate	20.43	mg/L	102		90 - 110

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QC Results

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	LCSD 1	Sulfate	20.48	mg/L	102	0.2	0 - 10
	LCSL 1	Sulfate	1.84	mg/L	92		50 - 150
	Method Blank 1	Sulfate	ND	mg/L		< 0.1	
QC19031113	190221_09-01: MS 1	Thallium, Total	46.19	ug/L	92		70 - 130
	190221_09-01: MSD 1	Thallium, Total	44.95	ug/L	90	2.7	0 - 20
	CCVB 1	Thallium, Total	ND	ug/L		< 0.1	
	LCS 1	Thallium, Total	48.96	ug/L	98		85 - 115
	LCSD 1	Thallium, Total	51.15	ug/L	102	4.4	0 - 20
	Method Blank 1	Thallium, Total	ND	ug/L		< 0.1	
	QCS 1	Thallium, Total	47.5	ug/L	95		85 - 115
QC19030606	190304_09-04: Duplicate 1	Total Dissolved Solids	220.0	mg/L		4.4	0 - 5
	CCVB 1	Total Dissolved Solids	ND	mg/L		< 0.1	
	LCS 1	Total Dissolved Solids	482.0	mg/L	96		90 - 110
	LCSD 1	Total Dissolved Solids	464.0	mg/L	93	3.8	0 - 10
	LCSD2 1	Total Dissolved Solids	500.0	mg/L	100	3.7	0 - 10
	LCSL 1	Total Dissolved Solids	44.0	mg/L	88		50 - 150
	Method Blank 1	Total Dissolved Solids	ND	mg/L		< 0.1	
QC19030801	190304_30-29: Duplicate 1	Turbidity	0.1	NTU		< 0.1	0 - 20
	190305_16-01: Duplicate 2	Turbidity	2.5	NTU		< 0.1	0 - 20
	CCVB 1	Turbidity	ND	NTU		< 0.1	
	LCS 1	Turbidity	1.04	NTU	104		95 - 105
	LCSD 1	Turbidity	1.02	NTU	102	1.9	0 - 20
	Method Blank 1	Turbidity	ND	NTU		< 0.1	
QC19031113	CCVB 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	Method Blank 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	190221_09-01: MS 1	Uranium, Total	55.39	ug/L	105		70 - 130
	190221_09-01: MSD 1	Uranium, Total	54.02	ug/L	102	2.7	0 - 20
	CCVB 1	Uranium, Total	ND	ug/L		< 0.1	
	LCS 1	Uranium, Total	50.74	ug/L	101		85 - 115
	LCSD 1	Uranium, Total	52.73	ug/L	105	3.8	0 - 20
	Method Blank 1	Uranium, Total	ND	ug/L		< 0.1	
	QCS 1	Uranium, Total	51.94	ug/L	104		85 - 115
QC19030609	190304_06-01: MS 1	Zinc, Total	1038.0	µg/L	104		70 - 130
	190304_06-01: MSD 1	Zinc, Total	1037.0	µg/L	103	0.1	0 - 20
	CCVB 1	Zinc, Total	ND	µg/L		< 0.1	
	LCB 1	Zinc, Total	ND	µg/L		< 0.1	

Maggiora Bros Drilling Inc.
Chris Duncan
595 Airport Blvd.
Watsonville, California 95076

Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS (6227)
www.MBASinc.com
ELAP Certification Number: 2385

Friday, April 12, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	LCS 1	Zinc, Total	968.7	µg/L	97		95 - 105
	LCSD 1	Zinc, Total	1018.0	µg/L	102	5.0	0 - 10
	LFB 1	Zinc, Total	1041.0	µg/L	104		85 - 115
	LFBD 1	Zinc, Total	1017.0	µg/L	102	2.3	0 - 20
	Method Blank 1	Zinc, Total	ND	µg/L		< 0.1	
	QCS 1	Zinc, Total	996.4	µg/L	100		95 - 105

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ELAP Certification Number: 2385

Friday, April 12, 2019

Sample Condition Upon Receipt

Order ID: 190304_06

Is there evidence of chilling? *NOTE: Systems are encouraged but not required to hold samples <10°C (Microbiology) or <6°C (Chemistry) during transit.	Yes (<2hrs)
Did bottle arrive intact?	Yes
Did bottle labels agree with COC?	Yes
Adequate sample volume?	Yes
Sample preservative (HNO3, NaOH, H2SO4, Na2S2O3, HCl, Other)	#01 = (3) 250mL preserved w/ HNO3 PS
Additional Comments	#01 = 250mL preserved w/ NaOH PS
Additional Comments	#01 = 250mL filtered w/ 0.45um filters PS

190304-06

Monterey Bay Analytical Services Chain Of Custody / Analysis Request

4 Justin Ct. Suite D • Monterey, Ca 93940 • (831) 375-MBAS (6227) • (831) 641-0734 (Fax)

MBAS
Monterey Bay Analytical Services

Client/Company Name: **Maggiora Bros. Drilling**	Attention: Chris Duncan
Billing Address: 595 Airport Blvd Watsonville, CA 95076	
Project/System Information: Twin Lakes Church Injection Well	E-Mail Address(es): Watsonville@MaggioraBros.com
	Contract/P.O. #:
For Regulatory Complaince? YES ☐ NO ☑	Turn Around Time: STD (7-14 Days) ☑ 48-Hour ☐
For State or Local Health Department reporting:	5-Day ☐ 24-Hour ☐
Electronic Data Transfer (EDT)? YES ☐ NO ☑	Phone # 831-724-1338
System ID Number:	Fax #
Drinking water ☐ Wastewater ☐ Monitoring Well ☐ Soil ☐ Sludge ☐ Other ☐	

MBAS Lab #	Project ID or Source Code #	Sample Site / Description (Well Name, APN#, Address, Stormdrain #)	Sampling Date	Sampling Time	Receiving Temp.	CL2 Residual	Coliform Analysis Routine	Coliform Analysis Other	Coliform Analysis Repeat	Coliform Analysis Special	# Cont.	Container Type	Container Size	Analysis Requested: T22, 123-TCP, Perchlorate	Cr 6, Asbestos, VOC (MTBE)	SOC Full, Dioxin, NDMA	Gross Alpha/Beta, Radon	Radium 226/228, Tririum, U	Sr, Fe Diss, Mn Diss, As Diss
-01		Sample Set Zone 2	3/4/19	930	12.9									✓	✓	✓	✓	✓	✓
		581'-601'																	
		3/4/19																	

	Printed Name	Signature	Date	Time	Comments or Special Instructions:
Sampled by:	L. Matsushima		3/4/19	9:30	Sampling Time + Travel ____hrs.
Relinquished by:	L. Matsushima		3/4/19	10.59	45x2 → travel
Received by:	Pauline Seto	Pauline Seto	3/4/19	1059	30 → Sampling time
Relinquished by:					
Received by:	Monterey Bay Analytical Services				

☐ Payment received Check # Amount: Receipt # Date:

LA Testing
520 Mission Street South Pasadena, CA 91030
Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com / pasadenalab@latesting.com

LA Testing Order ID: 321905760
Customer ID: MBAS42
Customer PO:
Project ID:

Attn: Sara Sugarman
Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Phone: (831) 375-6227
Fax: (831) 641-0734
Received: 03/05/2019
Analyzed: 03/10/2019

Proj: Twin Lakes Church Injection Well

Test Report: Determination of Asbestos Structures >10µm in Drinking Water Performed by the 100.2 Method (EPA 600/R-94/134)

Sample ID / Client / EMSL	Sample Filtration Date/Time	Original Sample Vol. Filtered (ml)	Effective Filter Area (mm²)	Area Analyzed (mm²)	ASBESTOS: Asbestos Types	Fibers Detected	Analytical Sensitivity	Concentration	Confidence Limits
								MFL (million fibers per liter)	
190304_06-01 321905760-0001	3/5/2019 12:50 PM	30	1288	0.2193	None Detected	ND	0.20	<0.20	0.00 - 0.72

Collection Date/Time: 03/04/2019 09:30

Sample Set Zone 2 (581'-601')

Analyst(s)
Sherrie Ahmad (1)

Jerry Drapala Ph.D, Laboratory Manager
or Other Approved Signatory

Any questions please contact Jerry Drapala.

Initial report from: 03/11/2019 20:38:21

Sample collection and containers provided by the client, acceptable bottle blank level is defined as ≤0.01MFL>10um. ND=None Detected. This report relates only to those items tested. This report may not be reproduced, except in full, without written permission by LA Testing. Samples received in good condition unless otherwise noted.

Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283

Asbestos Chain of Custody

LA Testing Order Number (Lab Use Only): #321905760

LA TESTING
520 MISSION STREET
S. PASADENA, CA 91030
PHONE (323) 254-9980
FAX (323) 254-9983

Company : Monterey Bay Analytical Services (+32MBAS66)	LA Testing-Bill to: ☒ Same ☐ Different If Bill to is Different note instructions in Comments**
Street: 4 Justin Court, Suite D	*Third Party Billing requires written authorization from third party*
City: Monterey — State/Province: CA	Zip/Postal Code: 93940 — Country: USA
Report To (Name): Sara Sugarman	Fax #: 831-641-0734
Telephone #: 831-375-6227	Email Address: info@mbasinc.com
Project Name/Number: Twin Lakes Church Injection Well	
Please Provide Results: ☐ Fax ☒ Email — Purchase Order:	U.S. State Samples Taken: Ca

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hours through 6 hours, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with LA Testing's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ 4-4.5hr TAT (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☒ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ EPA Protocol (Semi-Quantitative)
- ☐ EPA Protocol (Quantitative)

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: L. Matsushima — Samplers Signature:

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
	Sample Set Zone 2 (581'-601')	1L	3/4/19, 9:30

Client Sample # (s): 190304_06-01 - Total # of Samples: 1

Relinquished (Client): [signature] Ben Sawyer Date: 3/4/19 Time: 1600

Received (Lab): [signature] (EFO) Date: 3/5/19 Time: 955

Comments/Special Instructions: Account: MBAS42. Please include sample description in report.

Page 1 of ____ pages 18.1 °C

Controlled Document – Asbestos COC – R2 – 1/12/2010

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders:	9C06025	**Report Date:**	3/15/2019
		Received Date:	3/6/2019
Project:	Twin Lakes Church Injection Well Project	**Turnaround Time:**	Normal
		Phones:	(831) 375-6227
		Fax:	(831) 641-0734
Attn:	David Holland	**P.O. #:**	
Client:	Monterey Bay Analytical Services 4 Justin Court, Suite D Monterey, CA 93940	**Billing Code:**	

ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO 17025 #L2457.01 • LACSD #10143 • NELAP-CA #04229CA • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear David Holland,

Enclosed are the results of analyses for samples received 3/06/19 with the Chain-of-Custody document. The samples were received in good condition, at 4.8 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Regina Giancola
Project Manager

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.weclabs.com

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/15/2019 13:19

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
Sample Set Zone 2 (581'-601'), RegID: 190304_06-01	L.Matsushima	9C06025-01	Water	03/04/19 09:30	

Analyses Accreditation Summary

Analyte	CAS #	Not By NELAP	By ANAB
EPA 521 in Water			
N-Nitrosodimethylamine	62-75-9	✓	
NDMA-d6		✓	
SRL 524M-TCP in Water			
1,2,3-Trichloropropane	96-18-4	✓	

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/15/2019 13:19

Sample Results

Sample: Sample Set Zone 2 (581'-601'), RegID: 190304_06-01
9C06025-01 (Water)

Sampled: 03/04/19 9:30 by L.Matsushima

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM							
Method: SRL 524M-TCP **Batch ID:** W9C0402 **Instr:** GCMS04 **Prepared:** 03/07/19 11:41 **Analyst:** enf							
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l	1	03/07/19 18:53	
Nitrosamines by CI GC/MS/MS, EPA 521							
Method: EPA 521 **Batch ID:** W9C0444 **Instr:** GCMS09 **Prepared:** 03/08/19 08:31 **Analyst:** mld							
N-Nitrosodimethylamine	ND	0.28	2.0	ng/l	1	03/08/19 21:08	
Surrogate(s)							
NDMA-d6	*80%*	*Conc: 20.1*	*70-130*			*03/08/19 21:08*	

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www.weckabs.com

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported: 03/15/2019 13:19

Quality Control Results

Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0402 - SRL 524M-TCP											
Blank (W9C0402-BLK1)					**Prepared & Analyzed: 03/07/19**						
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l							
LCS (W9C0402-BS1)					**Prepared & Analyzed: 03/07/19**						
1,2,3-Trichloropropane	0.00506	0.0012	0.0050	ug/l	0.00500		101	80-120			
LCS Dup (W9C0402-BSD1)					**Prepared & Analyzed: 03/07/19**						
1,2,3-Trichloropropane	0.00494	0.0012	0.0050	ug/l	0.00500		99	80-120	2	20	J
Duplicate (W9C0402-DUP1)	**Source: 9C04039-02**				**Prepared & Analyzed: 03/07/19**						
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l		ND				20	

Quality Control Results

Nitrosamines by CI GC/MS/MS, EPA 521

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0444 - EPA 521											
Blank (W9C0444-BLK1)					**Prepared: 03/08/19 Analyzed: 03/11/19**						
N-Nitrosodimethylamine	ND	0.28	2.0	ng/l							
Surrogate(s)											
NDMA-d6	*23.5*			*ng/l*	*25.0*		*94*	*70-130*			
LCS (W9C0444-BS1)					**Prepared & Analyzed: 03/08/19**						
N-Nitrosodimethylamine	1.48	0.28	2.0	ng/l	2.00		74	50-150			J
Surrogate(s)											
NDMA-d6	*19.5*			*ng/l*	*25.0*		*78*	*70-130*			
LCS Dup (W9C0444-BSD1)					**Prepared & Analyzed: 03/08/19**						
N-Nitrosodimethylamine	1.81	0.28	2.0	ng/l	2.00		90	50-150	20	50	J
Surrogate(s)											
NDMA-d6	*19.5*			*ng/l*	*25.0*		*78*	*70-130*			

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.weckla

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/15/2019 13:19

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Source	Sample that was matrix spiked or duplicated.
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) and Detection Limit for Reporting (DLR)
MDA	Minimum Detectable Activity
NR	Not Reportable
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.
An Absence of Total Coliform meets the drinking water standards as established by the California State Water Resources Control Board (SWRCB)
All results are expressed on wet weight basis unless otherwise specified.
All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS 002.

CHAIN OF CUSTODY RECORD

Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964
14859 East Clark Avenue : Industry : CA 91745
Tel 626-336-2139 ♦ Fax 626-336-2634 ♦ www.wecklabs.com

STANDARD QC06025

CLIENT NAME:	PROJECT:
Monterey Bay Analytical Svcs	Twin Lakes Church Injection Well Project
ADDRESS:	PHONE: 831-375-6227
4 Justin Court Suite D	FAX: 831-641-0734
Monterey CA 93940	EMAIL: info@mbasinc.com
PROJECT MANAGER	SAMPLER
David Holland	L. Matsushima

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 - 15 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	1,2,3-TCP	EPA 521 (NDMA)									COMMENTS
	03/04/19	9:30	DW	Sample Set Zone 2 (581'-601')	4	X	X									190304_06-01

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	3/5/19 1600	GSO
GSO	3/6/19 1034	[signature]

SAMPLE CONDITION:

Actual Temperature: 4.8°C

Received On Ice	Y	N
Preserved	Y	N
Evidence Seals Present	Y	N
Container Attacked	Y	N
Preserved at Lab	Y	N

T-0194

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

PRESCHEDULED RUSH ANALYSES WILL TAKE PRIORITY OVER UNSCHEDULED RUSH REQUESTS
Client agrees to Terms & Conditions at: www.wecklabs.com

SPECIAL REQUIREMENTS / BILLING INFORMATION

COC version 042707

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
559-497-2888 (Main)
559-485-6935 (FAX)

A9C0567
3/27/2019
Invoice: A907932

David Holland
Monterey Bay Analytical
4 Justin Court Suite D
Monterey, CA 93940

RE: Report for A9C0567 General

Dear David Holland,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 3/6/2019. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

This certificate of analysis shall not be reproduced except in full, without written approval of the laboratory.

If additional clarification of any information is required, please contact your Project Manager, Jaime Lee LaFave , at 559-497-2888.

Thank you again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Jaime Lee LaFave, Project Manager

Accredited in Accordance with NELAP
ORELAP #4021-009

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK ASSOCIATES

Case Narrative

Project and Report Details		Invoice Details	
Client:	Monterey Bay Analytical	**Invoice To:**	Monterey Bay Analytical
Report To:	David Holland	**Invoice Attn:**	David Holland
Project #:	Twin Lakes Church Injection Well	**Project PO#:**	-
Received:	3/06/2019 - 12:03		
Report Due:	3/20/2019		

Sample Receipt Conditions

Cooler: Default Cooler
Temperature on Receipt ºC: 5.5

Containers Intact
COC/Labels Agree
Preservation Confirmed
Received On Wet Ice
Packing Material - Bubble Wrap
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Data Qualifiers

The following qualifiers have been applied to one or more analytical results:

BS	Blank spike recoveries did not meet acceptance limits.
BS1.0	Blank spike recovery for this analyte was biased high; no material impact on reported result as sample is ND for this parameter.
BS1.1	Blank spike recovery for this analyte was biased high. Associated result may be biased high; reanalysis not feasible.
CV0.0	CCV recovery was above method acceptance limits; no material impact on reported result as sample is ND for this parameter.
MS1.0	Matrix spike recoveries exceed control limits.
MS1.2	Matrix spike recovery exceeds lower control limit. Reported results for parent matrix should be considered estimated due to matrix interferences.
MS1.6	Matrix Spike recovery meets the wider acceptance criteria of 50-150% when the spike level is at or below the reporting limit (RL).

Report Distribution

Recipient(s)	Report Format	CC:
David Holland	FINAL.RPT	
Monterey Bay Analytical Services	FINAL.RPT	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Sample ID: A9C0567-01
Sampled By: L. Matsushima
Sample Description: Sample Set Zone 2 (581'-601') // 190304_06-01

Sample Date - Time: 03/04/19 - 09:30
Matrix: Drinking Water
Sample Type: Grab

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hexavalent Chromium	EPA 218.7	ND	0.050	ug/L	1	A903179	03/07/19	03/07/19	

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
EDB and DBCP by GC-ECD									
Dibromochloropropane (DBCP)	EPA 504.1	ND	0.010	ug/L	1	A903123	03/06/19	03/08/19	
Ethylene Dibromide (EDB)	EPA 504.1	ND	0.020	ug/L	1	A903123	03/06/19	03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 504.1	115 %	*Acceptable range: 70-130 %*						
Organohalide Pesticides and PCBs by GC-ECD									
Aldrin	EPA 505	ND	0.075	ug/L	1	A903123	03/06/19	03/08/19	
Chlordane	EPA 505	ND	0.10	ug/L	1	A903123	03/06/19	03/08/19	
Dieldrin	EPA 505	ND	0.020	ug/L	1	A903123	03/06/19	03/08/19	
Endrin	EPA 505	ND	0.10	ug/L	1	A903123	03/06/19	03/08/19	
Heptachlor	EPA 505	ND	0.010	ug/L	1	A903123	03/06/19	03/08/19	
Heptachlor Epoxide	EPA 505	ND	0.010	ug/L	1	A903123	03/06/19	03/08/19	
Hexachlorobenzene	EPA 505	ND	0.50	ug/L	1	A903123	03/06/19	03/08/19	
Hexachlorocyclopentadiene	EPA 505	ND	1.0	ug/L	1	A903123	03/06/19	03/08/19	
Lindane	EPA 505	ND	0.20	ug/L	1	A903123	03/06/19	03/08/19	
Methoxychlor	EPA 505	ND	10	ug/L	1	A903123	03/06/19	03/08/19	
PCB Aroclor Screen	EPA 505	ND	0.50	ug/L	1	A903123	03/06/19	03/08/19	
Toxaphene	EPA 505	ND	1.0	ug/L	1	A903123	03/06/19	03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 505	115 %	*Acceptable range: 70-130 %*						
Chlorinated Acid Herbicides by GC-ECD									
2,4,5-T	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/12/19	
2,4,5-TP (Silvex)	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/12/19	
2,4-D	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/12/19	
Bentazon	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/12/19	
Dalapon	EPA 515.4	ND	10	ug/L	1	A903254	03/11/19	03/12/19	
Dicamba	EPA 515.4	ND	1.5	ug/L	1	A903254	03/11/19	03/12/19	
Dinoseb	EPA 515.4	ND	2.0	ug/L	1	A903254	03/11/19	03/12/19	
Pentachlorophenol	EPA 515.4	ND	0.20	ug/L	1	A903254	03/11/19	03/12/19	MS1.2
Picloram	EPA 515.4	ND	1.0	ug/L	1	A903254	03/11/19	03/12/19	
Surrogate: DCPAA	EPA 515.4	114 %	*Acceptable range: 70-130 %*						
Volatile Organics by GC-MS									
1,1,1,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,1,1-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,1,2,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 524.2	ND	10	ug/L	1	A903085	03/06/19	03/06/19	
1,1,2-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,1-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	

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Certificate of Analysis

Sample ID: A9C0567-01
Sampled By: L. Matsushima
Sample Description: Sample Set Zone 2 (581'-601') // 190304_06-01

Sample Date - Time: 03/04/19 - 09:30
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
1,1-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,1-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2,3-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2,4-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2,4-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,3,5-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,3-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,3-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
1,4-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
2,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
2-Butanone	EPA 524.2	ND	5.0	ug/L	1	A903085	03/06/19	03/06/19	
2-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
2-Hexanone	EPA 524.2	ND	10	ug/L	1	A903085	03/06/19	03/06/19	
4-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
4-Methyl-2-pentanone	EPA 524.2	ND	5.0	ug/L	1	A903085	03/06/19	03/06/19	
Acetone	EPA 524.2	ND	10	ug/L	1	A903085	03/06/19	03/06/19	
Benzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Bromobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Bromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Bromodichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Bromoform	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Bromomethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	BS1.0, CV0.0
Carbon Tetrachloride	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Chlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Chloroethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	BS1.0, CV0.0
Chloroform	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Chloromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	BS1.0, CV0.0
cis-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
cis-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Dibromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Dibromomethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Dichlorodifluoromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	BS1.0
Dichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Di-isopropyl ether (DIPE)	EPA 524.2	ND	3.0	ug/L	1	A903085	03/06/19	03/06/19	
Ethyl tert-Butyl Ether (ETBE)	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Ethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Hexachlorobutadiene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Isopropylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
m,p-Xylenes	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Methyl-t-butyl ether	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	

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Certificate of Analysis

Sample ID: A9C0567-01
Sampled By: L. Matsushima
Sample Description: Sample Set Zone 2 (581'-601') // 190304_06-01

Sample Date - Time: 03/04/19 - 09:30
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
Naphthalene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
n-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
n-Propylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
o-Xylene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
p-Isopropyltoluene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
sec-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Styrene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
tert-Amyl Methyl Ether (TAME)	EPA 524.2	ND	3.0	ug/L	1	A903085	03/06/19	03/06/19	
tert-Butyl alcohol (TBA)	EPA 524.2	ND	2.0	ug/L	1	A903085	03/06/19	03/06/19	
tert-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Tetrachloroethene (PCE)	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Toluene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
trans-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
trans-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Trichloroethene (TCE)	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	
Trichlorofluoromethane	EPA 524.2	ND	5.0	ug/L	1	A903085	03/06/19	03/06/19	
Vinyl Chloride	EPA 524.2	ND	0.50	ug/L	1	A903085	03/06/19	03/06/19	BS1.0
Surrogate: 1,2-Dichlorobenzene-d4	EPA 524.2	107 %	*Acceptable range: 70-130 %*						
Surrogate: Bromofluorobenzene	EPA 524.2	102 %	*Acceptable range: 70-130 %*						
Total 1,3-Dichloropropene		ND	0.50	ug/L					
Total Trihalomethanes		ND	0.50	ug/L					
Total Xylenes, EPA 524.2		ND	0.50	ug/L					
Semi-Volatile Organics by GC-MS									
Alachlor	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Atrazine	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Benzo(a)pyrene	EPA 525.3	ND	0.10	ug/L	1	A903384	03/12/19	03/23/19	
Bis(2-ethylhexyl) adipate	EPA 525.3	ND	3.0	ug/L	1	A903384	03/12/19	03/23/19	
Bis(2-ethylhexyl) phthalate	EPA 525.3	ND	3.0	ug/L	1	A903384	03/12/19	03/23/19	
Bromacil	EPA 525.3	ND	10	ug/L	1	A903384	03/12/19	03/23/19	
Butachlor	EPA 525.3	ND	0.38	ug/L	1	A903384	03/12/19	03/23/19	
Diazinon	EPA 525.3	ND	0.25	ug/L	1	A903384	03/12/19	03/23/19	
Dimethoate	EPA 525.3	ND	10	ug/L	1	A903384	03/12/19	03/23/19	
Metolachlor	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Metribuzin	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Molinate	EPA 525.3	ND	2.0	ug/L	1	A903384	03/12/19	03/23/19	
Propachlor	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Simazine	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Thiobencarb	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	EPA 525.3	91 %	*Acceptable range: 70-130 %*						
Surrogate: Benzo(a)pyrene-d12	EPA 525.3	95 %	*Acceptable range: 70-130 %*						
Surrogate: Triphenyl Phosphate	EPA 525.3	103 %	*Acceptable range: 70-130 %*						
Carbamates by HPLC									

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Certificate of Analysis

Sample ID: A9C0567-01
Sampled By: L. Matsushima
Sample Description: Sample Set Zone 2 (581'-601') // 190304_06-01

Sample Date - Time: 03/04/19 - 09:30
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Carbamates by HPLC									
3-Hydroxycarbofuran	EPA 531.1	ND	3.0	ug/L	1	A903426	03/13/19	03/16/19	
Aldicarb	EPA 531.1	ND	3.0	ug/L	1	A903426	03/13/19	03/16/19	BS1.1
Aldicarb Sulfone	EPA 531.1	ND	2.0	ug/L	1	A903426	03/13/19	03/16/19	
Aldicarb Sulfoxide	EPA 531.1	ND	3.0	ug/L	1	A903426	03/13/19	03/16/19	
Carbaryl	EPA 531.1	ND	5.0	ug/L	1	A903426	03/13/19	03/16/19	
Carbofuran	EPA 531.1	ND	5.0	ug/L	1	A903426	03/13/19	03/16/19	
Methomyl	EPA 531.1	ND	2.0	ug/L	1	A903426	03/13/19	03/16/19	
Oxamyl	EPA 531.1	ND	20	ug/L	1	A903426	03/13/19	03/16/19	
Glyphosate by HPLC									
Glyphosate	EPA 547	ND	25	ug/L	1	A903506	03/14/19	03/14/19	
Surrogate: AMPA	EPA 547	88 %	*Acceptable range: 70-130 %*						
Endothall by GC-MS									
Endothall	EPA 548.1	ND	45	ug/L	1	A903189	03/07/19	03/17/19	
Diquat by HPLC									
Diquat	EPA 549.2	ND	4.0	ug/L	1	A903246	03/11/19	03/12/19	

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BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 218.7 - Quality Control											
Batch: A903179										Prepared: 3/7/2019	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank (A903179-BLK1)											
Hexavalent Chromium	ND	0.050	ug/L							03/07/19	
Blank Spike (A903179-BS1)											
Hexavalent Chromium	0.059	0.050	ug/L	0.050	ND	118	50-150			03/07/19	
Matrix Spike (A903179-MS1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115			03/07/19	
Matrix Spike Dup (A903179-MSD1), Source: A9C0613-05											
Hexavalent Chromium	2.6	0.050	ug/L	2.0	0.56	102	85-115	0	15	03/07/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 504.1 - Quality Control											
Batch: A903123										Prepared: 3/6/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A903123-BLK1)											
Dibromochloropropane (DBCP)	ND	0.010	ug/L							03/08/19	
Ethylene Dibromide (EDB)	ND	0.020	ug/L							03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.44*			*0.46*		*95*	*70-130*			03/08/19	
Blank Spike (A903123-BS1)											
Dibromochloropropane (DBCP)	0.10	0.010	ug/L	0.10	ND	103	70-130			03/08/19	
Ethylene Dibromide (EDB)	0.10	0.020	ug/L	0.10	ND	104	70-130			03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.46*			*0.46*		*102*	*70-130*			03/08/19	
Blank Spike Dup (A903123-BSD1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	106	70-130	3	20	03/08/19	
Ethylene Dibromide (EDB)	0.10	0.020	ug/L	0.10	ND	105	70-130	1	20	03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*107*	*70-130*			03/08/19	
Matrix Spike (A903123-MS1), Source: A9C0132-01											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.099	ND	100	65-135			03/08/19	
Ethylene Dibromide (EDB)	0.099	0.020	ug/L	0.099	ND	100	65-135			03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.44*			*0.45*		*97*	*70-130*			03/08/19	
EPA 505 - Quality Control											
Batch: A903123										Prepared: 3/6/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A903123-BLK1)											
Aldrin	ND	0.075	ug/L							03/08/19	
Chlordane	ND	0.10	ug/L							03/08/19	
Dieldrin	ND	0.020	ug/L							03/08/19	
Endrin	ND	0.10	ug/L							03/08/19	
Heptachlor	ND	0.010	ug/L							03/08/19	
Heptachlor Epoxide	ND	0.010	ug/L							03/08/19	
Hexachlorobenzene	ND	0.50	ug/L							03/08/19	
Hexachlorocyclopentadiene	ND	1.0	ug/L							03/08/19	
Lindane	ND	0.20	ug/L							03/08/19	
Methoxychlor	ND	10	ug/L							03/08/19	
PCB Aroclor Screen	ND	0.50	ug/L							03/08/19	
Toxaphene	ND	1.0	ug/L							03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.44*			*0.46*		*95*	*70-130*			03/08/19	
Blank Spike (A903123-BS1)											
Aldrin	0.81	0.075	ug/L	0.74	ND	109	70-130			03/08/19	
Dieldrin	0.21	0.020	ug/L	0.20	ND	103	70-130			03/08/19	
Endrin	0.10	0.10	ug/L	0.10	ND	100	70-130			03/08/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	106	70-130			03/08/19	
Heptachlor Epoxide	0.10	0.010	ug/L	0.10	ND	100	70-130			03/08/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 505 - Quality Control											
Batch: A903123										Prepared: 3/6/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank Spike (A903123-BS1)											
Hexachlorobenzene	0.99	0.50	ug/L	1.0	ND	99	70-130			03/08/19	
Hexachlorocyclopentadiene	0.83	1.0	ug/L	1.0	ND	83	70-130			03/08/19	
Lindane	0.20	0.20	ug/L	0.20	ND	99	70-130			03/08/19	
Methoxychlor	1.0	10	ug/L	1.0	ND	104	70-130			03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.46*			*0.46*		*102*	*70-130*			03/08/19	
Blank Spike Dup (A903123-BSD1)											
Aldrin	0.84	0.075	ug/L	0.74	ND	113	70-130	3	20	03/08/19	
Dieldrin	0.22	0.020	ug/L	0.20	ND	109	70-130	6	20	03/08/19	
Endrin	0.097	0.10	ug/L	0.10	ND	97	70-130	2	20	03/08/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	108	70-130	1	20	03/08/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	106	70-130	6	20	03/08/19	
Hexachlorobenzene	1.0	0.50	ug/L	1.0	ND	104	70-130	5	20	03/08/19	
Hexachlorocyclopentadiene	0.86	1.0	ug/L	1.0	ND	86	70-130	3	20	03/08/19	
Lindane	0.20	0.20	ug/L	0.20	ND	101	70-130	2	20	03/08/19	
Methoxychlor	1.0	10	ug/L	1.0	ND	105	70-130	1	20	03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.46*		*107*	*70-130*			03/08/19	
Matrix Spike (A903123-MS1), Source: A9C0132-01											
Aldrin	0.78	0.075	ug/L	0.73	ND	106	65-135			03/08/19	
Dieldrin	0.20	0.020	ug/L	0.20	ND	96	65-135			03/08/19	
Endrin	0.094	0.10	ug/L	0.099	ND	95	65-135			03/08/19	
Heptachlor	0.098	0.010	ug/L	0.099	ND	99	65-135			03/08/19	
Heptachlor Epoxide	0.095	0.010	ug/L	0.099	ND	97	65-135			03/08/19	
Hexachlorobenzene	0.95	0.50	ug/L	0.99	ND	96	65-135			03/08/19	
Hexachlorocyclopentadiene	0.78	1.0	ug/L	0.99	ND	72	65-135			03/08/19	
Lindane	0.19	0.20	ug/L	0.20	ND	94	65-135			03/08/19	
Methoxychlor	0.92	10	ug/L	0.99	ND	93	65-135			03/08/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.44*			*0.45*		*97*	*70-130*			03/08/19	
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
2,4,5-T	ND	1.0	ug/L							03/11/19	
2,4,5-TP (Silvex)	ND	1.0	ug/L							03/11/19	
2,4-D	ND	10	ug/L							03/11/19	
Bentazon	ND	2.0	ug/L							03/11/19	
Dalapon	ND	10	ug/L							03/11/19	
Dicamba	ND	1.5	ug/L							03/11/19	
Dinoseb	ND	2.0	ug/L							03/11/19	
Pentachlorophenol	ND	0.20	ug/L							03/11/19	
Picloram	ND	1.0	ug/L							03/11/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903254-BLK1)											
Surrogate: DCPAA	*34*			*36*		*94*	*70-130*			03/11/19	
Blank Spike (A903254-BS1)											
2,4,5-T	1.7	1.0	ug/L	1.6	ND	108	70-130			03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	102	70-130			03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	105	70-130			03/11/19	
Bentazon	2.0	2.0	ug/L	2.0	ND	99	70-130			03/11/19	
Dalapon	4.0	10	ug/L	4.0	ND	99	70-130			03/11/19	
Dicamba	0.77	1.5	ug/L	0.80	ND	96	70-130			03/11/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	95	70-130			03/11/19	
Pentachlorophenol	0.15	0.20	ug/L	0.16	ND	93	70-130			03/11/19	
Picloram	0.40	1.0	ug/L	0.40	ND	101	70-130			03/11/19	
Surrogate: DCPAA	*35*			*36*		*96*	*70-130*			03/11/19	
Blank Spike Dup (A903254-BSD1)											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	112	70-130	3	20	03/12/19	
2,4,5-TP (Silvex)	0.87	1.0	ug/L	0.80	ND	109	70-130	7	20	03/12/19	
2,4-D	0.45	10	ug/L	0.40	ND	111	70-130	6	20	03/12/19	
Bentazon	2.2	2.0	ug/L	2.0	ND	112	70-130	12	20	03/12/19	
Dalapon	4.0	10	ug/L	4.0	ND	101	70-130	2	20	03/12/19	
Dicamba	0.85	1.5	ug/L	0.80	ND	106	70-130	10	20	03/12/19	
Dinoseb	0.76	2.0	ug/L	0.80	ND	94	70-130	1	20	03/12/19	
Pentachlorophenol	0.16	0.20	ug/L	0.16	ND	97	70-130	4	20	03/12/19	
Picloram	0.43	1.0	ug/L	0.40	ND	108	70-130	7	20	03/12/19	
Surrogate: DCPAA	*38*			*36*		*104*	*70-130*			03/12/19	
Matrix Spike (A903254-MS1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130			03/11/19	
2,4,5-TP (Silvex)	0.85	1.0	ug/L	0.80	ND	106	70-130			03/11/19	
2,4-D	0.44	10	ug/L	0.40	ND	110	70-130			03/11/19	
Bentazon	1.8	2.0	ug/L	2.0	ND	88	70-130			03/11/19	
Dalapon	3.8	10	ug/L	4.0	ND	95	70-130			03/11/19	
Dicamba	0.76	1.5	ug/L	0.80	ND	94	70-130			03/11/19	
Dinoseb	0.71	2.0	ug/L	0.80	ND	83	70-130			03/11/19	
Pentachlorophenol	0.11	0.20	ug/L	0.16	ND	67	70-130			03/11/19	MS1.0 ***Low***
Picloram	0.37	1.0	ug/L	0.40	ND	93	70-130			03/11/19	
Surrogate: DCPAA	*42*			*36*		*118*	*70-130*			03/11/19	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
2,4,5-T	1.8	1.0	ug/L	1.6	ND	110	70-130	0	30	03/11/19	
2,4,5-TP (Silvex)	0.81	1.0	ug/L	0.80	ND	101	70-130	5	30	03/11/19	
2,4-D	0.42	10	ug/L	0.40	ND	106	70-130	4	30	03/11/19	
Bentazon	1.7	2.0	ug/L	2.0	ND	87	70-130	1	30	03/11/19	
Dalapon	3.7	10	ug/L	4.0	ND	93	70-130	2	30	03/11/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903254										Prepared: 3/11/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Matrix Spike Dup (A903254-MSD1), Source: A9C0090-01											
Dicamba	0.73	1.5	ug/L	0.80	ND	91	70-130	4	30	03/11/19	
Dinoseb	0.69	2.0	ug/L	0.80	ND	79	70-130	4	30	03/11/19	
Pentachlorophenol	0.094	0.20	ug/L	0.16	ND	59	70-130	13	30	03/11/19	MS1.0 ***Low***
Picloram	0.36	1.0	ug/L	0.40	ND	90	70-130	3	30	03/11/19	
Surrogate: DCPAA	*41*			*36*		*113*	*70-130*			03/11/19	
EPA 524.2 - Quality Control											
Batch: A903085										Prepared: 3/6/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903085-BLK1)											
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L							03/06/19	
1,1,1-Trichloroethane	ND	0.50	ug/L							03/06/19	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L							03/06/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	ug/L							03/06/19	
1,1,2-Trichloroethane	ND	0.50	ug/L							03/06/19	
1,1-Dichloroethane	ND	0.50	ug/L							03/06/19	
1,1-Dichloroethene	ND	0.50	ug/L							03/06/19	
1,1-Dichloropropene	ND	0.50	ug/L							03/06/19	
1,2,3-Trichlorobenzene	ND	0.50	ug/L							03/06/19	
1,2,4-Trichlorobenzene	ND	0.50	ug/L							03/06/19	
1,2,4-Trimethylbenzene	ND	0.50	ug/L							03/06/19	
1,2-Dichlorobenzene	ND	0.50	ug/L							03/06/19	
1,2-Dichloroethane	ND	0.50	ug/L							03/06/19	
1,2-Dichloropropane	ND	0.50	ug/L							03/06/19	
1,3,5-Trimethylbenzene	ND	0.50	ug/L							03/06/19	
1,3-Dichlorobenzene	ND	0.50	ug/L							03/06/19	
1,3-Dichloropropane	ND	0.50	ug/L							03/06/19	
1,4-Dichlorobenzene	ND	0.50	ug/L							03/06/19	
2,2-Dichloropropane	ND	0.50	ug/L							03/06/19	
2-Butanone	ND	5.0	ug/L							03/06/19	
2-Chlorotoluene	ND	0.50	ug/L							03/06/19	
2-Hexanone	ND	10	ug/L							03/06/19	
4-Chlorotoluene	ND	0.50	ug/L							03/06/19	
4-Methyl-2-pentanone	ND	5.0	ug/L							03/06/19	
Acetone	ND	10	ug/L							03/06/19	
Benzene	ND	0.50	ug/L							03/06/19	
Bromobenzene	ND	0.50	ug/L							03/06/19	
Bromochloromethane	ND	0.50	ug/L							03/06/19	
Bromodichloromethane	ND	0.50	ug/L							03/06/19	
Bromoform	ND	0.50	ug/L							03/06/19	
Bromomethane	ND	0.50	ug/L							03/06/19	
Carbon Tetrachloride	ND	0.50	ug/L							03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903085										Prepared: 3/6/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903085-BLK1)											
Chlorobenzene	ND	0.50	ug/L							03/06/19	
Chloroethane	ND	0.50	ug/L							03/06/19	
Chloroform	ND	0.50	ug/L							03/06/19	
Chloromethane	ND	0.50	ug/L							03/06/19	
cis-1,2-Dichloroethene	ND	0.50	ug/L							03/06/19	
cis-1,3-Dichloropropene	ND	0.50	ug/L							03/06/19	
Dibromochloromethane	ND	0.50	ug/L							03/06/19	
Dibromomethane	ND	0.50	ug/L							03/06/19	
Dichlorodifluoromethane	ND	0.50	ug/L							03/06/19	
Dichloromethane	ND	0.50	ug/L							03/06/19	
Di-isopropyl ether (DIPE)	ND	3.0	ug/L							03/06/19	
Ethyl tert-Butyl Ether (ETBE)	ND	0.50	ug/L							03/06/19	
Ethylbenzene	ND	0.50	ug/L							03/06/19	
Hexachlorobutadiene	ND	0.50	ug/L							03/06/19	
Isopropylbenzene	ND	0.50	ug/L							03/06/19	
m,p-Xylenes	ND	0.50	ug/L							03/06/19	
Methyl-t-butyl ether	ND	0.50	ug/L							03/06/19	
Naphthalene	ND	0.50	ug/L							03/06/19	
n-Butylbenzene	ND	0.50	ug/L							03/06/19	
n-Propylbenzene	ND	0.50	ug/L							03/06/19	
o-Xylene	ND	0.50	ug/L							03/06/19	
p-Isopropyltoluene	ND	0.50	ug/L							03/06/19	
sec-Butylbenzene	ND	0.50	ug/L							03/06/19	
Styrene	ND	0.50	ug/L							03/06/19	
tert-Amyl Methyl Ether (TAME)	ND	3.0	ug/L							03/06/19	
tert-Butyl alcohol (TBA)	ND	2.0	ug/L							03/06/19	
tert-Butylbenzene	ND	0.50	ug/L							03/06/19	
Tetrachloroethene (PCE)	ND	0.50	ug/L							03/06/19	
Toluene	ND	0.50	ug/L							03/06/19	
trans-1,2-Dichloroethene	ND	0.50	ug/L							03/06/19	
trans-1,3-Dichloropropene	ND	0.50	ug/L							03/06/19	
Trichloroethene (TCE)	ND	0.50	ug/L							03/06/19	
Trichlorofluoromethane	ND	5.0	ug/L							03/06/19	
Vinyl Chloride	ND	0.50	ug/L							03/06/19	
Surrogate: 1,2-Dichlorobenzene-d4	*50*			*50*		*101*	*70-130*			03/06/19	
Surrogate: Bromofluorobenzene	*50*			*50*		*100*	*70-130*			03/06/19	
Blank Spike (A903085-BS1)											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	107	70-130			03/06/19	
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	113	70-130			03/06/19	
1,1,2,2-Tetrachloroethane	9.9	0.50	ug/L	10	ND	99	70-130			03/06/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	114	70-130			03/06/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	100	70-130			03/06/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903085										Prepared: 3/6/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903085-BS1)												
1,1-Dichloroethane	11	0.50	ug/L	10	ND	114	70-130			03/06/19		
1,1-Dichloroethene	11	0.50	ug/L	10	ND	114	70-130			03/06/19		
1,1-Dichloropropene	11	0.50	ug/L	10	ND	106	70-130			03/06/19		
1,2,3-Trichlorobenzene	10	0.50	ug/L	10	ND	104	70-130			03/06/19		
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	107	70-130			03/06/19		
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	114	70-130			03/06/19		
1,2-Dichlorobenzene	11	0.50	ug/L	10	ND	112	70-130			03/06/19		
1,2-Dichloroethane	11	0.50	ug/L	10	ND	108	70-130			03/06/19		
1,2-Dichloropropane	11	0.50	ug/L	10	ND	106	70-130			03/06/19		
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	111	70-130			03/06/19		
1,3-Dichloropropane	10	0.50	ug/L	10	ND	101	70-130			03/06/19		
1,4-Dichlorobenzene	12	0.50	ug/L	10	ND	117	70-130			03/06/19		
2,2-Dichloropropane	12	0.50	ug/L	10	ND	119	70-130			03/06/19		
2-Butanone	8.5	5.0	ug/L	10	ND	85	70-130			03/06/19		
2-Chlorotoluene	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
2-Hexanone	8.0	10	ug/L	10	ND	80	70-130			03/06/19		
4-Chlorotoluene	12	0.50	ug/L	10	ND	115	70-130			03/06/19		
4-Methyl-2-pentanone	7.5	5.0	ug/L	10	ND	75	70-130			03/06/19		
Acetone	10	10	ug/L	10	ND	105	70-130			03/06/19		
Benzene	11	0.50	ug/L	10	ND	106	70-130			03/06/19		
Bromobenzene	11	0.50	ug/L	10	ND	110	70-130			03/06/19		
Bromochloromethane	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
Bromodichloromethane	11	0.50	ug/L	10	ND	108	70-130			03/06/19		
Bromoform	10	0.50	ug/L	10	ND	104	70-130			03/06/19		
Bromomethane	15	0.50	ug/L	10	ND	147	70-130			03/06/19	BS	***High***
Carbon disulfide	11	10	ug/L	10	ND	115	70-130			03/06/19		
Carbon Tetrachloride	11	0.50	ug/L	10	ND	112	70-130			03/06/19		
Chlorobenzene	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
Chloroethane	14	0.50	ug/L	10	ND	141	70-130			03/06/19	BS	***High***
Chloroform	11	0.50	ug/L	10	ND	112	70-130			03/06/19		
Chloromethane	18	0.50	ug/L	10	ND	180	70-130			03/06/19	BS	***High***
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	114	70-130			03/06/19		
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	105	70-130			03/06/19		
Dibromochloromethane	11	0.50	ug/L	10	ND	108	70-130			03/06/19		
Dibromomethane	11	0.50	ug/L	10	ND	107	70-130			03/06/19		
Dichlorodifluoromethane	13	0.50	ug/L	10	ND	131	70-130			03/06/19	BS	***High***
Dichloromethane	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
Di-isopropyl ether (DIPE)	9.9	3.0	ug/L	10	ND	99	70-130			03/06/19		
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	101	70-130			03/06/19		
Ethylbenzene	11	0.50	ug/L	10	ND	112	70-130			03/06/19		
Hexachlorobutadiene	12	0.50	ug/L	10	ND	116	70-130			03/06/19		
Isopropylbenzene	11	0.50	ug/L	10	ND	110	70-130			03/06/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903085										Prepared: 3/6/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike (A903085-BS1)												
m,p-Xylenes	21	0.50	ug/L	20	ND	103	70-130			03/06/19		
Methyl-t-butyl ether	22	0.50	ug/L	20	ND	109	70-130			03/06/19		
Naphthalene	8.1	0.50	ug/L	10	ND	81	70-130			03/06/19		
n-Butylbenzene	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
n-Propylbenzene	11	0.50	ug/L	10	ND	113	70-130			03/06/19		
o-Xylene	11	0.50	ug/L	10	ND	109	70-130			03/06/19		
p-Isopropyltoluene	11	0.50	ug/L	10	ND	115	70-130			03/06/19		
sec-Butylbenzene	11	0.50	ug/L	10	ND	114	70-130			03/06/19		
Styrene	9.7	0.50	ug/L	10	ND	97	70-130			03/06/19		
tert-Amyl Methyl Ether (TAME)	9.9	3.0	ug/L	10	ND	99	70-130			03/06/19		
tert-Butyl alcohol (TBA)	7.7	2.0	ug/L	10	ND	77	70-130			03/06/19		
tert-Butylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/06/19		
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	111	70-130			03/06/19		
Toluene	11	0.50	ug/L	10	ND	110	70-130			03/06/19		
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	115	70-130			03/06/19		
trans-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130			03/06/19		
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	108	70-130			03/06/19		
Trichlorofluoromethane	12	5.0	ug/L	10	ND	124	70-130			03/06/19		
Vinyl Chloride	13	0.50	ug/L	10	ND	132	70-130			03/06/19	BS	***High***
Surrogate: 1,2-Dichlorobenzene-d4	*56*			*50*		*112*	*70-130*			03/06/19		
Surrogate: Bromofluorobenzene	*57*			*50*		*114*	*70-130*			03/06/19		
Blank Spike Dup (A903085-BSD1)												
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	109	70-130	2	30	03/06/19		
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	113	70-130	0	30	03/06/19		
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	106	70-130	6	30	03/06/19		
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	114	70-130	0	30	03/06/19		
1,1,2-Trichloroethane	11	0.50	ug/L	10	ND	107	70-130	6	30	03/06/19		
1,1-Dichloroethane	11	0.50	ug/L	10	ND	114	70-130	0	30	03/06/19		
1,1-Dichloroethene	11	0.50	ug/L	10	ND	112	70-130	1	30	03/06/19		
1,1-Dichloropropene	11	0.50	ug/L	10	ND	108	70-130	3	30	03/06/19		
1,2,3-Trichlorobenzene	11	0.50	ug/L	10	ND	109	70-130	6	30	03/06/19		
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	110	70-130	3	30	03/06/19		
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	114	70-130	0	30	03/06/19		
1,2-Dichlorobenzene	11	0.50	ug/L	10	ND	114	70-130	2	30	03/06/19		
1,2-Dichloroethane	11	0.50	ug/L	10	ND	112	70-130	4	30	03/06/19		
1,2-Dichloropropane	11	0.50	ug/L	10	ND	110	70-130	4	30	03/06/19		
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	113	70-130	0	30	03/06/19		
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	112	70-130	1	30	03/06/19		
1,3-Dichloropropane	11	0.50	ug/L	10	ND	108	70-130	6	30	03/06/19		
1,4-Dichlorobenzene	12	0.50	ug/L	10	ND	118	70-130	1	30	03/06/19		
2,2-Dichloropropane	12	0.50	ug/L	10	ND	116	70-130	2	30	03/06/19		
2-Butanone	9.5	5.0	ug/L	10	ND	95	70-130	11	30	03/06/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 524.2 - Quality Control												
Batch: A903085										Prepared: 3/6/2019		
Prep Method: EPA 524.2										Analyst: ANM		
Blank Spike Dup (A903085-BSD1)												
2-Chlorotoluene	11	0.50	ug/L	10	ND	114	70-130	1	30	03/06/19		
2-Hexanone	8.9	10	ug/L	10	ND	89	70-130	12	30	03/06/19		
4-Chlorotoluene	12	0.50	ug/L	10	ND	116	70-130	0	30	03/06/19		
4-Methyl-2-pentanone	8.1	5.0	ug/L	10	ND	81	70-130	7	30	03/06/19		
Acetone	12	10	ug/L	10	ND	117	70-130	11	30	03/06/19		
Benzene	11	0.50	ug/L	10	ND	108	70-130	3	30	03/06/19		
Bromobenzene	11	0.50	ug/L	10	ND	113	70-130	3	30	03/06/19		
Bromochloromethane	11	0.50	ug/L	10	ND	114	70-130	1	30	03/06/19		
Bromodichloromethane	11	0.50	ug/L	10	ND	112	70-130	3	30	03/06/19		
Bromoform	11	0.50	ug/L	10	ND	109	70-130	4	30	03/06/19		
Bromomethane	14	0.50	ug/L	10	ND	140	70-130	5	30	03/06/19	BS	***High***
Carbon disulfide	11	10	ug/L	10	ND	113	70-130	1	30	03/06/19		
Carbon Tetrachloride	11	0.50	ug/L	10	ND	112	70-130	0	30	03/06/19		
Chlorobenzene	11	0.50	ug/L	10	ND	115	70-130	1	30	03/06/19		
Chloroethane	14	0.50	ug/L	10	ND	136	70-130	3	30	03/06/19	BS	***High***
Chloroform	11	0.50	ug/L	10	ND	113	70-130	0	30	03/06/19		
Chloromethane	17	0.50	ug/L	10	ND	166	70-130	8	30	03/06/19	BS	***High***
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	115	70-130	0	30	03/06/19		
cis-1,3-Dichloropropene	11	0.50	ug/L	10	ND	109	70-130	4	30	03/06/19		
Dibromochloromethane	11	0.50	ug/L	10	ND	112	70-130	4	30	03/06/19		
Dibromomethane	11	0.50	ug/L	10	ND	113	70-130	5	30	03/06/19		
Dichlorodifluoromethane	13	0.50	ug/L	10	ND	129	70-130	2	30	03/06/19		
Dichloromethane	11	0.50	ug/L	10	ND	112	70-130	1	30	03/06/19		
Di-isopropyl ether (DIPE)	11	3.0	ug/L	10	ND	105	70-130	6	30	03/06/19		
Ethyl tert-Butyl Ether (ETBE)	11	0.50	ug/L	10	ND	109	70-130	7	30	03/06/19		
Ethylbenzene	11	0.50	ug/L	10	ND	112	70-130	1	30	03/06/19		
Hexachlorobutadiene	11	0.50	ug/L	10	ND	114	70-130	2	30	03/06/19		
Isopropylbenzene	11	0.50	ug/L	10	ND	111	70-130	1	30	03/06/19		
m,p-Xylenes	21	0.50	ug/L	20	ND	105	70-130	1	30	03/06/19		
Methyl-t-butyl ether	23	0.50	ug/L	20	ND	116	70-130	6	30	03/06/19		
Naphthalene	9.0	0.50	ug/L	10	ND	90	70-130	11	30	03/06/19		
n-Butylbenzene	11	0.50	ug/L	10	ND	110	70-130	2	30	03/06/19		
n-Propylbenzene	11	0.50	ug/L	10	ND	114	70-130	0	30	03/06/19		
o-Xylene	11	0.50	ug/L	10	ND	111	70-130	2	30	03/06/19		
p-Isopropyltoluene	11	0.50	ug/L	10	ND	114	70-130	1	30	03/06/19		
sec-Butylbenzene	11	0.50	ug/L	10	ND	113	70-130	1	30	03/06/19		
Styrene	10	0.50	ug/L	10	ND	100	70-130	2	30	03/06/19		
tert-Amyl Methyl Ether (TAME)	11	3.0	ug/L	10	ND	105	70-130	6	30	03/06/19		
tert-Butyl alcohol (TBA)	8.6	2.0	ug/L	10	ND	86	70-130	10	30	03/06/19		
tert-Butylbenzene	11	0.50	ug/L	10	ND	111	70-130	0	30	03/06/19		
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	110	70-130	1	30	03/06/19		
Toluene	11	0.50	ug/L	10	ND	110	70-130	0	30	03/06/19		
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	112	70-130	2	30	03/06/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903085										Prepared: 3/6/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903085-BSD1)											
trans-1,3-Dichloropropene	11	0.50	ug/L	10	ND	108	70-130	4	30	03/06/19	
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	110	70-130	1	30	03/06/19	
Trichlorofluoromethane	12	5.0	ug/L	10	ND	121	70-130	3	30	03/06/19	
Vinyl Chloride	13	0.50	ug/L	10	ND	127	70-130	4	30	03/06/19	
Surrogate: 1,2-Dichlorobenzene-d4	*57*			*50*		*114*	*70-130*			03/06/19	
Surrogate: Bromofluorobenzene	*58*			*50*		*116*	*70-130*			03/06/19	
Matrix Spike (A903085-MS1), Source: A9C0365-01											
1,1,1,2-Tetrachloroethane	10	0.50	ug/L	10	ND	102	41-156			03/07/19	
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	113	48-160			03/07/19	
1,1,2,2-Tetrachloroethane	10	0.50	ug/L	10	ND	100	42-151			03/07/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	112	47-164			03/07/19	
1,1,2-Trichloroethane	10	0.50	ug/L	10	ND	101	45-152			03/07/19	
1,1-Dichloroethane	11	0.50	ug/L	10	ND	110	48-157			03/07/19	
1,1-Dichloroethene	0.73	0.50	ug/L	10	ND	7	51-158			03/07/19	MS1.0 ***Low***
1,1-Dichloropropene	ND	0.50	ug/L	10	ND	0	46-162			03/07/19	MS1.0 ***Low***
1,2,3-Trichlorobenzene	10	0.50	ug/L	10	ND	102	37-145			03/07/19	
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	114	33-149			03/07/19	
1,2,4-Trimethylbenzene	0.28	0.50	ug/L	10	ND	0	44-146			03/07/19	MS1.0 ***Low***
1,2-Dichlorobenzene	10	0.50	ug/L	10	ND	102	44-146			03/07/19	
1,2-Dichloroethane	11	0.50	ug/L	10	ND	106	47-151			03/07/19	
1,2-Dichloropropane	10	0.50	ug/L	10	ND	104	47-155			03/07/19	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	10	ND	0	45-154			03/07/19	MS1.0 ***Low***
1,3-Dichlorobenzene	7.9	0.50	ug/L	10	ND	79	44-146			03/07/19	
1,3-Dichloropropane	10	0.50	ug/L	10	ND	100	45-151			03/07/19	
1,4-Dichlorobenzene	10	0.50	ug/L	10	ND	104	43-146			03/07/19	
2,2-Dichloropropane	8.5	0.50	ug/L	10	ND	85	24-182			03/07/19	
2-Butanone	8.5	5.0	ug/L	10	ND	85	55-144			03/07/19	
2-Chlorotoluene	8.6	0.50	ug/L	10	ND	86	48-150			03/07/19	
2-Hexanone	7.2	10	ug/L	10	ND	72	40-159			03/07/19	
4-Chlorotoluene	7.4	0.50	ug/L	10	ND	74	43-150			03/07/19	
4-Methyl-2-pentanone	6.8	5.0	ug/L	10	ND	68	30-171			03/07/19	
Acetone	9.6	10	ug/L	10	ND	96	27-181			03/07/19	
Benzene	10	0.50	ug/L	10	ND	105	48-155			03/07/19	
Bromobenzene	9.6	0.50	ug/L	10	ND	96	43-151			03/07/19	
Bromochloromethane	11	0.50	ug/L	10	ND	108	48-161			03/07/19	
Bromodichloromethane	11	0.50	ug/L	10	ND	107	47-151			03/07/19	
Bromoform	20	0.50	ug/L	10	9.7	98	29-162			03/07/19	
Bromomethane	7.1	0.50	ug/L	10	ND	71	10-200			03/07/19	
Carbon disulfide	11	10	ug/L	10	ND	113	57-161			03/07/19	
Carbon Tetrachloride	11	0.50	ug/L	10	ND	112	47-163			03/07/19	
Chlorobenzene	11	0.50	ug/L	10	ND	105	46-152			03/07/19	
Chloroethane	13	0.50	ug/L	10	ND	131	28-189			03/07/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903085										Prepared: 3/6/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Matrix Spike (A903085-MS1), Source: A9C0365-01											
Chloroform	8.8	0.50	ug/L	10	ND	88	52-148			03/07/19	
Chloromethane	15	0.50	ug/L	10	ND	153	53-159			03/07/19	
cis-1,2-Dichloroethene	12	0.50	ug/L	10	ND	116	50-152			03/07/19	
cis-1,3-Dichloropropene	ND	0.50	ug/L	10	ND	0	34-156			03/07/19	MS1.0 ***Low***
Dibromochloromethane	13	0.50	ug/L	10	2.2	104	44-149			03/07/19	
Dibromomethane	10	0.50	ug/L	10	ND	104	46-150			03/07/19	
Dichlorodifluoromethane	12	0.50	ug/L	10	ND	124	33-170			03/07/19	
Dichloromethane	11	0.50	ug/L	10	ND	108	47-156			03/07/19	
Di-isopropyl ether (DIPE)	9.1	3.0	ug/L	10	ND	91	41-159			03/07/19	
Ethyl tert-Butyl Ether (ETBE)	9.2	0.50	ug/L	10	ND	92	32-160			03/07/19	
Ethylbenzene	ND	0.50	ug/L	10	ND	0	40-157			03/07/19	MS1.0 ***Low***
Hexachlorobutadiene	11	0.50	ug/L	10	ND	113	38-151			03/07/19	
Isopropylbenzene	ND	0.50	ug/L	10	ND	0	41-156			03/07/19	MS1.0 ***Low***
m,p-Xylenes	ND	0.50	ug/L	20	ND	0	49-154			03/07/19	MS1.0 ***Low***
Methyl-t-butyl ether	21	0.50	ug/L	20	ND	103	41-156			03/07/19	
Naphthalene	0.28	0.50	ug/L	10	ND	0	35-154			03/07/19	MS1.0 ***Low***
n-Butylbenzene	2.9	0.50	ug/L	10	ND	29	31-153			03/07/19	MS1.0 ***Low***
n-Propylbenzene	ND	0.50	ug/L	10	ND	0	39-156			03/07/19	MS1.0 ***Low***
o-Xylene	ND	0.50	ug/L	10	ND	0	27-164			03/07/19	MS1.0 ***Low***
p-Isopropyltoluene	0.30	0.50	ug/L	10	ND	0	26-161			03/07/19	MS1.0 ***Low***
sec-Butylbenzene	0.29	0.50	ug/L	10	ND	0	39-154			03/07/19	MS1.0 ***Low***
Styrene	ND	0.50	ug/L	10	ND	0	10-200			03/07/19	MS1.0 ***Low***
tert-Amyl Methyl Ether (TAME)	8.8	3.0	ug/L	10	ND	88	24-161			03/07/19	
tert-Butyl alcohol (TBA)	8.0	2.0	ug/L	10	ND	80	22-174			03/07/19	
tert-Butylbenzene	1.7	0.50	ug/L	10	ND	17	40-153			03/07/19	MS1.0 ***Low***
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	107	48-155			03/07/19	
Toluene	ND	0.50	ug/L	10	ND	0	40-159			03/07/19	MS1.0 ***Low***
trans-1,2-Dichloroethene	9.9	0.50	ug/L	10	ND	99	52-157			03/07/19	
trans-1,3-Dichloropropene	ND	0.50	ug/L	10	ND	0	28-160			03/07/19	MS1.0 ***Low***
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	108	49-155			03/07/19	
Trichlorofluoromethane	12	5.0	ug/L	10	ND	124	47-169			03/07/19	
Vinyl Chloride	ND	0.50	ug/L	10	ND	0	21-183			03/07/19	MS1.0 ***Low***
Surrogate: 1,2-Dichlorobenzene-d4	*51*			*50*		*102*	*70-130*			03/07/19	
Surrogate: Bromofluorobenzene	*45*			*50*		*91*	*70-130*			03/07/19	
EPA 525.3 - Quality Control											
Batch: A903384										Prepared: 3/12/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank (A903384-BLK1)											
Alachlor	ND	1.0	ug/L							03/23/19	
Atrazine	ND	0.50	ug/L							03/23/19	
Benzo(a)pyrene	ND	0.10	ug/L							03/23/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 525.3 - Quality Control											
Batch: A903384										Prepared: 3/12/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank (A903384-BLK1)											
Bis(2-ethylhexyl) adipate	ND	3.0	ug/L							03/23/19	
Bis(2-ethylhexyl) phthalate	ND	3.0	ug/L							03/23/19	
Bromacil	ND	10	ug/L							03/23/19	
Butachlor	ND	0.38	ug/L							03/23/19	
Diazinon	ND	0.25	ug/L							03/23/19	
Dimethoate	ND	10	ug/L							03/23/19	
Metolachlor	ND	0.50	ug/L							03/23/19	
Metribuzin	ND	0.50	ug/L							03/23/19	
Molinate	ND	2.0	ug/L							03/23/19	
Propachlor	ND	0.50	ug/L							03/23/19	
Simazine	ND	1.0	ug/L							03/23/19	
Thiobencarb	ND	1.0	ug/L							03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.91*			*1.0*		*91*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.89*			*1.0*		*89*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*102*	*70-130*			03/23/19	
Blank Spike (A903384-BS1)											
Alachlor	1.4	1.0	ug/L	1.4	ND	102	70-130			03/23/19	
Atrazine	0.72	0.50	ug/L	0.70	ND	104	70-130			03/23/19	
Benzo(a)pyrene	0.12	0.10	ug/L	0.14	ND	88	70-130			03/23/19	
Bis(2-ethylhexyl) adipate	3.0	3.0	ug/L	2.8	ND	109	70-130			03/23/19	
Bis(2-ethylhexyl) phthalate	4.4	3.0	ug/L	4.2	ND	105	70-130			03/23/19	
Bromacil	1.7	10	ug/L	1.4	ND	123	70-130			03/23/19	
Butachlor	1.6	0.38	ug/L	1.4	ND	114	70-130			03/23/19	
Diazinon	1.7	0.25	ug/L	1.8	ND	98	70-130			03/23/19	
Dimethoate	3.1	10	ug/L	2.8	ND	109	70-130			03/23/19	
Metolachlor	1.8	0.50	ug/L	1.8	ND	102	70-130			03/23/19	
Metribuzin	1.5	0.50	ug/L	1.4	ND	105	70-130			03/23/19	
Molinate	2.5	2.0	ug/L	2.8	ND	91	70-130			03/23/19	
Propachlor	0.72	0.50	ug/L	0.70	ND	103	70-130			03/23/19	
Simazine	0.51	1.0	ug/L	0.49	ND	104	70-130			03/23/19	
Thiobencarb	1.4	1.0	ug/L	1.4	ND	99	70-130			03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.92*			*1.0*		*92*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.90*			*1.0*		*90*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*103*	*70-130*			03/23/19	
Blank Spike Dup (A903384-BSD1)											
Alachlor	1.4	1.0	ug/L	1.4	ND	102	70-130	0	30	03/23/19	
Atrazine	0.72	0.50	ug/L	0.70	ND	103	70-130	0	30	03/23/19	
Benzo(a)pyrene	0.12	0.10	ug/L	0.14	ND	86	70-130	2	30	03/23/19	
Bis(2-ethylhexyl) adipate	3.0	3.0	ug/L	2.8	ND	108	70-130	0	30	03/23/19	
Bis(2-ethylhexyl) phthalate	4.4	3.0	ug/L	4.2	ND	105	70-130	0	30	03/23/19	
Bromacil	1.8	10	ug/L	1.4	ND	126	70-130	3	30	03/23/19	
Butachlor	1.6	0.38	ug/L	1.4	ND	113	70-130	0	30	03/23/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 525.3 - Quality Control											
Batch: A903384										Prepared: 3/12/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank Spike Dup (A903384-BSD1)											
Diazinon	1.7	0.25	ug/L	1.8	ND	98	70-130	0	30	03/23/19	
Dimethoate	3.1	10	ug/L	2.8	ND	109	70-130	0	30	03/23/19	
Metolachlor	1.8	0.50	ug/L	1.8	ND	101	70-130	0	30	03/23/19	
Metribuzin	1.5	0.50	ug/L	1.4	ND	104	70-130	0	30	03/23/19	
Molinate	2.5	2.0	ug/L	2.8	ND	90	70-130	1	30	03/23/19	
Propachlor	0.72	0.50	ug/L	0.70	ND	103	70-130	0	30	03/23/19	
Simazine	0.51	1.0	ug/L	0.49	ND	103	70-130	1	30	03/23/19	
Thiobencarb	1.4	1.0	ug/L	1.4	ND	98	70-130	1	30	03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.90*			*1.0*		*90*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.88*			*1.0*		*88*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*102*	*70-130*			03/23/19	
Matrix Spike (A903384-MS1), Source: A9C0927-01											
Alachlor	0.21	1.0	ug/L	0.19	ND	103	70-130			03/23/19	
Atrazine	0.11	0.50	ug/L	0.096	ND	115	70-130			03/23/19	
Benzo(a)pyrene	0.017	0.10	ug/L	0.019	ND	90	70-130			03/23/19	
Bis(2-ethylhexyl) adipate	0.49	3.0	ug/L	0.38	ND	128	70-130			03/23/19	
Bis(2-ethylhexyl) phthalate	0.60	3.0	ug/L	0.58	ND	104	70-130			03/23/19	
Bromacil	0.22	10	ug/L	0.19	ND	113	70-130			03/23/19	
Butachlor	0.25	0.38	ug/L	0.19	ND	131	70-130			03/23/19	MS1.6 ***High***
Diazinon	0.25	0.25	ug/L	0.24	ND	101	70-130			03/23/19	
Dimethoate	0.45	10	ug/L	0.38	ND	117	70-130			03/23/19	
Metolachlor	0.26	0.50	ug/L	0.24	ND	109	70-130			03/23/19	
Metribuzin	0.23	0.50	ug/L	0.19	ND	119	70-130			03/23/19	
Molinate	0.37	2.0	ug/L	0.38	ND	96	70-130			03/23/19	
Propachlor	0.10	0.50	ug/L	0.096	ND	105	70-130			03/23/19	
Simazine	0.077	1.0	ug/L	0.067	ND	114	70-130			03/23/19	
Thiobencarb	0.21	1.0	ug/L	0.19	ND	109	70-130			03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.89*			*0.96*		*92*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.91*			*0.96*		*94*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*0.96*		*109*	*70-130*			03/23/19	
EPA 531.1 - Quality Control											
Batch: A903426										Prepared: 3/13/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Blank (A903426-BLK1)											
3-Hydroxycarbofuran	ND	3.0	ug/L							03/16/19	
Aldicarb	ND	3.0	ug/L							03/16/19	
Aldicarb Sulfone	ND	2.0	ug/L							03/16/19	
Aldicarb Sulfoxide	ND	3.0	ug/L							03/16/19	
Carbaryl	ND	5.0	ug/L							03/16/19	
Carbofuran	ND	5.0	ug/L							03/16/19	
Methomyl	ND	2.0	ug/L							03/16/19	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 531.1 - Quality Control												
Batch: A903426										Prepared: 3/13/2019		
Prep Method: EPA 531.1										Analyst: PNN		
Blank (A903426-BLK1)												
Oxamyl	ND	20	ug/L							03/16/19		
Blank Spike (A903426-BS1)												
3-Hydroxycarbofuran	9.6	3.0	ug/L	8.7	ND	111	80-120			03/16/19		
Aldicarb	6.0	3.0	ug/L	4.3	ND	138	80-120			03/16/19	BS	***High***
Aldicarb Sulfone	7.1	2.0	ug/L	7.0	ND	102	80-120			03/16/19		
Aldicarb Sulfoxide	4.4	3.0	ug/L	4.3	ND	101	80-120			03/16/19		
Carbaryl	7.7	5.0	ug/L	8.7	ND	89	80-120			03/16/19		
Carbofuran	9.1	5.0	ug/L	7.8	ND	117	80-120			03/16/19		
Methomyl	7.9	2.0	ug/L	8.7	ND	91	80-120			03/16/19		
Oxamyl	9.0	20	ug/L	8.7	ND	104	80-120			03/16/19		
Blank Spike Dup (A903426-BSD1)												
3-Hydroxycarbofuran	9.3	3.0	ug/L	8.7	ND	107	80-120	4	20	03/16/19		
Aldicarb	6.0	3.0	ug/L	4.3	ND	138	80-120	0	20	03/16/19	BS	***High***
Aldicarb Sulfone	6.9	2.0	ug/L	7.0	ND	99	80-120	3	20	03/16/19		
Aldicarb Sulfoxide	4.1	3.0	ug/L	4.3	ND	94	80-120	6	20	03/16/19		
Carbaryl	7.6	5.0	ug/L	8.7	ND	87	80-120	2	20	03/16/19		
Carbofuran	9.1	5.0	ug/L	7.8	ND	116	80-120	0	20	03/16/19		
Methomyl	7.0	2.0	ug/L	8.7	ND	80	80-120	13	20	03/16/19		
Oxamyl	8.6	20	ug/L	8.7	ND	99	80-120	5	20	03/16/19		
Matrix Spike (A903426-MS1), Source: A9C0238-01												
3-Hydroxycarbofuran	8.8	3.0	ug/L	8.7	ND	97	65-135			03/16/19		
Aldicarb	3.7	3.0	ug/L	4.3	ND	85	65-135			03/16/19		
Aldicarb Sulfone	7.2	2.0	ug/L	7.0	ND	104	65-135			03/16/19		
Aldicarb Sulfoxide	4.2	3.0	ug/L	4.3	ND	97	65-135			03/16/19		
Carbaryl	7.8	5.0	ug/L	8.7	ND	89	65-135			03/16/19		
Carbofuran	8.8	5.0	ug/L	7.8	ND	112	65-135			03/16/19		
Methomyl	8.1	2.0	ug/L	8.7	ND	94	65-135			03/16/19		
Oxamyl	9.1	20	ug/L	8.7	ND	105	65-135			03/16/19		
EPA 547 - Quality Control												
Batch: A903506										Prepared: 3/14/2019		
Prep Method: EPA 547										Analyst: JNG		
Blank (A903506-BLK1)												
Glyphosate	ND	25	ug/L							03/14/19		
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/14/19		
Blank Spike (A903506-BS1)												
Glyphosate	100	25	ug/L	100	ND	105	70-130			03/14/19		
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/14/19		

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 547 - Quality Control											
Batch: A903506										Prepared: 3/14/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank Spike Dup (A903506-BSD1)											
Glyphosate	110	25	ug/L	100	ND	105	70-130	1	30	03/14/19	
Surrogate: AMPA	*210*			*200*		*106*	*70-130*			03/14/19	
Matrix Spike (A903506-MS1), Source: A9C0238-01											
Glyphosate	93	25	ug/L	100	ND	93	70-130			03/14/19	
Surrogate: AMPA	*180*			*200*		*88*	*70-130*			03/14/19	
EPA 548.1 - Quality Control											
Batch: A903189										Prepared: 3/7/2019	
Prep Method: EPA 548.1										Analyst: JKH	
Blank (A903189-BLK1)											
Endothall	ND	45	ug/L							03/17/19	
Blank Spike (A903189-BS1)											
Endothall	16	45	ug/L	20	ND	82	46-116			03/17/19	
Blank Spike Dup (A903189-BSD1)											
Endothall	17	45	ug/L	20	ND	84	46-116	2	30	03/17/19	
Matrix Spike (A903189-MS1), Source: A9C0014-01											
Endothall	1.6	45	ug/L	20	ND	8	46-116			03/17/19	MS1.0 ***Low***
EPA 549.2 - Quality Control											
Batch: A903246										Prepared: 3/11/2019	
Prep Method: EPA 549.2										Analyst: VTL	
Blank (A903246-BLK1)											
Diquat	ND	4.0	ug/L							03/12/19	
Blank Spike (A903246-BS1)											
Diquat	3.6	4.0	ug/L	4.0	ND	90	70-130			03/12/19	
Blank Spike Dup (A903246-BSD1)											
Diquat	3.5	4.0	ug/L	4.0	ND	87	70-130	4	30	03/12/19	
Matrix Spike (A903246-MS1), Source: A9C0238-01											
Diquat	2.5	4.0	ug/L	4.0	ND	62	70-130			03/12/19	MS1.0 ***Low***

Certificate of Analysis

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Field tests are outside the scope of laboratory accreditation and there is no certification available for field testing.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected below MRL/MDL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	PicoCuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit	U:	The analyte was not detected at or above the reported sample quantitation limit.

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters:

Chlorothalonil

Trifluralin

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing under each certification.**

Fresno

State of California - ELAP	1180	State of Hawaii	4021
Los Angeles CSD	9254479	NELAP certified	4021-011
State of Nevada	CA000792019-1	State of Oregon - NELAP	4021-011
EPA - UCMR4	CA00079	State of Washington	C997-18

Sacramento

State of California - ELAP	2435		

San Bernardino

State of California - ELAP	2993	Los Angeles CSD	9254478
NELAP certified	4119-003	State of Oregon - NELAP	4119-003

Vancouver

NELAP certified	WA100008-011	State of Oregon - NELAP	WA100008-011
State of Washington	C824-18b		

A9C0567

03062019

Monte6227

Turnaround: Standard
Due Date: 3/20/2019

Monterey Bay Analytical

Printed: 3/6/2019 6:38:56PM

BSK Associates Engineers & Laboratories
1414 Stanislaus St., Fresno, CA 93706
(559) 497-2888 · Fax (559) 497-2893
www.bskassociates.com

5.5 #514

Turnaround Time Request
- [x] Standard - 10 business days
- [ ] Rush (Surcharge may apply)
- [ ] Date needed:

Monte6227 10

*Required Fields Temp:

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax:
Monterey Bay Analytical Services	Sara Sugarman Additional cc's: David Holland	David Holland PO#:	831-375-6227	831-641-0734
			E-mail*: info@mbasinc.com	

Address*:	City*:	State*:	Zip*:
4 Justin Court, Suite D	Monterey	CA	93940

Project: Twin Lakes Church Injection Well
Project #:
How would you like to receive your completed results?* [x] E-Mail [ ] Fax [ ] Mail

Reporting Options: [ ] Trace (J-Flag) [ ] Swamp [ ] EDD Type: _____

Regulatory Carbon Copies: [ ] SWRCB (Drinking Water) [ ] Merced Co [ ] Fresno Co [ ] Madera Co [ ] Tulare Co [ ] Other:

Regulatory Compliance: [ ] EDT to California SWRCB (Drinking Water) System Number*: _____ [ ] Geotracker #: _____

Sampler Name (Printed/Signature)*: L. Matsushima

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX	EPA 504	EPA 505	EPA 515	EPA 524	EPA 525	EPA 531, EPA 547	EPA 548, EPA 549	EPA 1613 (2,3,7,8 Dioxin)	Chromium 6
1.	Sample Set Zone 2 (581'-601')	3/4/19	9:30	DW	190304_06-01	X	X	X	X	X	X	X	X	X

3619

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
David Holland	MBAS	3/5	1600	3619	
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date: 3619	Time: 1203	Payment Received at Delivery: Date: Amount: PIA#:	Check / Cash Init.

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Courier: _____
Cooling Method: Wet Blue None
Custody Seal: Y / N
Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

FOAM

SR-FL-0012-06

A9C0567 03/06/2019
Monte6227 10

BSK Associates SR-FL-0002-19

Sample Integrity

BSK Bottles: Yes No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 8°C	Yes No NA	Were correct containers and preservatives received for the tests requested?	Yes No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No NA	Bubbles Present VOAs (524.2/TCP/TTHM)? TB Received? (Check Method Below)	Yes No NA Yes No NA
Did all bottles arrive unbroken and intact?	Yes No	Was a sufficient amount of sample received?	Yes No
Did all bottle labels agree with COC?	Yes No	Do samples have a hold time <72 hours?	Yes No
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No NA	Was PM notified of discrepancies? PM: By/Time:	Yes No NA

Bottles Received

"—" means preservation/chlorine checks are either N/A or are performed in the lab

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?						
Bacti $Na_2S_2O_3$	—	—						
None (P) White Cap	—	—						
Cr6 (P) Lt. Green Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ DW	Cl, pH > 8	P F	1A					
Cr6 (P) Pink Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ WW	pH 9.3-9.7	P F				3619		
Cr6 (P) Black Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ 7199 ***24 HOUR HOLD TIME***	pH 9.0-9.5	P F						
HNO_3 (P) Red Cap or HCl (P) Purple Cap/Lt. Blue Label	—	—						
H_2SO_4 (P) or (AG) Yellow Cap/Label	pH < 2	P F						
NaOH (P) Green Cap	Cl, pH >10	P F						
NaOH + ZnAc (P)	pH > 9	P F						
Dissolved Oxygen 300ml (g)	—	—						
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—	2C					
HCl (AG) Lt. Blue Label O&G, Diesel, TCP	—	—						
Ascorbic, EDTA, KH_2Ct (AG) Pink Label 525	—	—	2C					
Na_2SO_3 250mL (AG) Neon Green Label 515	—	—	HA					
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—	1					
$Na_2S_2O_3$ (AG) Blue Label 548, THM, 524	—	—	1A					
$Na_2S_2O_3$ (CG) Blue Label 504, 505, 547	—	—	1V					
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH < 3	P F	1V					
NH_4Cl (AG) Purple Label 552	—	—						
EDA (AG) Brown Label DBPs	—	—						
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—	3V					
Buffer pH 4 (CG)	—	—						
H_3PO_4 (CG) Salmon Label	—	—						
Other:								
Asbestos 1L (P) w/ Foil / LL Metals Bottle	—	—						
Bottled Water	—	—						
Clear Glass 250mL / 500mL / 1 Liter	—	—						
Solids: Brass / Steel / Plastic Bag	—	—						

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

✓ **Indicates Blanks Received**

504 __ 524.2 __ TCP __ TTHM __ 537 __

8260/624 __

Labeled by: N @ 1750 Labels checked by: JNO @ 19:18 RUSH Paged by: ____ @ ____

CERES Analytical Laboratory, Inc.
4919 Windplay Dr. Suite 1, El Dorado Hills, CA 95762

March 22, 2019 Ceres ID: 12686

BSK Associates
1414 Stanislaus St.
Fresno, CA 93706

The following report contains the results for the one drinking water sample received on March 12, 2019. This sample was analyzed for 2,3,7,8-TCDD by EPA method 1613B. Routine turn-around time was provided for this work.

This work was authorized under your Subcontract Order # A9C0567.

Continuing Calibration Verification (CCV) Requirements
All associated calibration verification standard(s) (CCV) met the acceptance criteria.

The report consists of a Cover Letter, Sample Inventory (Section I), Data Summary (Section II), Sample Tracking (Section VI), and Qualifiers/Abbreviations (Section VII). Raw Data (Section III), Continuing Calibration (Section IV), and Initial Calibration (Section V) are available in a full report (.pdf format) upon request.

If you have any questions regarding this report, please feel free to contact me at (916)932-5011.

Sincerely,



James M. Hedin
Director of Operations/CEO
jhedin@ceres-lab.com

Section I: Sample Inventory

Ceres Sample ID:	Sample ID	Date Received	Collection Date	&Time
12686-001	Sample Set Zone 2 (581'-601') A9C0567-01	3/12/2019	3/4/2019	9:30

Section II: Data Summary

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Quality Assurance Sample **Method Blank**	**QC Batch #:** 1954	**Date Received:** NA
	Matrix: Drinking Water	**Date Extracted:** 3/21/2019
Project ID: A9C0567	**Sample Size:** 1.000 L	**ZB-5MS Analysis:** 3/21/2019

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.53	1.49	5.00		13C-2378-TCDD	81.0	31-137	
					CRS			
					37Cl4-2378-TCDD	62.9	35-197	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Quality Assurance Sample **Ongoing Precision and Recovery**		**Date Received:** NA
	QC Batch #: 1954	**Date Extracted:** 3/21/2019
	Matrix: Drinking Water	**ZB-5MS Analysis:** 3/21/2019
Project ID: A9C0567	**Sample Size:** 1.000 L	

Analyte	Conc. (ng/mL)	Limits (a)	Labeled Standards	% Rec.	Limits (a)
2,3,7,8-TCDD	11.2	7.3-14.6	13C-2378-TCDD	76.8	25-141
			CRS		
			37Cl4-2378-TCDD	82.3	37-158

(a) Limits based on method acceptance criteria.

Analyst: JMH **Reviewed by: BS**

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Client Sample ID: Sample Set Zone 2 (581'-601') A9C0567-01		
Project ID: A9C0567	**Ceres Sample ID:** 12686-001	**Date Received:** 3/12/2019
	QC Batch #: 1954	**Date Extracted:** 3/21/2019
Date Collected: 3/4/2019	**Matrix:** Drinking Water	**ZB-5MS Analysis:** 3/21/2019
Time Collected: 9:30	**Sample Size:** 1.007 L	

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 3.67	1.49	4.97		13C-2378-TCDD	98.9	31-137	
					CRS			
					37Cl4-2378-TCDD	94.2	42-164	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

Section VI: Sample Tracking

BSK ASSOCIATES

SUBCONTRACT ORDER

A9C0567

SENDING LABORATORY:

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
Phone: 559-497-2888
Fax: 559-485-6935
Project Manager: Jaime Lee LaFave
E-mail: jlafave@bskassociates.com

RECEIVING LABORATORY:

Ceres Analytical Laboratory, Inc
4919 Windplay Drive, Suite 1
El Dorado Hills, CA 95762
Phone :(916) 932-5011
Fax: -
Turnaround (Days): Standard
QC Deliverables: I Std III IV

Sample ID	Samp Desc		Sample Date
A9C0567-01	**Sample Set Zone 2 (581'-601')**	**Client Matrix** Drinking Water	**03/04/2019 09:30**

Sample Alias: 190304_06-01
Lab Matrix: Water

Analysis:
EXT-Dioxin-DW matrix, EPA 1613 2,3,7,8-TCDD

Released By	Date	Received By	Date
[signature]	3/11/19	[signature]	3/12/19 11:13

Sample Receipt Check List Logged by: _____ (initials)

Ceres ID: 12686		Date/Time: 3/12/19 11:13
Client Project ID: A9C0567		Received Temp: 3.8 °C Acceptable: Y / N
Chain of Custody Relinquished by signed?		Y / N
Chain of Custody Received by signed?		Y / N
Custody Seals?	Present? Intact? NA:	Y / N Y / N NA
Unlabeled / Illegible Samples		Y / N
Proper Containers:		Y / N
Preservation Acceptable (Chemical or Temperature)? Drinking Water, Sodium Thiosulfate present? Residual Cl? Aqueous sample pH: 7		Y / N Y / N / NA Y / N

List COC discrepancies:

3/12/19

List Damaged Samples:

3/12/19

Section VII: Qualifiers/Abbreviations

J	Concentration found below the lower quantitation limit but greater than zero.
B	Analyte present in the associated Method Blank.
E	Concentration found exceeds the Calibration range of the HRGC/HRMS.
D	This analyte concentration was calculated from a dilution.
X	The concentration found is the estimated maximum possible concentration due to chlorinated diphenyl ethers present in the sample.
H	Recovery limits exceeded. See cover letter.
*****	Results taken from dilution.
I	Interference. See cover letter.
Conc.	Concentration Found
DL	Calculated Detection Limit
ND	Non-Detect
% Rec.	Percent Recovery

April 12, 2019

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Lab ID : SP 1903039
Customer : 2-19144

Laboratory Report

Introduction: This report package contains total of 5 pages divided into 3 sections:

Case Narrative	(2 pages)	: An overview of the work performed at FGL.
Sample Results	(1 page)	: Results for each sample submitted.
Quality Control	(2 pages)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
Sample Set Zone 2 (581'601')	03/04/2019	03/06/2019	SP 1903039-001	DW

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived at 6 °C. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Radio QC

900.0	04/12/2019:205258 All analysis quality controls are within established criteria.
	04/05/2019:203700 All preparation quality controls are within established criteria, except: The following note applies to Gross Beta: 435 Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.
903.0	03/18/2019:203893 All analysis quality controls are within established criteria.
	03/12/2019:202706 All preparation quality controls are within established criteria, except: The following note applies to Total Alpha Radium (226): 436 Blank Spike (BS) not within Acceptance Range (AR). Data was accepted based on the LCS or CCV recovery. The following note applies to Total Alpha Radium (226): 410 Relative Percent Difference (RPD) not within Maximum Allowable Value (MAV). Data was accepted based on the LCS or CCV recovery.

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April 12, 2019 Lab ID : SP 1903039
Monterey Bay Analytical Services Customer : 2-19144

Radio QC

906.0	03/23/2019:204308 All analysis quality controls are within established criteria.
	03/19/2019:202959 All preparation quality controls are within established criteria.
Ra - 05	03/19/2019:204318 All analysis quality controls are within established criteria.
	03/14/2019:202660 All preparation quality controls are within established criteria.
SM7500Rn	03/08/2019:203467 All analysis quality controls are within established criteria.
	03/07/2019:202497 All preparation quality controls are within established criteria.

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:CEA

Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-04-12

April 12, 2019

Lab ID : SP 1903039-001
Customer ID : 2-19144

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Sampled On : March 4, 2019-09:30
Sampled By : L. Matsushima
Received On : March 6, 2019-11:38
Matrix : Drinking Water

Description : Sample Set Zone 2 (581'601')
Project : Twin Lakes Church Injection Well

Sample Result - Radio

Constituent	Result ± Error	MDA	Units	MCL/AL	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Radio Chemistry								
Gross Alpha	10.4 ± 1.63	1.28	pCi/L		900.0	04/05/19-09:09 2P1903700	900.0	04/12/19-10:40 2A1905258
Gross Beta	1.10 ± 1.20	1.38	pCi/L		900.0	04/05/19-09:09 2P1903700	900.0	04/12/19-10:40 2A1905258
Radon-222	299 ± 30.0	18.2	pCi/L		SM7500Rn	03/07/19-17:00 2P1902497	SM7500Rn	03/08/19-01:11 2A1903467
Total Alpha Radium (226)	0.101 ± 0.105	0.304	pCi/L		903.0	03/12/19-18:40 2P1902706	903.0	03/18/19-10:00 2A1903893
Tritium	126 ± 265	434	pCi/L		906.0	03/19/19-09:30 2P1902959	906.0	03/23/19-05:01 2A1904308
Ra 228	0.094 ± 0.557	0.384	pCi/L		Ra - 05	03/14/19-18:00 2P1902660	Ra - 05	03/19/19-18:10 2A1904318

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:
Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.

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April 12, 2019 Lab ID : SP 1903039
Monterey Bay Analytical Services Customer : 2-19144

Quality Control - Radio

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Radio								
Alpha	900.0	04/12/19:205258IWC	CCV	cpm	7923	43.0 %	35-47	
			CCB	cpm		0.1200	0.21	
Beta	900.0	04/12/19:205258IWC	CCV	cpm	7923	94.0 %	83-94	
			CCB	cpm		0.4600	0.51	
Gross Alpha	900.0	04/05/19:203700IWC	Blank	pCi/L		0.89	3	
			LCS	pCi/L	130.0	100 %	75-125	
			MS	pCi/L	130.0	77.1 %	60-140	
		(STK1934469-001)	MSD	pCi/L	130.0	81.4 %	60-140	
			MSRPD	pCi/L	130.0	5.4%	≤30	
Gross Beta	900.0	04/05/19:203700IWC	Blank	pCi/L		0.74	4	
			LCS	pCi/L	26.72	154 %	84-160	
			MS	pCi/L	26.72	143 %	80-130	435
		(STK1934469-001)	MSD	pCi/L	26.72	138 %	80-130	435
			MSRPD	pCi/L	130.0	3.3%	≤30	
Alpha	903.0	03/18/19:203893JCA	CCV	cpm	8296	40.5 %	37-46	
			CCB	cpm		0.0600	0.12	
Total Alpha Radium (226)	903.0	03/12/19:202706emv	RgBlk	pCi/L		-0.01	2	
			LCS	pCi/L	23.33	64.3 %	52-107	
			BS	pCi/L	23.33	47.3 %	43-111	
			BSD	pCi/L	23.33	35.9 %	43-111	436
			BSRPD	pCi/L	23.33	2.7	≤2	410
Tritium	906.0	03/19/19:202959JCA	Blank	pCi/L		137	<300	
			LCS	pCi/L	1666	92.1 %	75-125	
			BS	pCi/L	1666	94.4 %	75-125	
			BSD	pCi/L	1666	98.5 %	75-125	
			BSRPD	pCi/L	1666	3.9%	≤25	
	906.0	03/23/19:204308JCA	CCV	pCi/L	26150	106 %	90-110	
			CCB	pCi/L		70	500	
Beta	Ra - 05	03/19/19:204318emv	CCV	cpm	8296	88.4 %	84-94	
			CCB	cpm		0.3800	0.51	
Ra 228	Ra - 05	03/14/19:202660emv	RgBlk	pCi/L		-0.03	3	
			LRS	pCi/L	12.04	70.9 %	65-108	
			BS	pCi/L	12.04	104 %	75-125	
			BSD	pCi/L	12.04	101 %	75-125	
			BSRPD	pCi/L	12.04	0.35	≤3	
Radon	SM7500Rn	(SP 1903039-001)	Dup	pCi/L		13.8%	25	
	SM7500Rn	03/08/19:203467JCA	CCV	pCi/L	2582	96.8 %	90-110	
			CCB	pCi/L		-13.8	20	

Definition

CCV : Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
CCB : Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
RgBlk : Method Reagent Blank - Prepared to correct for any reagent contributions to sample result.
LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
LRS : Laboratory Recovery Standard - Prepared to establish the batch recovery factor used in result calculations.
MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
BS : Blank Spikes - A blank is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
BSD : Blank Spike Duplicate of BS/BSD pair - A blank duplicate is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
Dup : Duplicate Sample - A random sample with each batch is prepared and analyzed in duplicate. The relative percent difference is an indication of precision for the preparation and analysis.

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April 12, 2019 Lab ID : SP 1903039
Monterey Bay Analytical Services Customer : 2-19144

Quality Control - Radio

Definition	
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
BSRPD	: BS/BSD Relative Percent Difference (RPD) - The BS relative percent difference is an indication of precision for the preparation and analysis.
ND	: Non-detect - Result was below the DQO listed for the analyte.
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.
Explanation	
410	: Relative Percent Difference (RPD) not within Maximum Allowable Value (MAV). Data was accepted based on the LCS or CCV recovery.
435	: Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.
436	: Blank Spike (BS) not within Acceptance Range (AR). Data was accepted based on the LCS or CCV recovery.

ENVIRONMENTAL AGRICULTURAL
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CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT

Client: Monterey Bay Analytical Services
Customer Number: 2019144
Address: 4 Justin Court
Monterey, CA 93940

Phone: (831)375-6227 Fax: (831)641-0734
Email Address: info@mbasinc.com
Contact Person: David Holland
Project Name: Twin Lakes Church Injection Well
Purchase Order Number:
Quote Number:

Rush Analysis: ☐ 5 Day ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 24 hour
Rush pre-approval by lab (initals): _____
Electronic Data Transfer: ☑ No ☐ State ☐ Client Other: _____

Sampler(s): L. Matsushima

Sampling Fee: _____ Pickup Fee: _____
Compositor Setup Date: _____ Time: _____

Lab Number: 193036

TEST DESCRIPTION AND ANALYSES REQUESTED

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite (C) Grab (G)	Number of Containers	Type of Containers: (G)Glass (P)Plastic (VVOA (MT)Metal Tube	Potable (P) Non-Potable (NP) Ag Water (AgW)	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (WW) Waste Water (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sye) System (SRC) Source (W) Waste	BacT: (ROUT)Routine (RPT)Repeat (OTH)Other (RPL)Replace	(LT) Leaf Tissue (PET) Pesticle Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other _____	Gross Alpha	Gross Beta	Radium 226	Radium 228	Radon	Tritium
1.	Sample Set Zone 2 (581'-601')	3/4/19	9:30	G	6	var	P	DW						X	X	X	X	X	X
	5439972940																		X

Remarks
190304_06-01

Relinquished	Date:	Time:	Relinquished	Date:	Time:	Relinquished	Date:	Time:
[illegible]	3/5	1600	[illegible]	3/6/19	1130			
Received By:	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**	**Received By:**	**Date:**	**Time:**
			[illegible]	3/6/19	1138			

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Condition Upon Receipt (Attach to COC)

Sample Receipt at SP:

1. Number of ice chests/packages received: **1**
2. Shipper tracking numbers **543997298**
3. Were samples received in a chilled condition?
   Temps: **6** / _____ / _____ / _____ / _____ / _____ / _____
4. Surface water (SWTR) bact samples: A sample that has a temperature upon receipt of >10C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.
5. Do the number of bottles received agree with the COC? **Yes** No N/A
6. Verify sample date, time, sampler **Yes** No N/A
7. Were the samples received intact? (i.e. no broken bottles, leaks, etc.) **Yes** No
8. Were sample custody seals intact? Yes No **N/A**

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? **Yes** No
2. Did bottle labels correspond with the client's ID's? **Yes** No
3. Were all bottles requiring sample preservation properly preserved? Yes No **N/A** **FGL**
   [Exception: Oil & Grease, VOA and CrVI verified in lab]
4. VOAs checked for Headspace? **Yes** No N/A
5. Were all analyses within holding times at time of receipt? **Yes** No
6. Have rush or project due dates been checked and accepted? Yes No **N/A**

Include a copy of the COC for lab delivery. (Bacti. Inorganics and Radio)

Sample Receipt, Login and Verification completed by: Reviewed and Approved By **Inez Covarrubias** Digitally signed by Inez Covarrubias Title: Sample Receiving Date: 03/07/2019-16:19:33

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: _____ Phone Number: _____
   Initiated By: _____ Date: _____
   Problem:

   Resolution:

2. Person Contacted: _____ Phone Number: _____
   Initiated By: _____ Date: _____
   Problem:

   Resolution:

(2019144)
Monterey Bay Analytical Services
SP 1903039
IV/CC-03/07/2019-16:19:33

Maggiora Bros Drilling Inc.
Chris Duncan
595 Airport Blvd.
Watsonville, California 95076

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ELAP Certification Number: 2385

Monday, April 08, 2019

Lab Number: 190307_13-01 **Sample Description: Sample Set Zone 3**

Collection Date/Time: 3/7/2019 9:40 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 3/7/2019 11:36 System ID: Twin Lakes Church Injection Well *Non Reg

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
1,2,3-Trichloropropane	SRL 524M	µg/L	ND	1	E	0.005	0.005	3/14/2019	13:40	
Alkalinity, Total (as CaCO3)	SM2320B	mg/L	145	1		10		3/14/2019	9:38	LM
Aluminum, Total	EPA200.8	µg/L	276	1	IJ	5	1000	3/18/2019	12:38	MW
IJ: LFBD above acceptance limits.										
Anion-Cation Balance	Calculation	%	-1	1						
Antimony, Total	EPA200.8	µg/L	ND	1		0.5	6	3/18/2019	12:38	MW
Arsenic, Dissolved	EPA200.8	ug/L	1.4	1		0.5	10	3/18/2019	11:47	MW
Arsenic, Total	EPA200.8	µg/L	1.3	1		0.5	10	3/18/2019	12:38	MW
Asbestos	EPA100.2	mF/L	ND	1	E	0.2	7			
Due to excessive particulate the analytical sensitivity of 0.2 MFL as required by the method was not reached.										
Barium, Total	EPA200.8	µg/L	15.5	1		5	1000	3/18/2019	12:38	MW
Beryllium, Total	EPA200.8	µg/L	ND	1		0.5	4	3/18/2019	12:38	MW
Bicarbonate (as HCO3-)	SM2320B	mg/L	177	1		10				
Bromide	EPA300.0	mg/L	0.1	1		0.1		3/8/2019	15:27	HM
Cadmium, Total	EPA200.8	µg/L	ND	1		0.25	5	3/18/2019	12:38	MW
Calcium	EPA200.7	mg/L	11	1		1		3/13/2019	14:35	HM
Carbonate as CaCO3	SM2320B	mg/L	ND	1		10				
Chloride	EPA300.0	mg/L	60	1		1	250	3/8/2019	15:27	HM
Chromium VI	EPA 218.7	µg/L	ND	1	E			3/14/2019	12:00	
Chromium, Total	EPA200.8	µg/L	1.6	1		1	50	3/18/2019	12:38	MW
Color, Apparent (Unfiltered)	SM2120B	Color Units	5	1		3	15	3/7/2019	15:50	PS
Copper, Total	EPA200.7	µg/L	ND	1		10	1300	3/13/2019	14:35	HM
Cyanide, Available	OIA-1677-09	µg/L	ND	1		2	150	3/19/2019	14:55	BS
Dioxin	EPA 1613	pg/L	ND	1	E			3/21/2019	12:00	
2,3,7,8-TCDD										
Fluoride	EPA300.0	mg/L	0.1	1		0.1	2	3/8/2019	15:27	HM
Gross Alpha	EPA900.0	pCi/L	3.24±1.75	1	E			3/27/2019	10:14	
Gross Beta	EPA900.0	pCi/L	2.14±1.10	1	E			3/27/2019	10:14	
Hardness (as CaCO3)	SM2340B/Calc	mg/L	32	1		10				
Hydroxide	SM2320B	mg/L	ND	1		10				
Iron, Dissolved	EPA200.7	µg/L	23	1		10	300	3/13/2019	14:37	HM
Iron, Total	EPA200.7	µg/L	356	1		10	300	3/13/2019	14:35	HM
Langlier Index, 15°C	SM2330B	NA	0.23	1						
Langlier Index, 60°C	SM2330B	NA	1.05	1						
Lead, Total	EPA200.8	µg/L	ND	1		1	15	3/18/2019	12:38	MW

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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Monday, April 08, 2019

Lab Number: 190307_13-01 **Sample Description: Sample Set Zone 3**

Collection Date/Time: 3/7/2019 9:40 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 3/7/2019 11:36 System ID: Twin Lakes Church Injection Well *Non Reg

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Magnesium	EPA200.7	mg/L	1	1		0.5		3/13/2019	14:35	HM
Manganese, Dissolved	EPA200.7	µg/L	ND	1		10	50	3/13/2019	14:37	HM
Manganese, Total	EPA200.7	µg/L	ND	1		10	50	3/13/2019	14:35	HM
MBAS (Surfactants)	SM5540C	mg/L	ND	1		0.05		3/8/2019	10:43	HM
Mercury, Total	EPA200.8	µg/L	ND	1		0.2	2	3/18/2019	12:38	MW
Nickel, Total	EPA200.8	µg/L	ND	1		5	100	3/18/2019	12:38	MW
Nitrate as N	EPA300.0	mg/L	0.1	1		0.1	10	3/8/2019	15:27	HM
Nitrate+Nitrite as N	EPA300.0	mg/L	0.1	1		0.1	10	3/8/2019	15:27	HM
Nitrite as N	EPA300.0	mg/L	ND	1		0.1	1	3/8/2019	15:27	HM
N-Nitrosodimethylamine	EPA 521	ng/l	ND	1	E	2		3/18/2019	19:45	
Odor Threshold at 60 C *Odor: Earthy*	SM2150B	TON	2	1		1	3	3/7/2019	12:40	PS
Orthophosphate as P	EPA300.0	mg/L	ND	1		0.1		3/8/2019	15:27	HM
Perchlorate	EPA314.0	µg/L	ND	1		2	6	3/18/2019	16:29	BS
pH (Field Test)	SM4500-H+B	pH	8.72	1				3/7/2019	9:45	
pH (Laboratory)	SM4500-H+B	pH (H)	8.8	1		0.1	8.5	3/7/2019	16:44	PS
Potassium	EPA200.7	mg/L	2.4	1		0.5		3/13/2019	14:35	HM
QC Anion Sum x 100	Calculation	%	96	1						
QC Cation Sum x 100	Calculation	%	94	1						
QC Ratio TDS/SEC	Calculation	NA	0.64	1						
Radium 226	EPA903.0	pCi/L	0.006±0.064	1	E			3/18/2019	18:00	
Radium 228	EPA903.0	pCi/L	0.000±0.572	1	E			3/28/2019	18:40	
Radon	SM7500-Rn	pCi/L	278±39.6	1	E			3/12/2019	20:24	
Selenium, Total	EPA200.8	µg/L	ND	1		1	50	3/18/2019	12:38	MW
Silver, Total	EPA200.8	µg/L	ND	1		1	100	3/18/2019	12:38	MW
Sodium	EPA200.7	mg/L	193	1		1		3/13/2019	14:35	HM
Specific Conductance (EC)	SM2510B	µmhos/cm	970	1		1	900	3/12/2019	15:22	LM
Specific Conductance (Field)	SM2510B	µmhos/cm	905	1		1		3/7/2019	9:45	
Strontium, Total	EPA200.8	µg/L	106	1		0.15		3/18/2019	12:38	MW
Sulfate *LM: MS and/or MSD above acceptance limits.*	EPA300.0	mg/L	227	1	LM	1	250	3/8/2019	15:27	HM
Synthetic Organic Compounds	External	µg/L	ND	1	E			3/23/2019	12:00	
Thallium, Total	EPA200.8	µg/L	ND	1		0.5	2	3/18/2019	12:38	MW
Total Dissolved Solids	SM2540C	mg/L	618	1		10	500	3/11/2019	15:09	LM
Tritium	EPA906.0	pCi/L	0.000±269	1	E			4/4/2019	15:23	

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level

H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance

MDL = Method Detection Limit J = Result is less than PQL ND = Non Detect

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Monday, April 08, 2019

Lab Number: 190307_13-01 **Sample Description: Sample Set Zone 3**

Collection Date/Time: 3/7/2019 9:40 Sample Collector: Jones D Client Sample #:

Submittal Date/Time: 3/7/2019 11:36 System ID: Twin Lakes Church Injection Well *Non Reg

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Analysis Date / Time		Analyst
Turbidity	EPA180.1	NTU	3.80	1		0.05	1	3/7/2019	12:31	PS
Turbidity (Field)	EPA180.1	NTU	2.760	1		0.05		3/7/2019	9:45	
Uranium, Radiological	EPA200.8	pCi/L	ND	1		0.5	20	3/18/2019	12:38	MW
Uranium, Total	EPA200.8	µg/L	ND	1		0.5	30	3/18/2019	12:38	MW
Volatile Organic Compounds (DW)	EPA524	µg/L	ND	1	E			3/12/2019	12:00	
Zinc, Total	EPA200.7	µg/L	ND	1		10	5000	3/13/2019	14:35	HM

Report Approved by:
David Holland, Laboratory Director

mg/L : Millgrams per liter (=ppm) µg/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level
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QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
QC19031415	190311_14-01: Duplicate 1	Alkalinity, Total (as CaCO3)	28.0	mg/L		3.5	0 - 10
	190313_15-01: Duplicate 2	Alkalinity, Total (as CaCO3)	101.0	mg/L		1.0	0 - 10
	190313_49-04: Duplicate 3	Alkalinity, Total (as CaCO3)	83.0	mg/L		< 0.1	0 - 10
	CCVB 1	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
	CCVB 2	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
	LCS 1	Alkalinity, Total (as CaCO3)	41.6	mg/L	104		95 - 105
	LCSD 1	Alkalinity, Total (as CaCO3)	41.8	mg/L	105	0.5	0 - 10
	Method Blank 1	Alkalinity, Total (as CaCO3)	ND	mg/L		< 0.1	
QC19031905	190308_11-01: MS 1	Aluminum, Total	58.69	ug/L	107		70 - 130
	190308_11-01: MSD 1	Aluminum, Total	57.82	ug/L	106	1.6	0 - 20
	CCVB 1	Aluminum, Total	ND	ug/L		< 0.1	
	LCB 1	Aluminum, Total	ND	ug/L		< 0.1	
	LCS 1	Aluminum, Total	49.65	ug/L	99		85 - 115
	LCSD 1	Aluminum, Total	47.48	ug/L	95	4.5	0 - 20
	LFB 1	Aluminum, Total	129.8	ug/L	130		70 - 130
	LFBD 1	Aluminum, Total	132.4	ug/L	132	2.0	0 - 20
	Method Blank 1	Aluminum, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Antimony, Total	42.9	ug/L	87		70 - 130
	190308_11-01: MSD 1	Antimony, Total	43.12	ug/L	87	0.5	0 - 20
	CCVB 1	Antimony, Total	ND	ug/L		< 0.1	
	LCB 1	Antimony, Total	ND	ug/L		< 0.1	
	LCS 1	Antimony, Total	55.76	ug/L	112		85 - 115
	LCSD 1	Antimony, Total	50.24	ug/L	100	10.4	0 - 20
	LFB 1	Antimony, Total	90.84	ug/L	91		70 - 130
	LFBD 1	Antimony, Total	91.57	ug/L	92	0.8	0 - 20
	Method Blank 1	Antimony, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Arsenic, Total	52.28	ug/L	101		70 - 130
	190308_11-01: MSD 1	Arsenic, Total	51.86	ug/L	100	0.8	0 - 20
	CCVB 1	Arsenic, Total	ND	ug/L		< 0.1	
	LCB 1	Arsenic, Total	ND	ug/L		< 0.1	
	LCS 1	Arsenic, Total	53.64	ug/L	107		85 - 115
	LCSD 1	Arsenic, Total	50.6	ug/L	101	5.8	0 - 20
	LFB 1	Arsenic, Total	101.8	ug/L	102		70 - 130
	LFBD 1	Arsenic, Total	104.0	ug/L	104	2.1	0 - 20
	Method Blank 1	Arsenic, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Barium, Total	115.4	ug/L	101		70 - 130

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	190308_11-01: MSD 1	Barium, Total	115.4	ug/L	100	< 0.1	0 - 20
	CCVB 1	Barium, Total	ND	ug/L		< 0.1	
	LCB 1	Barium, Total	ND	ug/L		< 0.1	
	LCS 1	Barium, Total	54.45	ug/L	109		85 - 115
	LCSD 1	Barium, Total	49.15	ug/L	98	10.2	0 - 20
	LFB 1	Barium, Total	97.3	ug/L	97		70 - 130
	LFBD 1	Barium, Total	98.88	ug/L	99	1.6	0 - 20
	Method Blank 1	Barium, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Beryllium, Total	49.6	ug/L	100		70 - 130
	190308_11-01: MSD 1	Beryllium, Total	48.77	ug/L	98	1.7	0 - 20
	CCVB 1	Beryllium, Total	ND	ug/L		< 0.1	
	LCB 1	Beryllium, Total	ND	ug/L		< 0.1	
	LCS 1	Beryllium, Total	52.65	ug/L	105		85 - 115
	LCSD 1	Beryllium, Total	51.67	ug/L	103	1.9	0 - 20
	Method Blank 1	Beryllium, Total	ND	ug/L		< 0.1	
QC19031103	190307_13-01: MS 1	Bromide	1.89	mg/L	89		80 - 120
	190307_13-01: MSD 1	Bromide	1.87	mg/L	88	0.8	0 - 10
	CCVB 1	Bromide	ND	mg/L		< 0.1	
	LCS 1	Bromide	1.8	mg/L	90		90 - 110
	LCSD 1	Bromide	1.97	mg/L	98	8.9	0 - 10
	LCSL 1	Bromide	0.16	mg/L	80		50 - 150
	Method Blank 1	Bromide	ND	mg/L		< 0.1	
QC19031905	190308_11-01: MS 1	Cadmium, Total	39.98	ug/L	81		70 - 130
	190308_11-01: MSD 1	Cadmium, Total	40.03	ug/L	81	0.1	0 - 20
	CCVB 1	Cadmium, Total	ND	ug/L		< 0.1	
	LCB 1	Cadmium, Total	ND	ug/L		< 0.1	
	LCS 1	Cadmium, Total	55.56	ug/L	111		85 - 115
	LCSD 1	Cadmium, Total	51.39	ug/L	103	7.8	0 - 20
	LFB 1	Cadmium, Total	94.31	ug/L	94		70 - 130
	LFBD 1	Cadmium, Total	95.38	ug/L	95	1.1	0 - 20
	Method Blank 1	Cadmium, Total	ND	ug/L		< 0.1	
QC19031410	190307_15-01: MS 1	Calcium	161.9	mg/L	91		70 - 130
	190307_15-01: MSD 1	Calcium	164.7	mg/L	97	5.9	0 - 20
	CCVB 1	Calcium	ND	mg/L		< 0.1	
	LCB 1	Calcium	ND	mg/L		< 0.1	
	LCS 1	Calcium	51.6	mg/L	103		95 - 105

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	LCSD 1	Calcium	52.61	mg/L	105	1.9	0 - 10
	LFB 1	Calcium	51.88	mg/L	104		85 - 115
	LFBD 1	Calcium	53.44	mg/L	107	3.0	0 - 20
	Method Blank 1	Calcium	ND	mg/L		< 0.1	
	QCS 1	Calcium	52.04	mg/L	104		95 - 105
QC19031103	190307_13-01: MS 1	Chloride	81.0	mg/L	103		80 - 120
	190307_13-01: MSD 1	Chloride	79.81	mg/L	97	6.0	0 - 10
	CCVB 1	Chloride	ND	mg/L		< 0.1	
	LCS 1	Chloride	18.98	mg/L	95		90 - 110
	LCSD 1	Chloride	19.98	mg/L	100	5.1	0 - 10
	LCSL 1	Chloride	1.8	mg/L	90		50 - 150
	Method Blank 1	Chloride	ND	mg/L		< 0.1	
QC19031905	190308_11-01: MS 1	Chromium, Total	71.99	ug/L	118		70 - 130
	190308_11-01: MSD 1	Chromium, Total	69.63	ug/L	113	4.1	0 - 20
	CCVB 1	Chromium, Total	ND	ug/L		< 0.1	
	LCB 1	Chromium, Total	ND	ug/L		< 0.1	
	LCS 1	Chromium, Total	50.21	ug/L	100		85 - 115
	LCSD 1	Chromium, Total	45.78	ug/L	92	9.2	0 - 20
	LFB 1	Chromium, Total	126.6	ug/L	127		70 - 130
	LFBD 1	Chromium, Total	129.4	ug/L	129	2.2	0 - 20
	Method Blank 1	Chromium, Total	ND	ug/L		< 0.1	
QC19031108	190307_13-01: Duplicate 1	Color, Apparent (Unfiltered)	5.0	Color Units		< 0.1	0 - 25
	CCVB 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
	LCS 1	Color, Apparent (Unfiltered)	5.0	Color Units	100		80 - 120
	LCSD 1	Color, Apparent (Unfiltered)	5.0	Color Units	100	< 0.1	0 - 20
	Method Blank 1	Color, Apparent (Unfiltered)	ND	Color Units		< 0.1	
QC19031410	190307_15-01: MS 1	Copper, Total	992.2	µg/L	99		70 - 130
	190307_15-01: MSD 1	Copper, Total	1001.0	µg/L	100	0.9	0 - 20
	CCVB 1	Copper, Total	ND	µg/L		< 0.1	
	LCB 1	Copper, Total	ND	µg/L		< 0.1	
	LCS 1	Copper, Total	1034.0	µg/L	103		95 - 105
	LCSD 1	Copper, Total	1059.0	µg/L	106	2.4	0 - 10
	LFB 1	Copper, Total	1006.0	µg/L	101		85 - 115
	LFBD 1	Copper, Total	1052.0	µg/L	105	4.5	0 - 20
	Method Blank 1	Copper, Total	ND	µg/L		< 0.1	
	QCS 1	Copper, Total	1033.0	µg/L	103		95 - 105

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QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
QC19032114	190307_13-01: MS 1	Cyanide, Available	52.71	µg/L	104		80 - 120
	190307_13-01: MSD 1	Cyanide, Available	53.92	µg/L	107	2.3	0 - 20
	CCVB 1	Cyanide, Available	ND	µg/L		< 0.1	
	LCS 1	Cyanide, Available	51.69	µg/L	103		90 - 110
	LCSD 1	Cyanide, Available	53.4	µg/L	107	3.2	0 - 10
	LCSL 1	Cyanide, Available	1.98	µg/L	99		50 - 150
	Method Blank 1	Cyanide, Available	ND	µg/L		< 0.1	
	QCS 1	Cyanide, Available	52.68	µg/L	105		90 - 110
QC19031103	190307_13-01: MS 1	Fluoride	2.11	mg/L	100		80 - 120
	190307_13-01: MSD 1	Fluoride	2.06	mg/L	98	2.3	0 - 10
	CCVB 1	Fluoride	ND	mg/L		< 0.1	
	LCS 1	Fluoride	2.04	mg/L	102		90 - 110
	LCSD 1	Fluoride	2.08	mg/L	104	1.9	0 - 10
	LCSL 1	Fluoride	0.14	mg/L	68		50 - 150
	Method Blank 1	Fluoride	ND	mg/L		< 0.1	
QC19031410	190307_15-01: MS 1	Iron, Total	958.0	µg/L	95		70 - 130
	190307_15-01: MSD 1	Iron, Total	968.8	µg/L	96	1.1	0 - 20
	CCVB 1	Iron, Total	ND	µg/L		< 0.1	
	LCB 1	Iron, Total	ND	µg/L		< 0.1	
	LCS 1	Iron, Total	982.0	µg/L	98		95 - 105
	LCSD 1	Iron, Total	995.1	µg/L	100	1.3	0 - 10
	LFB 1	Iron, Total	985.2	µg/L	99		85 - 115
	LFBD 1	Iron, Total	1023.0	µg/L	102	3.8	0 - 20
	Method Blank 1	Iron, Total	ND	µg/L		< 0.1	
	QCS 1	Iron, Total	1006.0	µg/L	101		95 - 105
QC19031905	190308_11-01: MS 1	Lead, Total	44.72	ug/L	90		70 - 130
	190308_11-01: MSD 1	Lead, Total	44.37	ug/L	90	0.8	0 - 20
	CCVB 1	Lead, Total	ND	ug/L		< 0.1	
	LCB 1	Lead, Total	ND	ug/L		< 0.1	
	LCS 1	Lead, Total	49.73	ug/L	99		85 - 115
	LCSD 1	Lead, Total	48.17	ug/L	96	3.2	0 - 20
	LFB 1	Lead, Total	102.0	ug/L	102		70 - 130
	LFBD 1	Lead, Total	103.5	ug/L	104	1.5	0 - 20
	Method Blank 1	Lead, Total	ND	ug/L		< 0.1	
QC19031410	190307_15-01: MS 1	Magnesium	91.91	mg/L	105		70 - 130
	190307_15-01: MSD 1	Magnesium	92.98	mg/L	107	2.0	0 - 20

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	CCVB 1	Magnesium	ND	mg/L		< 0.1	
	LCB 1	Magnesium	ND	mg/L		< 0.1	
	LCS 1	Magnesium	51.25	mg/L	102		95 - 105
	LCSD 1	Magnesium	52.61	mg/L	105	2.6	0 - 10
	LFB 1	Magnesium	51.28	mg/L	103		85 - 115
	LFBD 1	Magnesium	53.34	mg/L	107	3.9	0 - 20
	Method Blank 1	Magnesium	ND	mg/L		< 0.1	
	QCS 1	Magnesium	52.13	mg/L	104		95 - 105
	190307_15-01: MS 1	Manganese, Total	964.2	µg/L	97		70 - 130
	190307_15-01: MSD 1	Manganese, Total	972.5	µg/L	97	0.9	0 - 20
	CCVB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCB 1	Manganese, Total	ND	µg/L		< 0.1	
	LCS 1	Manganese, Total	986.5	µg/L	99		95 - 105
	LCSD 1	Manganese, Total	1003.0	µg/L	100	1.6	0 - 10
	LFB 1	Manganese, Total	988.3	µg/L	99		85 - 115
	LFBD 1	Manganese, Total	1032.0	µg/L	103	4.3	0 - 20
	Method Blank 1	Manganese, Total	ND	µg/L		< 0.1	
	QCS 1	Manganese, Total	995.4	µg/L	100		95 - 105
QC19031110	190307_13-01: MS 1	MBAS (Surfactants)	0.24	mg/L	96		80 - 120
	190307_13-01: MSD 1	MBAS (Surfactants)	0.26	mg/L	102	6.1	0 - 10
	CCVB 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
	LCS 1	MBAS (Surfactants)	0.24	mg/L	97		80 - 120
	LCSD 1	MBAS (Surfactants)	0.25	mg/L	101	3.6	0 - 10
	LCSL 1	MBAS (Surfactants)	0.05	mg/L	108		50 - 150
	Method Blank 1	MBAS (Surfactants)	ND	mg/L		< 0.1	
QC19031905	190308_11-01: MS 1	Mercury, Total	0.92	ug/L	103		70 - 130
	190308_11-01: MSD 1	Mercury, Total	0.93	ug/L	104	0.9	0 - 20
	CCVB 1	Mercury, Total	ND	ug/L		< 0.1	
	LCB 1	Mercury, Total	ND	ug/L		< 0.1	
	LCS 1	Mercury, Total	0.97	ug/L	97		85 - 115
	LCSD 1	Mercury, Total	0.96	ug/L	96	1.1	0 - 20
	Method Blank 1	Mercury, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Nickel, Total	51.11	ug/L	99		70 - 130
	190308_11-01: MSD 1	Nickel, Total	48.71	ug/L	95	5.0	0 - 20
	CCVB 1	Nickel, Total	ND	ug/L		< 0.1	
	LCB 1	Nickel, Total	ND	ug/L		< 0.1	

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	LCS 1	Nickel, Total	51.52	ug/L	103		85 - 115
	LCSD 1	Nickel, Total	47.88	ug/L	96	7.3	0 - 20
	LFB 1	Nickel, Total	103.2	ug/L	103		70 - 130
	Method Blank 1	Nickel, Total	ND	ug/L		< 0.1	
QC19031103	190307_13-01: MS 1	Nitrate as N	1.96	mg/L	95		80 - 120
	190307_13-01: MSD 1	Nitrate as N	1.85	mg/L	89	6.2	0 - 10
	CCVB 1	Nitrate as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate as N	1.91	mg/L	96		90 - 110
	LCSD 1	Nitrate as N	2.01	mg/L	100	4.8	0 - 10
	LCSL 1	Nitrate as N	0.18	mg/L	88		50 - 150
	Method Blank 1	Nitrate as N	ND	mg/L		< 0.1	
	190307_13-01: MS 1	Nitrate+Nitrite as N	3.79	mg/L	93		80 - 120
	190307_13-01: MSD 1	Nitrate+Nitrite as N	3.67	mg/L	90	3.2	0 - 10
	CCVB 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrate+Nitrite as N	3.88	mg/L	97		90 - 110
	LCSD 1	Nitrate+Nitrite as N	4.1	mg/L	102	5.4	0 - 10
	LCSL 1	Nitrate+Nitrite as N	0.34	mg/L	85		50 - 150
	Method Blank 1	Nitrate+Nitrite as N	ND	mg/L		< 0.1	
	190307_13-01: MS 1	Nitrite as N	1.83	mg/L	91		80 - 120
	190307_13-01: MSD 1	Nitrite as N	1.82	mg/L	91	0.1	0 - 10
	CCVB 1	Nitrite as N	ND	mg/L		< 0.1	
	LCS 1	Nitrite as N	1.97	mg/L	98		90 - 110
	LCSD 1	Nitrite as N	2.09	mg/L	105	6.1	0 - 10
	LCSL 1	Nitrite as N	0.16	mg/L	81		50 - 150
	Method Blank 1	Nitrite as N	ND	mg/L		< 0.1	
	190307_13-01: MS 1	Orthophosphate as P	2.12	mg/L	104		80 - 120
	190307_13-01: MSD 1	Orthophosphate as P	2.1	mg/L	103	1.0	0 - 10
	CCVB 1	Orthophosphate as P	ND	mg/L		< 0.1	
	LCS 1	Orthophosphate as P	2.02	mg/L	101		90 - 110
	LCSD 1	Orthophosphate as P	2.12	mg/L	106	5.0	0 - 10
	LCSL 1	Orthophosphate as P	0.24	mg/L	118		50 - 150
	Method Blank 1	Orthophosphate as P	ND	mg/L		< 0.1	
QC19031911	190312_17-01: MS 1	Perchlorate	5.39	ug/L	100		85 - 115
	190312_17-01: MSD 1	Perchlorate	5.36	ug/L	100	0.6	0 - 10
	CCVB 1	Perchlorate	ND	µg/L		< 0.1	
	IPC 1	Perchlorate	4.22	µg/L	84		80 - 120

Maggiora Bros Drilling Inc.
Chris Duncan
595 Airport Blvd.
Watsonville, California 95076

Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS (6227)
www.MBASinc.com
ELAP Certification Number: 2385

Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	LCS 1	Perchlorate	5.04	ug/L	101		90 - 110
	LCSD 1	Perchlorate	5.1	ug/L	102	1.2	0 - 10
	LCSL 1	Perchlorate	1.99	ug/L	100		75 - 125
	Method Blank 1	Perchlorate	ND	µg/L		< 0.1	
	QCS 1	Perchlorate	5.1	ug/L	102		90 - 110
QC19030713	190307_30-03: Duplicate 1	pH (Laboratory)	7.3	pH (H)		< 0.1	0 - 10
	LCS 1	pH (Laboratory)	6.87	pH (H)	100		95 - 105
QC19031410	190307_15-01: MS 1	Potassium	16.01	mg/L	105		70 - 130
	190307_15-01: MSD 1	Potassium	16.46	mg/L	110	4.2	0 - 20
	CCVB 1	Potassium	ND	mg/L		< 0.1	
	LCB 1	Potassium	ND	mg/L		< 0.1	
	LCS 1	Potassium	9.86	mg/L	99		95 - 105
	LCSD 1	Potassium	10.32	mg/L	103	4.6	0 - 10
	LFB 1	Potassium	10.08	mg/L	101		85 - 115
	LFBD 1	Potassium	10.29	mg/L	103	2.1	0 - 20
	Method Blank 1	Potassium	ND	mg/L		< 0.1	
	QCS 1	Potassium	10.31	mg/L	103		95 - 105
QC19031905	190308_11-01: MS 1	Selenium, Total	48.44	ug/L	90		70 - 130
	190308_11-01: MSD 1	Selenium, Total	47.51	ug/L	88	2.1	0 - 20
	CCVB 1	Selenium, Total	ND	ug/L		< 0.1	
	LCB 1	Selenium, Total	ND	ug/L		< 0.1	
	LCS 1	Selenium, Total	53.77	ug/L	108		85 - 115
	LCSD 1	Selenium, Total	51.63	ug/L	103	4.1	0 - 20
	LFB 1	Selenium, Total	103.2	ug/L	103		70 - 130
	LFBD 1	Selenium, Total	106.0	ug/L	106	2.6	0 - 20
	Method Blank 1	Selenium, Total	ND	ug/L		< 0.1	
	190308_11-01: MS 1	Silver, Total	38.1	ug/L	77		70 - 130
	190308_11-01: MSD 1	Silver, Total	37.32	ug/L	76	2.0	0 - 20
	CCVB 1	Silver, Total	ND	ug/L		< 0.1	
	LCB 1	Silver, Total	ND	ug/L		< 0.1	
	LCS 1	Silver, Total	54.83	ug/L	110		85 - 115
	LCSD 1	Silver, Total	48.37	ug/L	97	12.5	0 - 20
	LFB 1	Silver, Total	101.4	ug/L	101		70 - 130
	LFBD 1	Silver, Total	100.9	ug/L	101	0.5	0 - 20
	Method Blank 1	Silver, Total	ND	ug/L		< 0.1	
QC19031410	190307_15-01: MS 1	Sodium	305.5	mg/L	105		70 - 130

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Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	190307_15-01: MSD 1	Sodium	311.9	mg/L	118	11.5	0 - 20
	CCVB 1	Sodium	ND	mg/L		< 0.1	
	LCB 1	Sodium	ND	mg/L		< 0.1	
	LCS 1	Sodium	49.1	mg/L	98		95 - 105
	LCSD 1	Sodium	52.19	mg/L	104	6.1	0 - 10
	LFB 1	Sodium	49.5	mg/L	99		85 - 115
	LFBD 1	Sodium	51.2	mg/L	102	3.4	0 - 20
	Method Blank 1	Sodium	ND	mg/L		< 0.1	
	QCS 1	Sodium	49.45	mg/L	99		95 - 105
QC19031205	190308_12-03: Duplicate 1	Specific Conductance (EC)	37400.0	µmhos/cm		< 0.1	0 - 10
	190311_14-04: Duplicate 2	Specific Conductance (EC)	840.0	µmhos/cm		0.6	0 - 10
	190311_14-05: Duplicate 3	Specific Conductance (EC)	144.0	µmhos/cm		< 0.1	0 - 10
	LCS 1	Specific Conductance (EC)	1412.0	µmhos/cm	100		90 - 110
	LCSH 1	Specific Conductance (EC)	24810.0	µmhos/cm	100		90 - 110
	LCSL 1	Specific Conductance (EC)	147.0	µmhos/cm	100		90 - 110
QC19031905	190308_11-01: MS 1	Strontium, Total	547.4	ug/L	112		70 - 130
	190308_11-01: MSD 1	Strontium, Total	547.7	ug/L	113	0.4	0 - 20
	CCVB 1	Strontium, Total	ND	ug/L		< 0.1	
	LCB 1	Strontium, Total	ND	ug/L		< 0.1	
	LCS 1	Strontium, Total	48.26	ug/L	97		85 - 115
	LCSD 1	Strontium, Total	45.1	ug/L	90	6.8	0 - 20
	LFB 1	Strontium, Total	104.8	ug/L	105		70 - 130
	LFBD 1	Strontium, Total	106.2	ug/L	106	1.4	0 - 20
	Method Blank 1	Strontium, Total	ND	ug/L		< 0.1	
QC19031103	190307_13-01: MS 1	Sulfate	251.9	mg/L	126		80 - 120
	190307_13-01: MSD 1	Sulfate	249.3	mg/L	113	10.9	0 - 10
	CCVB 1	Sulfate	ND	mg/L		< 0.1	
	LCS 1	Sulfate	19.1	mg/L	95		90 - 110
	LCSD 1	Sulfate	20.23	mg/L	101	5.7	0 - 10
	LCSL 1	Sulfate	1.7	mg/L	85		50 - 150
	Method Blank 1	Sulfate	ND	mg/L		< 0.1	
QC19031905	190308_11-01: MS 1	Thallium, Total	44.78	ug/L	90		70 - 130
	190308_11-01: MSD 1	Thallium, Total	44.11	ug/L	89	1.5	0 - 20
	CCVB 1	Thallium, Total	ND	ug/L		< 0.1	
	LCB 1	Thallium, Total	ND	ug/L		< 0.1	
	LCS 1	Thallium, Total	53.16	ug/L	106		85 - 115

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QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	LCSD 1	Thallium, Total	51.96	ug/L	104	2.3	0 - 20
	LFB 1	Thallium, Total	95.91	ug/L	96		70 - 130
	LFBD 1	Thallium, Total	97.87	ug/L	98	2.0	0 - 20
	Method Blank 1	Thallium, Total	ND	ug/L		< 0.1	
QC19031302	190307_28-02: Duplicate 1	Total Dissolved Solids	1332.0	mg/L		4.3	0 - 5
	CCVB 1	Total Dissolved Solids	ND	mg/L		< 0.1	
	LCS 1	Total Dissolved Solids	504.0	mg/L	101		90 - 110
	LCSD 1	Total Dissolved Solids	488.0	mg/L	98	3.2	0 - 10
	LCSL 1	Total Dissolved Solids	44.0	mg/L	88		50 - 150
	Method Blank 1	Total Dissolved Solids	ND	mg/L		< 0.1	
QC19030802	190306_18-03: Duplicate 1	Turbidity	38.0	NTU		< 0.1	0 - 20
	190307_13-01: Duplicate 2	Turbidity	3.8	NTU		< 0.1	0 - 20
	CCVB 1	Turbidity	ND	NTU		< 0.1	
	LCS 1	Turbidity	1.04	NTU	104		95 - 105
	LCSD 1	Turbidity	1.03	NTU	103	1.0	0 - 20
	Method Blank 1	Turbidity	ND	NTU		< 0.1	
QC19031905	CCVB 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	LCB 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	Method Blank 1	Uranium, Radiological	ND	pCi/L		< 0.1	
	190308_11-01: MS 1	Uranium, Total	64.68	ug/L	108		70 - 130
	190308_11-01: MSD 1	Uranium, Total	64.69	ug/L	109	< 0.1	0 - 20
	CCVB 1	Uranium, Total	ND	ug/L		< 0.1	
	LCB 1	Uranium, Total	ND	ug/L		< 0.1	
	LCS 1	Uranium, Total	51.98	ug/L	104		85 - 115
	LCSD 1	Uranium, Total	50.06	ug/L	100	3.8	0 - 20
	LFB 1	Uranium, Total	101.8	ug/L	102		70 - 130
	LFBD 1	Uranium, Total	106.2	ug/L	106	4.2	0 - 20
	Method Blank 1	Uranium, Total	ND	ug/L		< 0.1	
QC19031410	190307_15-01: MS 1	Zinc, Total	935.9	µg/L	93		70 - 130
	190307_15-01: MSD 1	Zinc, Total	951.7	µg/L	94	1.7	0 - 20
	CCVB 1	Zinc, Total	ND	µg/L		< 0.1	
	LCB 1	Zinc, Total	ND	µg/L		< 0.1	
	LCS 1	Zinc, Total	975.0	µg/L	97		95 - 105
	LCSD 1	Zinc, Total	1002.0	µg/L	100	2.7	0 - 10
	LFB 1	Zinc, Total	962.3	µg/L	96		85 - 115
	LFBD 1	Zinc, Total	1003.0	µg/L	100	4.1	0 - 20

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Monday, April 08, 2019

QC Results

QCBatch ID	QC ID	Parameter	Results	Units	% Rec	% RPD	Control Limit
	Method Blank 1	Zinc, Total	ND	µg/L		< 0.1	
	QCS 1	Zinc, Total	966.5	µg/L	97		95 - 105

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Monday, April 08, 2019

Sample Condition Upon Receipt

Order ID: 190307_13

Is there evidence of chilling? *NOTE: Systems are encouraged but not required to hold samples <10°C (Microbiology) or <6°C (Chemistry) during transit.	Yes (<2hrs)
Did bottle arrive intact?	Yes
Did bottle labels agree with COC?	Yes
Adequate sample volume?	Yes
Sample preservative (HNO3, NaOH, H2SO4, Na2S2O3, HCl, Other)	#01 = (2) 250mL preserved w/ 2mL HNO3, pH<2 PS
Additional Comments	#01 = 250mL preserved w/ 10 drops NaOH, pH>12 PS
Additional Comments	#01 = 250mL filtered w/ 0.45um PS

190307 -13

Monterey Bay Analytical Services Chain Of Custody / Analysis Request

4 Justin Ct. Suite D • Monterey, Ca 93940 • (831) 375-MBAS (6227) • (831) 641-0734 (Fax)

MBAS
Monterey Bay Analytical Services

Client/Company Name: **Maggiora Bros. Drilling**

Attention: Chris Duncan

Billing Address: 595 Airport Blvd Watsonville, CA 95076

Project/System Information: Twin Lakes Church Injection Well

E-Mail Address(es): Watsonville@MaggioraBros.com

Contract/P.O. #:

For Regulatory Complaince? YES ☐ NO ☑
For State or Local Health Department reporting:
Electronic Data Transfer (EDT)? YES ☐ NO ☑
System ID Number:

Turn Around Time: STD (7-14 Days) ☑ 48-Hour ☐ 5-Day ☐ 24-Hour ☐

Phone # 831-724-1338

Fax #

Drinking water ☒ Wastewater ☐ Monitoring Well ☐ Soil ☐ Sludge ☐ Other ☐

Analysis Requested

MBAS Lab #	Project ID or Source Code #	Sample Site / Description (Well Name, APN#, Address, Stormdrain #)	Sampling Date	Sampling Time	Receiving Temp.	CL2 Residual	Coliform Analysis Routine	Coliform Analysis Other	Coliform Analysis Repeat	Coliform Analysis Special	# Cont.	Container Type	Container Size	T22, 123-TCP, Perchlorate	Cr 6, Asbestos, VOC (MTBE)	SOC Full, Dioxin, NDMA	Gross Alpha/Beta, Radon	Radium 226/228, Tririum, U	Sr, Fe Diss, Mn Diss, As Diss
-01		Sample Set Zone 3	3/7/19	940	10.1									✓	✓	✓	✓	✓	✓

	Printed Name	Signature	Date	Time
Sampled by:	Dylan Jones	[signature]		
Relinquished by:	Dylan Jones	[signature]	3/7/19	1136
Received by:	Pauline Seto	Pauline Seto	3/7/19	1136
Relinquished by:				
Received by:	Monterey Bay Analytical Services			

Comments or Special Instructions:
Sampling Time + Travel 2 hrs.
field pH : 8.72
@9:45 am Sec : 9.05 us/cm
Turp : 2.76 NTU

☐ Payment received Check # Amount: Receipt # Date:

LA Testing
520 Mission Street South Pasadena, CA 91030
Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com / pasadenalab@latesting.com

LA Testing Order ID: 321906113
Customer ID: MBAS42
Customer PO:
Project ID:

Attn: Sara Sugarman
Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Phone: (831) 375-6227
Fax: (831) 641-0734
Received: 03/08/2019
Analyzed: 03/14/2019

Proj: Twin Lakes Church Injection Well

Test Report: Determination of Asbestos Structures >10µm in Drinking Water Performed by the 100.2 Method (EPA 600/R-94/134)

					ASBESTOS				
Sample ID Client / EMSL	Sample Filtration Date/Time	Original Sample Vol. Filtered (ml)	Effective Filter Area (mm^2)	Area Analyzed (mm^2)	Asbestos Types	Fibers Detected	Analytical Sensitivity	Concentration	Confidence Limits
							MFL (million fibers per liter)		
Sample Set Zone 3 321906113-0001	3/8/2019 03:35 PM	5	1288	0.2600	Chrysotile	2	0.99	2.00	0.24 - 7.20

Collection Date/Time: 03/07/2019 09:40

Due to excessive particulate the analytical sensitivity of 0.2 MFL as required by the method was not reached.

Analyst(s)
Kyeong Corbin (1)

Jerry Drapala Ph.D, Laboratory Manager
or Other Approved Signatory

Any questions please contact Jerry Drapala.

Initial report from: 03/14/2019 11:11:14

Sample collection and containers provided by the client, acceptable bottle blank level is defined as ≤0.01MFL>10um. ND=None Detected. This report relates only to those items tested. This report may not be reproduced, except in full, without written permission by LA Testing. Samples received in good condition unless otherwise noted.

Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283

OrderID: 321906113

Asbestos Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

#321906113

LA TESTING
520 MISSION STREET
S. PASADENA, CA 91030
PHONE: (323) 254-9960
FAX: (323) 254-9982

Company : Monterey Bay Analytical Services (+32MBAS66)	**LA Testing-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments**
Street: 4 Justin Court, Suite D	*Third Party Billing requires written authorization from third party*
City: Monterey / **State/Province: CA**	**Zip/Postal Code: 93940** / **Country: USA**
Report To (Name): Sara Sugarman	**Fax #: 831-641-0734**
Telephone #: 831-375-6227	**Email Address: info@mbasinc.com**
Project Name/Number: Twin Lakes Church Injection Well	
Please Provide Results: ☐ Fax ☒ Email / **Purchase Order:**	**U.S. State Samples Taken: Ca**

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hours through 6 hours, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with LA Testing's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☒ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ EPA Protocol (Semi-Quantitative)
- ☐ EPA Protocol (Quantitative)

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: Dylan Jones | **Samplers Signature:**

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
	Sample Set Zone 3	1L	3/7/19, 9:40

Client Sample # (s): 190307_13-01 - **Total # of Samples:** 1

Relinquished (Client): [signature] **Date:** 3/7/19 **Time:** 1600

Received (Lab): R. Zhao (EMSL-FE) **Date:** 3/8/19 **Time:** 9:30 AM

Comments/Special Instructions: Account: MBAS42. Please include sample description in report.

Page 1 of ____ pages

Controlled Document – Asbestos COC – R2 – 1/12/2010

Temp: 16°C

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders:	9C13035	**Report Date:**	3/25/2019
		Received Date:	3/13/2019
Project:	Twin Lakes Church Injection Well Project	**Turnaround Time:**	Normal
		Phones:	(831) 375-6227
		Fax:	(831) 641-0734
Attn:	David Holland	**P.O. #:**	
Client:	Monterey Bay Analytical Services 4 Justin Court, Suite D Monterey, CA 93940	**Billing Code:**	

ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO 17025 #L2457.01 • LACSD #10143 • NELAP-CA #04229CA • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear David Holland,

Enclosed are the results of analyses for samples received 3/13/19 with the Chain-of-Custody document. The samples were received in good condition, at 5.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Regina Giancola
Project Manager

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.weckabs.com

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/25/2019 11:01

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
Sample Set Zone 3, RegID: 190307_13-01	Dylan Jones	9C13035-01	Water	03/07/19 09:40	

Analyses Accreditation Summary

Analyte	CAS #	Not By NELAP	By ANAB
EPA 521 in Water			
N-Nitrosodimethylamine	62-75-9	✓	
NDMA-d6		✓	
SRL 524M-TCP in Water			
1,2,3-Trichloropropane	96-18-4	✓	

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Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/25/2019 11:01

Sample Results

Sample: Sample Set Zone 3, RegID: 190307_13-01
9C13035-01 (Water)

Sampled: 03/07/19 9:40 by Dylan Jones

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM							
Method: SRL 524M-TCP **Batch ID:** W9C0776 **Instr:** GCMS04 **Prepared:** 03/14/19 10:50 **Analyst:** enf							
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l	1	03/14/19 13:40	
Nitrosamines by CI GC/MS/MS, EPA 521							
Method: EPA 521 **Batch ID:** W9C0830 **Instr:** GCMS09 **Prepared:** 03/15/19 08:34 **Analyst:** mld							
N-Nitrosodimethylamine	ND	0.28	2.0	ng/l	1	03/18/19 19:45	
Surrogate(s)							
NDMA-d6	*88%*	*Conc: 22.0*	*70-130*			*03/18/19 19:45*	

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www.weckla

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported: 03/25/2019 11:01

Quality Control Results

Low Level 1,2,3-TCP by SRL Method, P&T, GC/MS SIM

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0776 - SRL 524M-TCP											
Blank (W9C0776-BLK1)					**Prepared & Analyzed: 03/14/19**						
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l							
LCS (W9C0776-BS1)					**Prepared & Analyzed: 03/14/19**						
1,2,3-Trichloropropane	0.00542	0.0012	0.0050	ug/l	0.00500		108	80-120			
LCS Dup (W9C0776-BSD1)					**Prepared & Analyzed: 03/14/19**						
1,2,3-Trichloropropane	0.00521	0.0012	0.0050	ug/l	0.00500		104	80-120	4	20	
Duplicate (W9C0776-DUP1)	**Source: 9C13044-01**				**Prepared & Analyzed: 03/14/19**						
1,2,3-Trichloropropane	ND	0.0012	0.0050	ug/l		ND				20	

Quality Control Results

Nitrosamines by CI GC/MS/MS, EPA 521

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9C0830 - EPA 521											
Blank (W9C0830-BLK1)					**Prepared: 03/15/19 Analyzed: 03/18/19**						
N-Nitrosodimethylamine	0.337	0.28	2.0	ng/l							J
Surrogate(s)											
NDMA-d6	*23.3*			*ng/l*	*25.0*		*93*	*70-130*			
LCS (W9C0830-BS1)					**Prepared: 03/15/19 Analyzed: 03/18/19**						
N-Nitrosodimethylamine	2.31	0.28	2.0	ng/l	2.00		115	50-150			
Surrogate(s)											
NDMA-d6	*22.0*			*ng/l*	*25.0*		*88*	*70-130*			
LCS Dup (W9C0830-BSD1)					**Prepared: 03/15/19 Analyzed: 03/18/19**						
N-Nitrosodimethylamine	2.03	0.28	2.0	ng/l	2.00		101	50-150	13	50	
Surrogate(s)											
NDMA-d6	*24.6*			*ng/l*	*25.0*		*99*	*70-130*			

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www.weckla

Monterey Bay Analytical Services
4 Justin Court, Suite D
Monterey, CA 93940

Project Number: Twin Lakes Church Injection Well Project

Project Manager: David Holland

Reported:
03/25/2019 11:01

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Source	Sample that was matrix spiked or duplicated.
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) and Detection Limit for Reporting (DLR)
MDA	Minimum Detectable Activity
NR	Not Reportable
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.
An Absence of Total Coliform meets the drinking water standards as established by the California State Water Resources Control Board (SWRCB)
All results are expressed on wet weight basis unless otherwise specified.
All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS 002.

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Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964

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CHAIN OF CUSTODY RECORD

STANDARD 9C13035

Page 1 Of 1

CLIENT NAME:	PROJECT:
Monterey Bay Analytical Svcs	Twin Lakes Church Injection Well Project
ADDRESS:	PHONE: 831-375-6227
4 Justin Court Suite D	FAX: 831-641-0734
Monterey CA 93940	EMAIL: info@mbasinc.com
PROJECT MANAGER	SAMPLER
David Holland	Dylan Jones

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	ANALYSES REQUESTED: 1,2,3-TCP	EPA 521 (NDMA)	COMMENTS
	03/07/19	9:40	DW	Sample Set Zone 3	4	X	X	190307_13-01

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 - 15 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

RELINQUISHED BY	DATE / TIME	RECEIVED BY
DeHoll	3/7/19 1600	
GSV	3-13-19 10:35	

SAMPLE CONDITION:

Actual Temperature: 5.3 °C

Received On Ice	(Y) N
Preserved	Y / N
Evidence Seals Present	Y / (N)
Container Attacked	Y / (N)
Preserved at Lab	Y / N

T-0209

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

PRESCHEDULED RUSH ANALYSES WILL TAKE PRIORITY OVER UNSCHEDULED RUSH REQUESTS
Client agrees to Terms & Conditions at: www.wecklabs.com

SPECIAL REQUIREMENTS / BILLING INFORMATION

COC version 042707

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
559-497-2888 (Main)
559-485-6935 (FAX)

A9C1008
3/27/2019
Invoice: A907954

David Holland
Monterey Bay Analytical
4 Justin Court Suite D
Monterey, CA 93940

RE: Report for A9C1008 General

Dear David Holland,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 3/12/2019. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

This certificate of analysis shall not be reproduced except in full, without written approval of the laboratory.

If additional clarification of any information is required, please contact your Project Manager, Jaime Lee LaFave , at 559-497-2888.

Thank you again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Jaime Lee LaFave, Project Manager

Accredited in Accordance with NELAP
ORELAP #4021-009

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BSK ASSOCIATES

Case Narrative

Project and Report Details		Invoice Details	
Client:	Monterey Bay Analytical	**Invoice To:**	Monterey Bay Analytical
Report To:	David Holland	**Invoice Attn:**	David Holland
Project #:	Twin Lakes Church Injection Well	**Project PO#:**	-
Received:	3/12/2019 - 09:10		
Report Due:	3/26/2019		

Sample Receipt Conditions

Cooler: Default Cooler
Temperature on Receipt ºC: 3.3

Containers Intact
COC/Labels Agree
Preservation Confirmed
Received On Wet Ice
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Data Qualifiers

The following qualifiers have been applied to one or more analytical results:

BS	Blank spike recoveries did not meet acceptance limits.
BS1.0	Blank spike recovery for this analyte was biased high; no material impact on reported result as sample is ND for this parameter.
BS3.0	BS/BSD RPD exceeded the acceptance limit. Recovery met acceptance criteria.
CV0.0	CCV recovery was above method acceptance limits; no material impact on reported result as sample is ND for this parameter.
MS1.0	Matrix spike recoveries exceed control limits.
MS1.6	Matrix Spike recovery meets the wider acceptance criteria of 50-150% when the spike level is at or below the reporting limit (RL).

Report Distribution

Recipient(s)	Report Format	CC:
David Holland	FINAL.RPT	
Monterey Bay Analytical Services	FINAL.RPT	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Sample ID: A9C1008-01
Sampled By: Dylan Jones
Sample Description: Sample Set Zone 3 // 190307_13-01

Sample Date - Time: 03/07/19 - 09:40
Matrix: Drinking Water
Sample Type: Grab

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hexavalent Chromium	EPA 218.7	ND	0.050	ug/L	1	A903490	03/14/19	03/14/19	

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
EDB and DBCP by GC-ECD									
Dibromochloropropane (DBCP)	EPA 504.1	ND	0.010	ug/L	1	A903382	03/12/19	03/14/19	
Ethylene Dibromide (EDB)	EPA 504.1	ND	0.020	ug/L	1	A903382	03/12/19	03/14/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 504.1	107 %	*Acceptable range: 70-130 %*						
Organohalide Pesticides and PCBs by GC-ECD									
Aldrin	EPA 505	ND	0.075	ug/L	1	A903382	03/12/19	03/14/19	
Chlordane	EPA 505	ND	0.10	ug/L	1	A903382	03/12/19	03/14/19	
Dieldrin	EPA 505	ND	0.020	ug/L	1	A903382	03/12/19	03/14/19	
Endrin	EPA 505	ND	0.10	ug/L	1	A903382	03/12/19	03/14/19	
Heptachlor	EPA 505	ND	0.010	ug/L	1	A903382	03/12/19	03/14/19	
Heptachlor Epoxide	EPA 505	ND	0.010	ug/L	1	A903382	03/12/19	03/14/19	
Hexachlorobenzene	EPA 505	ND	0.50	ug/L	1	A903382	03/12/19	03/14/19	
Hexachlorocyclopentadiene	EPA 505	ND	1.0	ug/L	1	A903382	03/12/19	03/14/19	
Lindane	EPA 505	ND	0.20	ug/L	1	A903382	03/12/19	03/14/19	
Methoxychlor	EPA 505	ND	10	ug/L	1	A903382	03/12/19	03/14/19	
PCB Aroclor Screen	EPA 505	ND	0.50	ug/L	1	A903382	03/12/19	03/14/19	
Toxaphene	EPA 505	ND	1.0	ug/L	1	A903382	03/12/19	03/14/19	
Surrogate: 1-Br-2-Nitrobenzene	EPA 505	107 %	*Acceptable range: 70-130 %*						
Chlorinated Acid Herbicides by GC-ECD									
2,4,5-T	EPA 515.4	ND	1.0	ug/L	1	A903680	03/19/19	03/20/19	
2,4,5-TP (Silvex)	EPA 515.4	ND	1.0	ug/L	1	A903680	03/19/19	03/20/19	
2,4-D	EPA 515.4	ND	10	ug/L	1	A903680	03/19/19	03/20/19	
Bentazon	EPA 515.4	ND	2.0	ug/L	1	A903680	03/19/19	03/20/19	
Dalapon	EPA 515.4	ND	10	ug/L	1	A903680	03/19/19	03/20/19	
Dicamba	EPA 515.4	ND	1.5	ug/L	1	A903680	03/19/19	03/20/19	
Dinoseb	EPA 515.4	ND	2.0	ug/L	1	A903680	03/19/19	03/20/19	
Pentachlorophenol	EPA 515.4	ND	0.20	ug/L	1	A903680	03/19/19	03/20/19	
Picloram	EPA 515.4	ND	1.0	ug/L	1	A903680	03/19/19	03/20/19	
Surrogate: DCPAA	EPA 515.4	103 %	*Acceptable range: 70-130 %*						
Volatile Organics by GC-MS									
1,1,1,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,1,1-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,1,2,2-Tetrachloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 524.2	ND	10	ug/L	1	A903350	03/12/19	03/12/19	
1,1,2-Trichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,1-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certificate of Analysis

Sample ID: A9C1008-01
Sampled By: Dylan Jones
Sample Description: Sample Set Zone 3 // 190307_13-01

Sample Date - Time: 03/07/19 - 09:40
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
1,1-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,1-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2,3-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2,4-Trichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2,4-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2-Dichloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,3,5-Trimethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,3-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,3-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
1,4-Dichlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
2,2-Dichloropropane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
2-Butanone	EPA 524.2	ND	5.0	ug/L	1	A903350	03/12/19	03/12/19	
2-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
2-Hexanone	EPA 524.2	ND	10	ug/L	1	A903350	03/12/19	03/12/19	
4-Chlorotoluene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
4-Methyl-2-pentanone	EPA 524.2	ND	5.0	ug/L	1	A903350	03/12/19	03/12/19	
Acetone	EPA 524.2	ND	10	ug/L	1	A903350	03/12/19	03/12/19	
Benzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Bromobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Bromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Bromodichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Bromoform	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Bromomethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Carbon Tetrachloride	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Chlorobenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Chloroethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Chloroform	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Chloromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
cis-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
cis-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Dibromochloromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Dibromomethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Dichlorodifluoromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Dichloromethane	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Di-isopropyl ether (DIPE)	EPA 524.2	ND	3.0	ug/L	1	A903350	03/12/19	03/12/19	
Ethyl tert-Butyl Ether (ETBE)	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Ethylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Hexachlorobutadiene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Isopropylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
m,p-Xylenes	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Methyl-t-butyl ether	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Naphthalene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	

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Certificate of Analysis

Sample ID: A9C1008-01
Sampled By: Dylan Jones
Sample Description: Sample Set Zone 3 // 190307_13-01

Sample Date - Time: 03/07/19 - 09:40
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Volatile Organics by GC-MS									
n-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
n-Propylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
o-Xylene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
p-Isopropyltoluene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
sec-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Styrene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
tert-Amyl Methyl Ether (TAME)	EPA 524.2	ND	3.0	ug/L	1	A903350	03/12/19	03/12/19	
tert-Butyl alcohol (TBA)	EPA 524.2	ND	2.0	ug/L	1	A903350	03/12/19	03/12/19	
tert-Butylbenzene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Tetrachloroethene (PCE)	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Toluene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
trans-1,2-Dichloroethene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
trans-1,3-Dichloropropene	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Trichloroethene (TCE)	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Trichlorofluoromethane	EPA 524.2	ND	5.0	ug/L	1	A903350	03/12/19	03/12/19	
Vinyl Chloride	EPA 524.2	ND	0.50	ug/L	1	A903350	03/12/19	03/12/19	
Surrogate: 1,2-Dichlorobenzene-d4	EPA 524.2	112 %	*Acceptable range: 70-130 %*						
Surrogate: Bromofluorobenzene	EPA 524.2	103 %	*Acceptable range: 70-130 %*						
Total 1,3-Dichloropropene		ND	0.50	ug/L					
Total Trihalomethanes		ND	0.50	ug/L					
Total Xylenes, EPA 524.2		ND	0.50	ug/L					
Semi-Volatile Organics by GC-MS									
Alachlor	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Atrazine	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Benzo(a)pyrene	EPA 525.3	ND	0.10	ug/L	1	A903384	03/12/19	03/23/19	
Bis(2-ethylhexyl) adipate	EPA 525.3	ND	3.0	ug/L	1	A903384	03/12/19	03/23/19	
Bis(2-ethylhexyl) phthalate	EPA 525.3	ND	3.0	ug/L	1	A903384	03/12/19	03/23/19	
Bromacil	EPA 525.3	ND	10	ug/L	1	A903384	03/12/19	03/23/19	
Butachlor	EPA 525.3	ND	0.38	ug/L	1	A903384	03/12/19	03/23/19	
Diazinon	EPA 525.3	ND	0.25	ug/L	1	A903384	03/12/19	03/23/19	
Dimethoate	EPA 525.3	ND	10	ug/L	1	A903384	03/12/19	03/23/19	
Metolachlor	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Metribuzin	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Molinate	EPA 525.3	ND	2.0	ug/L	1	A903384	03/12/19	03/23/19	
Propachlor	EPA 525.3	ND	0.50	ug/L	1	A903384	03/12/19	03/23/19	
Simazine	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Thiobencarb	EPA 525.3	ND	1.0	ug/L	1	A903384	03/12/19	03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	EPA 525.3	91 %	*Acceptable range: 70-130 %*						
Surrogate: Benzo(a)pyrene-d12	EPA 525.3	99 %	*Acceptable range: 70-130 %*						
Surrogate: Triphenyl Phosphate	EPA 525.3	101 %	*Acceptable range: 70-130 %*						
Carbamates by HPLC									
3-Hydroxycarbofuran	EPA 531.1	ND	3.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0

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Certificate of Analysis

Sample ID: A9C1008-01
Sampled By: Dylan Jones
Sample Description: Sample Set Zone 3 // 190307_13-01

Sample Date - Time: 03/07/19 - 09:40
Matrix: Drinking Water
Sample Type: Grab

Organics

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Carbamates by HPLC									
Aldicarb	EPA 531.1	ND	3.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Aldicarb Sulfone	EPA 531.1	ND	2.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Aldicarb Sulfoxide	EPA 531.1	ND	3.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Carbaryl	EPA 531.1	ND	5.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Carbofuran	EPA 531.1	ND	5.0	ug/L	1	A903821	03/20/19	03/22/19	BS1.0, CV0.0
Methomyl	EPA 531.1	ND	2.0	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Oxamyl	EPA 531.1	ND	20	ug/L	1	A903821	03/20/19	03/22/19	CV0.0
Glyphosate by HPLC									
Glyphosate	EPA 547	ND	25	ug/L	1	A903506	03/14/19	03/14/19	
Surrogate: AMPA	EPA 547	92 %	*Acceptable range: 70-130 %*						
Endothall by GC-MS									
Endothall	EPA 548.1	ND	45	ug/L	1	A903521	03/14/19	03/16/19	
Diquat by HPLC									
Diquat	EPA 549.2	ND	4.0	ug/L	1	A903459	03/14/19	03/19/19	

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BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 218.7 - Quality Control											
Batch: A903490										Prepared: 3/14/2019	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank (A903490-BLK1)											
Hexavalent Chromium	ND	0.050	ug/L							03/14/19	
Blank Spike (A903490-BS1)											
Hexavalent Chromium	0.055	0.050	ug/L	0.050	ND	110	50-150			03/14/19	
Matrix Spike (A903490-MS1), Source: A9C1487-01											
Hexavalent Chromium	8.0	0.050	ug/L	2.0	6.0	103	85-115			03/14/19	
Matrix Spike Dup (A903490-MSD1), Source: A9C1487-01											
Hexavalent Chromium	8.0	0.050	ug/L	2.0	6.0	104	85-115	0	15	03/14/19	

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Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 504.1 - Quality Control											
Batch: A903382										Prepared: 3/12/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A903382-BLK1)											
Dibromochloropropane (DBCP)	ND	0.010	ug/L							03/13/19	
Ethylene Dibromide (EDB)	ND	0.020	ug/L							03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*105*	*70-130*			03/13/19	
Blank Spike (A903382-BS1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	108	70-130			03/13/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	112	70-130			03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*104*	*70-130*			03/13/19	
Blank Spike Dup (A903382-BSD1)											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	108	70-130	0	20	03/13/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	111	70-130	1	20	03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*105*	*70-130*			03/13/19	
Matrix Spike (A903382-MS1), Source: A9C0800-01											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	110	65-135			03/13/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	112	65-135			03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*104*	*70-130*			03/13/19	
Matrix Spike Dup (A903382-MSD1), Source: A9C0800-01											
Dibromochloropropane (DBCP)	0.11	0.010	ug/L	0.10	ND	112	65-135	4	20	03/13/19	
Ethylene Dibromide (EDB)	0.11	0.020	ug/L	0.10	ND	110	65-135	1	20	03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.47*		*105*	*70-130*			03/13/19	
EPA 505 - Quality Control											
Batch: A903382										Prepared: 3/12/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank (A903382-BLK1)											
Aldrin	ND	0.075	ug/L							03/13/19	
Chlordane	ND	0.10	ug/L							03/13/19	
Dieldrin	ND	0.020	ug/L							03/13/19	
Endrin	ND	0.10	ug/L							03/13/19	
Heptachlor	ND	0.010	ug/L							03/13/19	
Heptachlor Epoxide	ND	0.010	ug/L							03/13/19	
Hexachlorobenzene	ND	0.50	ug/L							03/13/19	
Hexachlorocyclopentadiene	ND	1.0	ug/L							03/13/19	
Lindane	ND	0.20	ug/L							03/13/19	
Methoxychlor	ND	10	ug/L							03/13/19	
PCB Aroclor Screen	ND	0.50	ug/L							03/13/19	
Toxaphene	ND	1.0	ug/L							03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*105*	*70-130*			03/13/19	
Blank Spike (A903382-BS1)											

BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 505 - Quality Control											
Batch: A903382										Prepared: 3/12/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Blank Spike (A903382-BS1)											
Aldrin	0.80	0.075	ug/L	0.74	ND	107	70-130			03/13/19	
Dieldrin	0.21	0.020	ug/L	0.20	ND	104	70-130			03/13/19	
Endrin	0.10	0.10	ug/L	0.10	ND	103	70-130			03/13/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	106	70-130			03/13/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	105	70-130			03/13/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	106	70-130			03/13/19	
Hexachlorocyclopentadiene	1.1	1.0	ug/L	1.0	ND	106	70-130			03/13/19	
Lindane	0.20	0.20	ug/L	0.20	ND	100	70-130			03/13/19	
Methoxychlor	1.1	10	ug/L	1.0	ND	110	70-130			03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*104*	*70-130*			03/13/19	
Blank Spike Dup (A903382-BSD1)											
Aldrin	0.79	0.075	ug/L	0.74	ND	107	70-130	1	20	03/13/19	
Dieldrin	0.21	0.020	ug/L	0.20	ND	107	70-130	2	20	03/13/19	
Endrin	0.10	0.10	ug/L	0.10	ND	100	70-130	3	20	03/13/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	109	70-130	3	20	03/13/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	107	70-130	1	20	03/13/19	
Hexachlorobenzene	1.0	0.50	ug/L	1.0	ND	105	70-130	1	20	03/13/19	
Hexachlorocyclopentadiene	1.1	1.0	ug/L	1.0	ND	109	70-130	3	20	03/13/19	
Lindane	0.20	0.20	ug/L	0.20	ND	100	70-130	0	20	03/13/19	
Methoxychlor	1.1	10	ug/L	1.0	ND	109	70-130	1	20	03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*105*	*70-130*			03/13/19	
Matrix Spike (A903382-MS1), Source: A9C0800-01											
Aldrin	0.75	0.075	ug/L	0.74	ND	100	65-135			03/13/19	
Dieldrin	0.21	0.020	ug/L	0.20	ND	101	65-135			03/13/19	
Endrin	0.10	0.10	ug/L	0.10	ND	103	65-135			03/13/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	106	65-135			03/13/19	
Heptachlor Epoxide	0.10	0.010	ug/L	0.10	ND	104	65-135			03/13/19	
Hexachlorobenzene	1.0	0.50	ug/L	1.0	ND	100	65-135			03/13/19	
Hexachlorocyclopentadiene	0.91	1.0	ug/L	1.0	ND	83	65-135			03/13/19	
Lindane	0.20	0.20	ug/L	0.20	ND	93	65-135			03/13/19	
Methoxychlor	1.1	10	ug/L	1.0	ND	106	65-135			03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.48*			*0.46*		*104*	*70-130*			03/13/19	
Matrix Spike Dup (A903382-MSD1), Source: A9C0800-01											
Aldrin	0.76	0.075	ug/L	0.76	ND	100	65-135	1	20	03/13/19	
Dieldrin	0.20	0.020	ug/L	0.20	ND	97	65-135	1	20	03/13/19	
Endrin	0.11	0.10	ug/L	0.10	ND	104	65-135	4	20	03/13/19	
Heptachlor	0.11	0.010	ug/L	0.10	ND	107	65-135	3	20	03/13/19	
Heptachlor Epoxide	0.11	0.010	ug/L	0.10	ND	106	65-135	4	20	03/13/19	
Hexachlorobenzene	1.1	0.50	ug/L	1.0	ND	103	65-135	5	20	03/13/19	
Hexachlorocyclopentadiene	1.0	1.0	ug/L	1.0	ND	93	65-135	12	20	03/13/19	
Lindane	0.21	0.20	ug/L	0.20	ND	95	65-135	4	20	03/13/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 505 - Quality Control											
Batch: A903382										Prepared: 3/12/2019	
Prep Method: EPA 504/505										Analyst: YNV	
Matrix Spike Dup (A903382-MSD1), Source: A9C0800-01											
Methoxychlor	1.1	10	ug/L	1.0	ND	112	65-135	7	20	03/13/19	
Surrogate: 1-Br-2-Nitrobenzene	*0.49*			*0.47*		*105*	*70-130*			03/13/19	
EPA 515.4 - Quality Control											
Batch: A903680										Prepared: 3/19/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Blank (A903680-BLK1)											
2,4,5-T	ND	1.0	ug/L							03/19/19	
2,4,5-TP (Silvex)	ND	1.0	ug/L							03/19/19	
2,4-D	ND	10	ug/L							03/19/19	
Bentazon	ND	2.0	ug/L							03/19/19	
Dalapon	ND	10	ug/L							03/19/19	
Dicamba	ND	1.5	ug/L							03/19/19	
Dinoseb	ND	2.0	ug/L							03/19/19	
Pentachlorophenol	ND	0.20	ug/L							03/19/19	
Picloram	ND	1.0	ug/L							03/19/19	
Surrogate: DCPAA	*37*			*36*		*102*	*70-130*			03/19/19	
Blank Spike (A903680-BS1)											
2,4,5-T	1.6	1.0	ug/L	1.6	ND	101	70-130			03/19/19	
2,4,5-TP (Silvex)	0.80	1.0	ug/L	0.80	ND	100	70-130			03/19/19	
2,4-D	0.41	10	ug/L	0.40	ND	101	70-130			03/19/19	
Bentazon	2.0	2.0	ug/L	2.0	ND	100	70-130			03/19/19	
Dalapon	4.0	10	ug/L	4.0	ND	99	70-130			03/19/19	
Dicamba	0.81	1.5	ug/L	0.80	ND	101	70-130			03/19/19	
Dinoseb	0.80	2.0	ug/L	0.80	ND	100	70-130			03/19/19	
Pentachlorophenol	0.17	0.20	ug/L	0.16	ND	104	70-130			03/19/19	
Picloram	0.40	1.0	ug/L	0.40	ND	101	70-130			03/19/19	
Surrogate: DCPAA	*36*			*36*		*101*	*70-130*			03/19/19	
Blank Spike Dup (A903680-BSD1)											
2,4,5-T	1.7	1.0	ug/L	1.6	ND	104	70-130	3	20	03/20/19	
2,4,5-TP (Silvex)	0.82	1.0	ug/L	0.80	ND	103	70-130	3	20	03/20/19	
2,4-D	0.42	10	ug/L	0.40	ND	105	70-130	3	20	03/20/19	
Bentazon	2.0	2.0	ug/L	2.0	ND	99	70-130	1	20	03/20/19	
Dalapon	4.0	10	ug/L	4.0	ND	101	70-130	1	20	03/20/19	
Dicamba	0.82	1.5	ug/L	0.80	ND	102	70-130	1	20	03/20/19	
Dinoseb	0.87	2.0	ug/L	0.80	ND	109	70-130	8	20	03/20/19	
Pentachlorophenol	0.16	0.20	ug/L	0.16	ND	102	70-130	2	20	03/20/19	
Picloram	0.40	1.0	ug/L	0.40	ND	100	70-130	1	20	03/20/19	
Surrogate: DCPAA	*37*			*36*		*104*	*70-130*			03/20/19	
Matrix Spike (A903680-MS1), Source: A9C0902-01											

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Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 515.4 - Quality Control											
Batch: A903680										Prepared: 3/19/2019	
Prep Method: EPA 515.4										Analyst: VTL	
Matrix Spike (A903680-MS1), Source: A9C0902-01											
2,4,5-T	1.6	1.0	ug/L	1.6	ND	101	70-130			03/19/19	
2,4,5-TP (Silvex)	0.74	1.0	ug/L	0.80	ND	92	70-130			03/19/19	
2,4-D	0.41	10	ug/L	0.40	ND	102	70-130			03/19/19	
Bentazon	1.9	2.0	ug/L	2.0	ND	97	70-130			03/19/19	
Dalapon	3.9	10	ug/L	4.0	ND	99	70-130			03/19/19	
Dicamba	0.78	1.5	ug/L	0.80	ND	98	70-130			03/19/19	
Dinoseb	0.66	2.0	ug/L	0.80	ND	83	70-130			03/19/19	
Pentachlorophenol	0.090	0.20	ug/L	0.16	ND	56	70-130			03/19/19	MS1.0 ***Low***
Picloram	0.39	1.0	ug/L	0.40	ND	97	70-130			03/19/19	
Surrogate: DCPAA	*37*			*36*		*103*	*70-130*			03/19/19	
Matrix Spike Dup (A903680-MSD1), Source: A9C0902-01											
2,4,5-T	1.6	1.0	ug/L	1.6	ND	101	70-130	1	30	03/19/19	
2,4,5-TP (Silvex)	0.71	1.0	ug/L	0.80	ND	88	70-130	4	30	03/19/19	
2,4-D	0.40	10	ug/L	0.40	ND	100	70-130	2	30	03/19/19	
Bentazon	1.9	2.0	ug/L	2.0	ND	93	70-130	3	30	03/19/19	
Dalapon	3.9	10	ug/L	4.0	ND	98	70-130	1	30	03/19/19	
Dicamba	0.78	1.5	ug/L	0.80	ND	97	70-130	1	30	03/19/19	
Dinoseb	0.62	2.0	ug/L	0.80	ND	77	70-130	7	30	03/19/19	
Pentachlorophenol	0.084	0.20	ug/L	0.16	ND	52	70-130	7	30	03/19/19	MS1.0 ***Low***
Picloram	0.39	1.0	ug/L	0.40	ND	97	70-130	0	30	03/19/19	
Surrogate: DCPAA	*37*			*36*		*103*	*70-130*			03/19/19	
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903350-BLK1)											
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L							03/12/19	
1,1,1-Trichloroethane	ND	0.50	ug/L							03/12/19	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L							03/12/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	ug/L							03/12/19	
1,1,2-Trichloroethane	ND	0.50	ug/L							03/12/19	
1,1-Dichloroethane	ND	0.50	ug/L							03/12/19	
1,1-Dichloroethene	ND	0.50	ug/L							03/12/19	
1,1-Dichloropropene	ND	0.50	ug/L							03/12/19	
1,2,3-Trichlorobenzene	ND	0.50	ug/L							03/12/19	
1,2,4-Trichlorobenzene	ND	0.50	ug/L							03/12/19	
1,2,4-Trimethylbenzene	ND	0.50	ug/L							03/12/19	
1,2-Dichlorobenzene	ND	0.50	ug/L							03/12/19	
1,2-Dichloroethane	ND	0.50	ug/L							03/12/19	
1,2-Dichloropropane	ND	0.50	ug/L							03/12/19	
1,3,5-Trimethylbenzene	ND	0.50	ug/L							03/12/19	

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Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903350-BLK1)											
1,3-Dichlorobenzene	ND	0.50	ug/L							03/12/19	
1,3-Dichloropropane	ND	0.50	ug/L							03/12/19	
1,4-Dichlorobenzene	ND	0.50	ug/L							03/12/19	
2,2-Dichloropropane	ND	0.50	ug/L							03/12/19	
2-Butanone	ND	5.0	ug/L							03/12/19	
2-Chlorotoluene	ND	0.50	ug/L							03/12/19	
2-Hexanone	ND	10	ug/L							03/12/19	
4-Chlorotoluene	ND	0.50	ug/L							03/12/19	
4-Methyl-2-pentanone	ND	5.0	ug/L							03/12/19	
Acetone	ND	10	ug/L							03/12/19	
Benzene	ND	0.50	ug/L							03/12/19	
Bromobenzene	ND	0.50	ug/L							03/12/19	
Bromochloromethane	ND	0.50	ug/L							03/12/19	
Bromodichloromethane	ND	0.50	ug/L							03/12/19	
Bromoform	ND	0.50	ug/L							03/12/19	
Bromomethane	ND	0.50	ug/L							03/12/19	
Carbon Tetrachloride	ND	0.50	ug/L							03/12/19	
Chlorobenzene	ND	0.50	ug/L							03/12/19	
Chloroethane	ND	0.50	ug/L							03/12/19	
Chloroform	ND	0.50	ug/L							03/12/19	
Chloromethane	ND	0.50	ug/L							03/12/19	
cis-1,2-Dichloroethene	ND	0.50	ug/L							03/12/19	
cis-1,3-Dichloropropene	ND	0.50	ug/L							03/12/19	
Dibromochloromethane	ND	0.50	ug/L							03/12/19	
Dibromomethane	ND	0.50	ug/L							03/12/19	
Dichlorodifluoromethane	ND	0.50	ug/L							03/12/19	
Dichloromethane	ND	0.50	ug/L							03/12/19	
Di-isopropyl ether (DIPE)	ND	3.0	ug/L							03/12/19	
Ethyl tert-Butyl Ether (ETBE)	ND	0.50	ug/L							03/12/19	
Ethylbenzene	ND	0.50	ug/L							03/12/19	
Hexachlorobutadiene	ND	0.50	ug/L							03/12/19	
Isopropylbenzene	ND	0.50	ug/L							03/12/19	
m,p-Xylenes	ND	0.50	ug/L							03/12/19	
Methyl-t-butyl ether	ND	0.50	ug/L							03/12/19	
Naphthalene	ND	0.50	ug/L							03/12/19	
n-Butylbenzene	ND	0.50	ug/L							03/12/19	
n-Propylbenzene	ND	0.50	ug/L							03/12/19	
o-Xylene	ND	0.50	ug/L							03/12/19	
p-Isopropyltoluene	ND	0.50	ug/L							03/12/19	
sec-Butylbenzene	ND	0.50	ug/L							03/12/19	
Styrene	ND	0.50	ug/L							03/12/19	
tert-Amyl Methyl Ether (TAME)	ND	3.0	ug/L							03/12/19	
tert-Butyl alcohol (TBA)	ND	2.0	ug/L							03/12/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank (A903350-BLK1)											
tert-Butylbenzene	ND	0.50	ug/L							03/12/19	
Tetrachloroethene (PCE)	ND	0.50	ug/L							03/12/19	
Toluene	ND	0.50	ug/L							03/12/19	
trans-1,2-Dichloroethene	ND	0.50	ug/L							03/12/19	
trans-1,3-Dichloropropene	ND	0.50	ug/L							03/12/19	
Trichloroethene (TCE)	ND	0.50	ug/L							03/12/19	
Trichlorofluoromethane	ND	5.0	ug/L							03/12/19	
Vinyl Chloride	ND	0.50	ug/L							03/12/19	
Surrogate: 1,2-Dichlorobenzene-d4	*55*			*50*		*111*	*70-130*			03/12/19	
Surrogate: Bromofluorobenzene	*55*			*50*		*109*	*70-130*			03/12/19	
Blank Spike (A903350-BS1)											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	108	70-130			03/12/19	
1,1,1-Trichloroethane	11	0.50	ug/L	10	ND	105	70-130			03/12/19	
1,1,2,2-Tetrachloroethane	10	0.50	ug/L	10	ND	100	70-130			03/12/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	10	ug/L	10	ND	111	70-130			03/12/19	
1,1,2-Trichloroethane	9.9	0.50	ug/L	10	ND	99	70-130			03/12/19	
1,1-Dichloroethane	10	0.50	ug/L	10	ND	102	70-130			03/12/19	
1,1-Dichloroethene	11	0.50	ug/L	10	ND	105	70-130			03/12/19	
1,1-Dichloropropene	10	0.50	ug/L	10	ND	105	70-130			03/12/19	
1,2,3-Trichlorobenzene	11	0.50	ug/L	10	ND	106	70-130			03/12/19	
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
1,2-Dichlorobenzene	11	0.50	ug/L	10	ND	109	70-130			03/12/19	
1,2-Dichloroethane	10	0.50	ug/L	10	ND	102	70-130			03/12/19	
1,2-Dichloropropane	10	0.50	ug/L	10	ND	102	70-130			03/12/19	
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
1,3-Dichloropropane	10	0.50	ug/L	10	ND	101	70-130			03/12/19	
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	114	70-130			03/12/19	
2,2-Dichloropropane	12	0.50	ug/L	10	ND	119	70-130			03/12/19	
2-Butanone	8.2	5.0	ug/L	10	ND	82	70-130			03/12/19	
2-Chlorotoluene	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
2-Hexanone	8.4	10	ug/L	10	ND	84	70-130			03/12/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
4-Methyl-2-pentanone	7.8	5.0	ug/L	10	ND	78	70-130			03/12/19	
Acetone	8.5	10	ug/L	10	ND	85	70-130			03/12/19	
Benzene	10	0.50	ug/L	10	ND	102	70-130			03/12/19	
Bromobenzene	11	0.50	ug/L	10	ND	107	70-130			03/12/19	
Bromochloromethane	9.8	0.50	ug/L	10	ND	98	70-130			03/12/19	
Bromodichloromethane	10	0.50	ug/L	10	ND	103	70-130			03/12/19	
Bromoform	11	0.50	ug/L	10	ND	110	70-130			03/12/19	
Bromomethane	11	0.50	ug/L	10	ND	109	70-130			03/12/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike (A903350-BS1)											
Carbon disulfide	11	10	ug/L	10	ND	107	70-130			03/12/19	
Carbon Tetrachloride	11	0.50	ug/L	10	ND	110	70-130			03/12/19	
Chlorobenzene	11	0.50	ug/L	10	ND	113	70-130			03/12/19	
Chloroethane	12	0.50	ug/L	10	ND	122	70-130			03/12/19	
Chloroform	9.6	0.50	ug/L	10	ND	96	70-130			03/12/19	
Chloromethane	13	0.50	ug/L	10	ND	130	70-130			03/12/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	107	70-130			03/12/19	
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	104	70-130			03/12/19	
Dibromochloromethane	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
Dibromomethane	10	0.50	ug/L	10	ND	102	70-130			03/12/19	
Dichlorodifluoromethane	12	0.50	ug/L	10	ND	118	70-130			03/12/19	
Dichloromethane	10	0.50	ug/L	10	ND	101	70-130			03/12/19	
Di-isopropyl ether (DIPE)	9.1	3.0	ug/L	10	ND	91	70-130			03/12/19	
Ethyl tert-Butyl Ether (ETBE)	9.9	0.50	ug/L	10	ND	99	70-130			03/12/19	
Ethylbenzene	11	0.50	ug/L	10	ND	113	70-130			03/12/19	
Hexachlorobutadiene	12	0.50	ug/L	10	ND	116	70-130			03/12/19	
Isopropylbenzene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
m,p-Xylenes	21	0.50	ug/L	20	ND	103	70-130			03/12/19	
Methyl-t-butyl ether	21	0.50	ug/L	20	ND	107	70-130			03/12/19	
Naphthalene	8.7	0.50	ug/L	10	ND	87	70-130			03/12/19	
n-Butylbenzene	11	0.50	ug/L	10	ND	107	70-130			03/12/19	
n-Propylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
o-Xylene	11	0.50	ug/L	10	ND	110	70-130			03/12/19	
p-Isopropyltoluene	11	0.50	ug/L	10	ND	112	70-130			03/12/19	
sec-Butylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
Styrene	9.8	0.50	ug/L	10	ND	98	70-130			03/12/19	
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	101	70-130			03/12/19	
tert-Butyl alcohol (TBA)	7.4	2.0	ug/L	10	ND	74	70-130			03/12/19	
tert-Butylbenzene	11	0.50	ug/L	10	ND	111	70-130			03/12/19	
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	110	70-130			03/12/19	
Toluene	11	0.50	ug/L	10	ND	107	70-130			03/12/19	
trans-1,2-Dichloroethene	10	0.50	ug/L	10	ND	104	70-130			03/12/19	
trans-1,3-Dichloropropene	10	0.50	ug/L	10	ND	103	70-130			03/12/19	
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	107	70-130			03/12/19	
Trichlorofluoromethane	12	5.0	ug/L	10	ND	117	70-130			03/12/19	
Vinyl Chloride	12	0.50	ug/L	10	ND	121	70-130			03/12/19	
Surrogate: 1,2-Dichlorobenzene-d4	*58*			*50*		*116*	*70-130*			03/12/19	
Surrogate: Bromofluorobenzene	*60*			*50*		*119*	*70-130*			03/12/19	
Blank Spike Dup (A903350-BSD1)											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	105	70-130	2	30	03/12/19	
1,1,1-Trichloroethane	10	0.50	ug/L	10	ND	100	70-130	5	30	03/12/19	
1,1,2,2-Tetrachloroethane	10	0.50	ug/L	10	ND	101	70-130	1	30	03/12/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903350-BSD1)											
1,1,2-Trichloro-1,2,2-trifluoroethane	10	10	ug/L	10	ND	105	70-130	6	30	03/12/19	
1,1,2-Trichloroethane	9.9	0.50	ug/L	10	ND	99	70-130	0	30	03/12/19	
1,1-Dichloroethane	9.7	0.50	ug/L	10	ND	97	70-130	4	30	03/12/19	
1,1-Dichloroethene	9.8	0.50	ug/L	10	ND	98	70-130	7	30	03/12/19	
1,1-Dichloropropene	10	0.50	ug/L	10	ND	103	70-130	1	30	03/12/19	
1,2,3-Trichlorobenzene	11	0.50	ug/L	10	ND	106	70-130	0	30	03/12/19	
1,2,4-Trichlorobenzene	11	0.50	ug/L	10	ND	108	70-130	3	30	03/12/19	
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	107	70-130	5	30	03/12/19	
1,2-Dichlorobenzene	10	0.50	ug/L	10	ND	102	70-130	7	30	03/12/19	
1,2-Dichloroethane	9.5	0.50	ug/L	10	ND	95	70-130	7	30	03/12/19	
1,2-Dichloropropane	10	0.50	ug/L	10	ND	100	70-130	1	30	03/12/19	
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	106	70-130	5	30	03/12/19	
1,3-Dichlorobenzene	10	0.50	ug/L	10	ND	103	70-130	7	30	03/12/19	
1,3-Dichloropropane	10	0.50	ug/L	10	ND	100	70-130	1	30	03/12/19	
1,4-Dichlorobenzene	11	0.50	ug/L	10	ND	106	70-130	7	30	03/12/19	
2,2-Dichloropropane	11	0.50	ug/L	10	ND	111	70-130	6	30	03/12/19	
2-Butanone	9.8	5.0	ug/L	10	ND	98	70-130	17	30	03/12/19	
2-Chlorotoluene	11	0.50	ug/L	10	ND	106	70-130	5	30	03/12/19	
2-Hexanone	9.5	10	ug/L	10	ND	95	70-130	13	30	03/12/19	
4-Chlorotoluene	11	0.50	ug/L	10	ND	106	70-130	6	30	03/12/19	
4-Methyl-2-pentanone	8.9	5.0	ug/L	10	ND	89	70-130	13	30	03/12/19	
Acetone	9.3	10	ug/L	10	ND	93	70-130	10	30	03/12/19	
Benzene	9.9	0.50	ug/L	10	ND	99	70-130	3	30	03/12/19	
Bromobenzene	10	0.50	ug/L	10	ND	103	70-130	4	30	03/12/19	
Bromochloromethane	9.2	0.50	ug/L	10	ND	92	70-130	6	30	03/12/19	
Bromodichloromethane	9.8	0.50	ug/L	10	ND	98	70-130	5	30	03/12/19	
Bromoform	11	0.50	ug/L	10	ND	108	70-130	2	30	03/12/19	
Bromomethane	10	0.50	ug/L	10	ND	102	70-130	7	30	03/12/19	
Carbon disulfide	9.9	10	ug/L	10	ND	99	70-130	8	30	03/12/19	
Carbon Tetrachloride	10	0.50	ug/L	10	ND	104	70-130	5	30	03/12/19	
Chlorobenzene	11	0.50	ug/L	10	ND	108	70-130	4	30	03/12/19	
Chloroethane	11	0.50	ug/L	10	ND	105	70-130	15	30	03/12/19	
Chloroform	9.1	0.50	ug/L	10	ND	91	70-130	5	30	03/12/19	
Chloromethane	11	0.50	ug/L	10	ND	107	70-130	19	30	03/12/19	
cis-1,2-Dichloroethene	10	0.50	ug/L	10	ND	101	70-130	6	30	03/12/19	
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	103	70-130	1	30	03/12/19	
Dibromochloromethane	11	0.50	ug/L	10	ND	108	70-130	3	30	03/12/19	
Dibromomethane	10	0.50	ug/L	10	ND	102	70-130	0	30	03/12/19	
Dichlorodifluoromethane	11	0.50	ug/L	10	ND	108	70-130	9	30	03/12/19	
Dichloromethane	9.0	0.50	ug/L	10	ND	90	70-130	11	30	03/12/19	
Di-isopropyl ether (DIPE)	9.5	3.0	ug/L	10	ND	95	70-130	4	30	03/12/19	
Ethyl tert-Butyl Ether (ETBE)	10	0.50	ug/L	10	ND	102	70-130	3	30	03/12/19	
Ethylbenzene	11	0.50	ug/L	10	ND	109	70-130	3	30	03/12/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Blank Spike Dup (A903350-BSD1)											
Hexachlorobutadiene	11	0.50	ug/L	10	ND	110	70-130	5	30	03/12/19	
Isopropylbenzene	11	0.50	ug/L	10	ND	109	70-130	3	30	03/12/19	
m,p-Xylenes	20	0.50	ug/L	20	ND	100	70-130	3	30	03/12/19	
Methyl-t-butyl ether	22	0.50	ug/L	20	ND	111	70-130	4	30	03/12/19	
Naphthalene	9.6	0.50	ug/L	10	ND	96	70-130	9	30	03/12/19	
n-Butylbenzene	10	0.50	ug/L	10	ND	102	70-130	5	30	03/12/19	
n-Propylbenzene	11	0.50	ug/L	10	ND	106	70-130	4	30	03/12/19	
o-Xylene	11	0.50	ug/L	10	ND	107	70-130	3	30	03/12/19	
p-Isopropyltoluene	11	0.50	ug/L	10	ND	107	70-130	5	30	03/12/19	
sec-Butylbenzene	11	0.50	ug/L	10	ND	106	70-130	4	30	03/12/19	
Styrene	9.4	0.50	ug/L	10	ND	94	70-130	4	30	03/12/19	
tert-Amyl Methyl Ether (TAME)	10	3.0	ug/L	10	ND	101	70-130	0	30	03/12/19	
tert-Butyl alcohol (TBA)	9.5	2.0	ug/L	10	ND	95	70-130	26	30	03/12/19	
tert-Butylbenzene	11	0.50	ug/L	10	ND	106	70-130	5	30	03/12/19	
Tetrachloroethene (PCE)	11	0.50	ug/L	10	ND	107	70-130	3	30	03/12/19	
Toluene	10	0.50	ug/L	10	ND	104	70-130	3	30	03/12/19	
trans-1,2-Dichloroethene	9.8	0.50	ug/L	10	ND	98	70-130	6	30	03/12/19	
trans-1,3-Dichloropropene	10	0.50	ug/L	10	ND	102	70-130	1	30	03/12/19	
Trichloroethene (TCE)	11	0.50	ug/L	10	ND	107	70-130	0	30	03/12/19	
Trichlorofluoromethane	11	5.0	ug/L	10	ND	110	70-130	6	30	03/12/19	
Vinyl Chloride	11	0.50	ug/L	10	ND	108	70-130	12	30	03/12/19	
Surrogate: 1,2-Dichlorobenzene-d4	*54*			*50*		*108*	*70-130*			03/12/19	
Surrogate: Bromofluorobenzene	*56*			*50*		*112*	*70-130*			03/12/19	
Matrix Spike (A903350-MS1), Source: A9C1071-01											
1,1,1,2-Tetrachloroethane	11	0.50	ug/L	10	ND	114	41-156			03/13/19	
1,1,1-Trichloroethane	12	0.50	ug/L	10	ND	117	48-160			03/13/19	
1,1,2,2-Tetrachloroethane	11	0.50	ug/L	10	ND	110	42-151			03/13/19	
1,1,2-Trichloro-1,2,2-trifluoroethane	13	10	ug/L	10	ND	128	47-164			03/13/19	
1,1,2-Trichloroethane	11	0.50	ug/L	10	ND	110	45-152			03/13/19	
1,1-Dichloroethane	11	0.50	ug/L	10	ND	112	48-157			03/13/19	
1,1-Dichloroethene	11	0.50	ug/L	10	ND	115	51-158			03/13/19	
1,1-Dichloropropene	11	0.50	ug/L	10	ND	111	46-162			03/13/19	
1,2,3-Trichlorobenzene	10	0.50	ug/L	10	ND	101	37-145			03/13/19	
1,2,4-Trichlorobenzene	10	0.50	ug/L	10	ND	100	33-149			03/13/19	
1,2,4-Trimethylbenzene	11	0.50	ug/L	10	ND	111	44-146			03/13/19	
1,2-Dichlorobenzene	12	0.50	ug/L	10	ND	117	44-146			03/13/19	
1,2-Dichloroethane	11	0.50	ug/L	10	ND	106	47-151			03/13/19	
1,2-Dichloropropane	11	0.50	ug/L	10	ND	107	47-155			03/13/19	
1,3,5-Trimethylbenzene	11	0.50	ug/L	10	ND	113	45-154			03/13/19	
1,3-Dichlorobenzene	11	0.50	ug/L	10	ND	113	44-146			03/13/19	
1,3-Dichloropropane	11	0.50	ug/L	10	ND	108	45-151			03/13/19	
1,4-Dichlorobenzene	12	0.50	ug/L	10	ND	119	43-146			03/13/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

EPA 524.2 - Quality Control

Batch: A903350 Prepared: 3/12/2019

Prep Method: EPA 524.2 Analyst: ANM

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Matrix Spike (A903350-MS1), Source: A9C1071-01											
2,2-Dichloropropane	9.4	0.50	ug/L	10	ND	94	24-182			03/13/19	
2-Butanone	8.8	5.0	ug/L	10	ND	88	55-144			03/13/19	
2-Chlorotoluene	11	0.50	ug/L	10	ND	113	48-150			03/13/19	
2-Hexanone	8.2	10	ug/L	10	ND	82	40-159			03/13/19	
4-Chlorotoluene	12	0.50	ug/L	10	ND	116	43-150			03/13/19	
4-Methyl-2-pentanone	7.4	5.0	ug/L	10	ND	74	30-171			03/13/19	
Acetone	10	10	ug/L	10	ND	103	27-181			03/13/19	
Benzene	11	0.50	ug/L	10	ND	109	48-155			03/13/19	
Bromobenzene	11	0.50	ug/L	10	ND	111	43-151			03/13/19	
Bromochloromethane	11	0.50	ug/L	10	ND	107	48-161			03/13/19	
Bromodichloromethane	11	0.50	ug/L	10	ND	111	47-151			03/13/19	
Bromoform	13	0.50	ug/L	10	2.1	111	29-162			03/13/19	
Bromomethane	13	0.50	ug/L	10	ND	125	10-200			03/13/19	
Carbon disulfide	11	10	ug/L	10	ND	112	57-161			03/13/19	
Carbon Tetrachloride	12	0.50	ug/L	10	ND	120	47-163			03/13/19	
Chlorobenzene	12	0.50	ug/L	10	ND	119	46-152			03/13/19	
Chloroethane	13	0.50	ug/L	10	ND	135	28-189			03/13/19	
Chloroform	9.1	0.50	ug/L	10	ND	91	52-148			03/13/19	
Chloromethane	15	0.50	ug/L	10	ND	151	53-159			03/13/19	
cis-1,2-Dichloroethene	11	0.50	ug/L	10	ND	111	50-152			03/13/19	
cis-1,3-Dichloropropene	10	0.50	ug/L	10	ND	100	34-156			03/13/19	
Dibromochloromethane	12	0.50	ug/L	10	0.99	114	44-149			03/13/19	
Dibromomethane	11	0.50	ug/L	10	ND	110	46-150			03/13/19	
Dichlorodifluoromethane	14	0.50	ug/L	10	ND	136	33-170			03/13/19	
Dichloromethane	11	0.50	ug/L	10	ND	109	47-156			03/13/19	
Di-isopropyl ether (DIPE)	9.1	3.0	ug/L	10	ND	91	41-159			03/13/19	
Ethyl tert-Butyl Ether (ETBE)	9.3	0.50	ug/L	10	ND	93	32-160			03/13/19	
Ethylbenzene	11	0.50	ug/L	10	ND	112	40-157			03/13/19	
Hexachlorobutadiene	12	0.50	ug/L	10	ND	115	38-151			03/13/19	
Isopropylbenzene	11	0.50	ug/L	10	ND	109	41-156			03/13/19	
m,p-Xylenes	21	0.50	ug/L	20	ND	106	49-154			03/13/19	
Methyl-t-butyl ether	21	0.50	ug/L	20	ND	105	41-156			03/13/19	
Naphthalene	8.2	0.50	ug/L	10	ND	79	35-154			03/13/19	
n-Butylbenzene	11	0.50	ug/L	10	ND	108	31-153			03/13/19	
n-Propylbenzene	11	0.50	ug/L	10	ND	113	39-156			03/13/19	
o-Xylene	11	0.50	ug/L	10	ND	107	27-164			03/13/19	
p-Isopropyltoluene	11	0.50	ug/L	10	ND	109	26-161			03/13/19	
sec-Butylbenzene	11	0.50	ug/L	10	ND	110	39-154			03/13/19	
Styrene	9.7	0.50	ug/L	10	ND	97	10-200			03/13/19	
tert-Amyl Methyl Ether (TAME)	8.9	3.0	ug/L	10	ND	89	24-161			03/13/19	
tert-Butyl alcohol (TBA)	8.2	2.0	ug/L	10	ND	82	22-174			03/13/19	
tert-Butylbenzene	11	0.50	ug/L	10	ND	111	40-153			03/13/19	
Tetrachloroethene (PCE)	12	0.50	ug/L	10	ND	121	48-155			03/13/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 524.2 - Quality Control											
Batch: A903350										Prepared: 3/12/2019	
Prep Method: EPA 524.2										Analyst: ANM	
Matrix Spike (A903350-MS1), Source: A9C1071-01											
Toluene	11	0.50	ug/L	10	ND	114	40-159			03/13/19	
trans-1,2-Dichloroethene	11	0.50	ug/L	10	ND	114	52-157			03/13/19	
trans-1,3-Dichloropropene	9.8	0.50	ug/L	10	ND	98	28-160			03/13/19	
Trichloroethene (TCE)	12	0.50	ug/L	10	ND	117	49-155			03/13/19	
Trichlorofluoromethane	13	5.0	ug/L	10	ND	135	47-169			03/13/19	
Vinyl Chloride	14	0.50	ug/L	10	ND	135	21-183			03/13/19	
Surrogate: 1,2-Dichlorobenzene-d4	*63*			*50*		*126*	*70-130*			03/13/19	
Surrogate: Bromofluorobenzene	*63*			*50*		*127*	*70-130*			03/13/19	
EPA 525.3 - Quality Control											
Batch: A903384										Prepared: 3/12/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank (A903384-BLK1)											
Alachlor	ND	1.0	ug/L							03/23/19	
Atrazine	ND	0.50	ug/L							03/23/19	
Benzo(a)pyrene	ND	0.10	ug/L							03/23/19	
Bis(2-ethylhexyl) adipate	ND	3.0	ug/L							03/23/19	
Bis(2-ethylhexyl) phthalate	ND	3.0	ug/L							03/23/19	
Bromacil	ND	10	ug/L							03/23/19	
Butachlor	ND	0.38	ug/L							03/23/19	
Diazinon	ND	0.25	ug/L							03/23/19	
Dimethoate	ND	10	ug/L							03/23/19	
Metolachlor	ND	0.50	ug/L							03/23/19	
Metribuzin	ND	0.50	ug/L							03/23/19	
Molinate	ND	2.0	ug/L							03/23/19	
Propachlor	ND	0.50	ug/L							03/23/19	
Simazine	ND	1.0	ug/L							03/23/19	
Thiobencarb	ND	1.0	ug/L							03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.91*			*1.0*		*91*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.89*			*1.0*		*89*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*102*	*70-130*			03/23/19	
Blank Spike (A903384-BS1)											
Alachlor	1.4	1.0	ug/L	1.4	ND	102	70-130			03/23/19	
Atrazine	0.72	0.50	ug/L	0.70	ND	104	70-130			03/23/19	
Benzo(a)pyrene	0.12	0.10	ug/L	0.14	ND	88	70-130			03/23/19	
Bis(2-ethylhexyl) adipate	3.0	3.0	ug/L	2.8	ND	109	70-130			03/23/19	
Bis(2-ethylhexyl) phthalate	4.4	3.0	ug/L	4.2	ND	105	70-130			03/23/19	
Bromacil	1.7	10	ug/L	1.4	ND	123	70-130			03/23/19	
Butachlor	1.6	0.38	ug/L	1.4	ND	114	70-130			03/23/19	
Diazinon	1.7	0.25	ug/L	1.8	ND	98	70-130			03/23/19	
Dimethoate	3.1	10	ug/L	2.8	ND	109	70-130			03/23/19	
Metolachlor	1.8	0.50	ug/L	1.8	ND	102	70-130			03/23/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 525.3 - Quality Control											
Batch: A903384										Prepared: 3/12/2019	
Prep Method: EPA 525.3										Analyst: JKH	
Blank Spike (A903384-BS1)											
Metribuzin	1.5	0.50	ug/L	1.4	ND	105	70-130			03/23/19	
Molinate	2.5	2.0	ug/L	2.8	ND	91	70-130			03/23/19	
Propachlor	0.72	0.50	ug/L	0.70	ND	103	70-130			03/23/19	
Simazine	0.51	1.0	ug/L	0.49	ND	104	70-130			03/23/19	
Thiobencarb	1.4	1.0	ug/L	1.4	ND	99	70-130			03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.92*			*1.0*		*92*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.90*			*1.0*		*90*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*103*	*70-130*			03/23/19	
Blank Spike Dup (A903384-BSD1)											
Alachlor	1.4	1.0	ug/L	1.4	ND	102	70-130	0	30	03/23/19	
Atrazine	0.72	0.50	ug/L	0.70	ND	103	70-130	0	30	03/23/19	
Benzo(a)pyrene	0.12	0.10	ug/L	0.14	ND	86	70-130	2	30	03/23/19	
Bis(2-ethylhexyl) adipate	3.0	3.0	ug/L	2.8	ND	108	70-130	0	30	03/23/19	
Bis(2-ethylhexyl) phthalate	4.4	3.0	ug/L	4.2	ND	105	70-130	0	30	03/23/19	
Bromacil	1.8	10	ug/L	1.4	ND	126	70-130	3	30	03/23/19	
Butachlor	1.6	0.38	ug/L	1.4	ND	113	70-130	0	30	03/23/19	
Diazinon	1.7	0.25	ug/L	1.8	ND	98	70-130	0	30	03/23/19	
Dimethoate	3.1	10	ug/L	2.8	ND	109	70-130	0	30	03/23/19	
Metolachlor	1.8	0.50	ug/L	1.8	ND	101	70-130	0	30	03/23/19	
Metribuzin	1.5	0.50	ug/L	1.4	ND	104	70-130	0	30	03/23/19	
Molinate	2.5	2.0	ug/L	2.8	ND	90	70-130	1	30	03/23/19	
Propachlor	0.72	0.50	ug/L	0.70	ND	103	70-130	0	30	03/23/19	
Simazine	0.51	1.0	ug/L	0.49	ND	103	70-130	1	30	03/23/19	
Thiobencarb	1.4	1.0	ug/L	1.4	ND	98	70-130	1	30	03/23/19	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.90*			*1.0*		*90*	*70-130*			03/23/19	
Surrogate: Benzo(a)pyrene-d12	*0.88*			*1.0*		*88*	*70-130*			03/23/19	
Surrogate: Triphenyl Phosphate	*1.0*			*1.0*		*102*	*70-130*			03/23/19	
Matrix Spike (A903384-MS1), Source: A9C0927-01											
Alachlor	0.21	1.0	ug/L	0.19	ND	103	70-130			03/23/19	
Atrazine	0.11	0.50	ug/L	0.096	ND	115	70-130			03/23/19	
Benzo(a)pyrene	0.017	0.10	ug/L	0.019	ND	90	70-130			03/23/19	
Bis(2-ethylhexyl) adipate	0.49	3.0	ug/L	0.38	ND	128	70-130			03/23/19	
Bis(2-ethylhexyl) phthalate	0.60	3.0	ug/L	0.58	ND	104	70-130			03/23/19	
Bromacil	0.22	10	ug/L	0.19	ND	113	70-130			03/23/19	
Butachlor	0.25	0.38	ug/L	0.19	ND	131	70-130			03/23/19	MS1.6 ***High***
Diazinon	0.25	0.25	ug/L	0.24	ND	101	70-130			03/23/19	
Dimethoate	0.45	10	ug/L	0.38	ND	117	70-130			03/23/19	
Metolachlor	0.26	0.50	ug/L	0.24	ND	109	70-130			03/23/19	
Metribuzin	0.23	0.50	ug/L	0.19	ND	119	70-130			03/23/19	
Molinate	0.37	2.0	ug/L	0.38	ND	96	70-130			03/23/19	
Propachlor	0.10	0.50	ug/L	0.096	ND	105	70-130			03/23/19	
Simazine	0.077	1.0	ug/L	0.067	ND	114	70-130			03/23/19	

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 525.3 - Quality Control												
Batch: A903384										Prepared: 3/12/2019		
Prep Method: EPA 525.3										Analyst: JKH		
Matrix Spike (A903384-MS1), Source: A9C0927-01												
Thiobencarb	0.21	1.0	ug/L	0.19	ND	109	70-130			03/23/19		
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*0.89*			*0.96*		*92*	*70-130*			03/23/19		
Surrogate: Benzo(a)pyrene-d12	*0.91*			*0.96*		*94*	*70-130*			03/23/19		
Surrogate: Triphenyl Phosphate	*1.0*			*0.96*		*109*	*70-130*			03/23/19		
EPA 531.1 - Quality Control												
Batch: A903821										Prepared: 3/20/2019		
Prep Method: EPA 531.1										Analyst: PNN		
Blank (A903821-BLK1)												
3-Hydroxycarbofuran	ND	3.0	ug/L							03/22/19		
Aldicarb	ND	3.0	ug/L							03/22/19		
Aldicarb Sulfone	ND	2.0	ug/L							03/22/19		
Aldicarb Sulfoxide	ND	3.0	ug/L							03/22/19		
Carbaryl	ND	5.0	ug/L							03/22/19		
Carbofuran	ND	5.0	ug/L							03/22/19		
Methomyl	ND	2.0	ug/L							03/22/19		
Oxamyl	ND	20	ug/L							03/22/19		
Blank Spike (A903821-BS1)												
3-Hydroxycarbofuran	9.1	3.0	ug/L	8.7	ND	105	80-120			03/22/19		
Aldicarb	3.8	3.0	ug/L	4.3	ND	87	80-120			03/22/19		
Aldicarb Sulfone	7.3	2.0	ug/L	7.0	ND	105	80-120			03/22/19		
Aldicarb Sulfoxide	4.4	3.0	ug/L	4.3	ND	100	80-120			03/22/19		
Carbaryl	7.9	5.0	ug/L	8.7	ND	91	80-120			03/22/19		
Carbofuran	9.4	5.0	ug/L	7.8	ND	121	80-120			03/22/19	BS	***High***
Methomyl	9.2	2.0	ug/L	8.7	ND	106	80-120			03/22/19		
Oxamyl	9.0	20	ug/L	8.7	ND	104	80-120			03/22/19		
Blank Spike Dup (A903821-BSD1)												
3-Hydroxycarbofuran	10	3.0	ug/L	8.7	ND	118	80-120	12	20	03/22/19		
Aldicarb	5.1	3.0	ug/L	4.3	ND	117	80-120	30	20	03/22/19	BS3.0	
Aldicarb Sulfone	7.9	2.0	ug/L	7.0	ND	114	80-120	9	20	03/22/19		
Aldicarb Sulfoxide	4.9	3.0	ug/L	4.3	ND	113	80-120	12	20	03/22/19		
Carbaryl	8.7	5.0	ug/L	8.7	ND	100	80-120	10	20	03/22/19		
Carbofuran	10	5.0	ug/L	7.8	ND	130	80-120	8	20	03/22/19	BS	***High***
Methomyl	8.7	2.0	ug/L	8.7	ND	100	80-120	6	20	03/22/19		
Oxamyl	9.9	20	ug/L	8.7	ND	114	80-120	9	20	03/22/19		
Matrix Spike (A903821-MS1), Source: A9C0989-01												
3-Hydroxycarbofuran	11	3.0	ug/L	8.7	ND	122	65-135			03/22/19		
Aldicarb	5.7	3.0	ug/L	4.3	ND	131	65-135			03/22/19		
Aldicarb Sulfone	8.5	2.0	ug/L	7.0	ND	122	65-135			03/22/19		
Aldicarb Sulfoxide	5.2	3.0	ug/L	4.3	ND	120	65-135			03/22/19		

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 531.1 - Quality Control											
Batch: A903821										Prepared: 3/20/2019	
Prep Method: EPA 531.1										Analyst: PNN	
Matrix Spike (A903821-MS1), Source: A9C0989-01											
Carbaryl	9.5	5.0	ug/L	8.7	ND	109	65-135			03/22/19	
Carbofuran	11	5.0	ug/L	7.8	ND	142	65-135			03/22/19	MS1.0 ***High***
Methomyl	9.4	2.0	ug/L	8.7	ND	108	65-135			03/22/19	
Oxamyl	10	20	ug/L	8.7	ND	120	65-135			03/22/19	
EPA 547 - Quality Control											
Batch: A903506										Prepared: 3/14/2019	
Prep Method: EPA 547										Analyst: JNG	
Blank (A903506-BLK1)											
Glyphosate	ND	25	ug/L							03/14/19	
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/14/19	
Blank Spike (A903506-BS1)											
Glyphosate	100	25	ug/L	100	ND	105	70-130			03/14/19	
Surrogate: AMPA	*190*			*200*		*97*	*70-130*			03/14/19	
Blank Spike Dup (A903506-BSD1)											
Glyphosate	110	25	ug/L	100	ND	105	70-130	1	30	03/14/19	
Surrogate: AMPA	*210*			*200*		*106*	*70-130*			03/14/19	
Matrix Spike (A903506-MS1), Source: A9C0238-01											
Glyphosate	93	25	ug/L	100	ND	93	70-130			03/14/19	
Surrogate: AMPA	*180*			*200*		*88*	*70-130*			03/14/19	
EPA 548.1 - Quality Control											
Batch: A903521										Prepared: 3/14/2019	
Prep Method: EPA 548.1										Analyst: JKH	
Blank (A903521-BLK1)											
Endothall	ND	45	ug/L							03/16/19	
Blank (A903521-BLK2)											
Endothall	ND	45	ug/L							03/15/19	
Blank (A903521-BLK3)											
Endothall	ND	45	ug/L							03/15/19	
Blank Spike (A903521-BS1)											
Endothall	15	45	ug/L	20	ND	74	46-116			03/16/19	
Blank Spike Dup (A903521-BSD1)											
Endothall	14	45	ug/L	20	ND	72	46-116	3	30	03/16/19	
MRL Check (A903521-MRL1)											

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BSK Associates Laboratory Fresno

Organics Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 548.1 - Quality Control											
Batch: A903521										Prepared: 3/14/2019	
Prep Method: EPA 548.1										Analyst: JKH	
MRL Check (A903521-MRL1)											
Endothall	ND	45	ug/L	2.0	ND	82	0-200			03/15/19	
MRL Check (A903521-MRL2)											
Endothall	ND	45	ug/L	2.0	ND	99	0-200			03/15/19	
Matrix Spike (A903521-MS1), Source: A9C0800-01											
Endothall	2.5	45	ug/L	20	ND	12	46-116			03/16/19	MS1.0 ***Low***
EPA 549.2 - Quality Control											
Batch: A903459										Prepared: 3/14/2019	
Prep Method: EPA 549.2										Analyst: VTL	
Blank (A903459-BLK1)											
Diquat	ND	4.0	ug/L							03/19/19	
Blank Spike (A903459-BS1)											
Diquat	3.4	4.0	ug/L	4.0	ND	85	70-130			03/19/19	
Blank Spike Dup (A903459-BSD1)											
Diquat	3.8	4.0	ug/L	4.0	ND	95	70-130	11	30	03/19/19	
Matrix Spike (A903459-MS1), Source: A9C0927-01											
Diquat	3.7	4.0	ug/L	4.0	ND	93	70-130			03/19/19	

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Certificate of Analysis

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Field tests are outside the scope of laboratory accreditation and there is no certification available for field testing.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected below MRL/MDL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	PicoCuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit	U:	The analyte was not detected at or above the reported sample quantitation limit.

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters:

Chlorothalonil

Trifluralin

Certificate of Analysis

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing under each certification.**

Fresno

State of California - ELAP	1180	State of Hawaii	4021
Los Angeles CSD	9254479	NELAP certified	4021-011
State of Nevada	CA000792019-1	State of Oregon - NELAP	4021-011
EPA - UCMR4	CA00079	State of Washington	C997-18

Sacramento

State of California - ELAP	2435

San Bernardino

State of California - ELAP	2993	Los Angeles CSD	9254478
NELAP certified	4119-003	State of Oregon - NELAP	4119-003

Vancouver

NELAP certified	WA100008-011	State of Oregon - NELAP	WA100008-011
State of Washington	C824-18b		

A9C1008

03122019

Monte6227

Turnaround: Standard
Due Date: 3/26/2019

Monterey Bay Analytical

Printed: 3/12/2019 2:11:01PM
Page 1 of 1

BSK Associates Engineers & Laboratories
1414 Stanislaus St., Fresno, CA 93706
(559) 497-2888 · Fax (559) 497-2893
www.bskassociates.com

Turnaround Time Request
☒ Standard - 10 business days
☐ Rush (Surcharge may apply)
Date needed:

A9C1008 03/12/2019
Monte6227 10

*Required Fields Temp: 3.3 #54

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax:
Monterey Bay Analytical Services	Sara Sugarman Additional cc's: David Holland	David Holland PO#:	831-375-6227 E-mail*: info@mbasinc.com	831-641-0734

Address*:	City*:	State*:	Zip*:
4 Justin Court, Suite D	Monterey	CA	93940

Project:	Project #:	How would you like to receive your completed results?*
Twin Lakes Church Injection Well		☒ E-Mail ☐ Fax ☐ Mail

Reporting Options: ☐ Trace (J-Flag) ☐ Swamp ☐ EDD Type: _____

Sampler Name (Printed/Signature)*: Dylan Jones

Regulatory Carbon Copies: ☐ SWRCB (Drinking Water) ☐ Merced Co ☐ Fresno Co ☐ Madera Co ☐ Tulare Co ☐ Other: _____

Regulatory Compliance: ☐ EDT to California SWRCB (Drinking Water) System Number*: _____ ☐ Geotracker #: _____

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX	EPA 504	EPA 505	EPA 515	EPA 524	EPA 525	EPA 531, EPA 547	EPA 548, EPA 549	EPA 1613 (2,3,7,8 Dioxin)	Chromium 6
1.	Sample Set Zone 3	3/7/19	9:40	DW	190307_13-01	X	X	X	X	X	X	X	X	X

VH 3-12-19

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
~~David Holland~~ Ben Sanchez	MBAS	3/11	1600		
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date: 3.12	Time: 9:10	Payment Received at Delivery: Date:	Check / Cash Amount: PIA#: Init.

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Courier: _____
Cooling Method: Wet Blue None
Custody Seal: Y / N
Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

SR-FL-0012-06

A9C1008 03/12/2019
Monte6227 10

BSK Associates SR-FL-0002-19

Sample Integrity

BSK Bottles: (Yes) No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 8°C	(Yes) No NA	Were correct containers and preservatives received for the tests requested?	(Yes) No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No (NA)	Bubbles Present VOAs (524.2/TCP/TTHM)? TB Received? (Check Method Below)	Yes (No) NA Yes (No) NA
Did all bottles arrive unbroken and intact?	(Yes) No	Was a sufficient amount of sample received?	(Yes) No
Did all bottle labels agree with COC?	(Yes) No	Do samples have a hold time <72 hours?	Yes (No)
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No (NA)	Was PM notified of discrepancies? PM: By/Time:	Yes No (NA)

Bottles Received ("—" means preservation/chlorine checks are either N/A or are performed in the lab)

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	
Bacti $Na_2S_2O_3$	—	—	
None (P) White Cap	—	—	
Cr6 (P) Lt. Green Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ DW	Cl, pH > 8	(P) F	1A
Cr6 (P) Pink Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ WW	pH 9.3-9.7	P F	
Cr6 (P) Black Label/Blue Cap $NH_4OH(NH_4)_2SO_4$ 7199 ***24 HOUR HOLD TIME***	pH 9.0-9.5	P F	
HNO_3 (P) Red Cap or HCl (P) Purple Cap/Lt. Blue Label	—	—	
H_2SO_4 (P) or (AG) Yellow Cap/Label	pH < 2	P F	
NaOH (P) Green Cap	Cl, pH >10	P F	
NaOH + ZnAc (P)	pH > 9	P F	
Dissolved Oxygen 300ml (g)	—	—	
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—	2C
HCl (AG) Lt. Blue Label O&G, Diesel, TCP	—	—	
Ascorbic, EDTA, KH_2Ct (AG) Pink Label 525	—	—	2C
Na_2SO_3 250mL (AG) Neon Green Label 515	—	—	1A
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—	1C
$Na_2S_2O_3$ (AG) Blue Label 548, THM, 524	—	—	1A
$Na_2S_2O_3$ (CG) Blue Label 504, 505, 547	—	—	7V
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH < 3	(P) F	1V
NH_4Cl (AG) Purple Label 552	—	—	
EDA (AG) Brown Label DBPs	—	—	
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—	3V
Buffer pH 4 (CG)	—	—	
H_3PO_4 (CG) Salmon Label	—	—	
Other:			
Asbestos 1L (P) w/ Foil / LL Metals Bottle	—	—	
Bottled Water	—	—	
Clear Glass 250mL / 500mL / 1 Liter	—	—	
Solids: Brass / Steel / Plastic Bag	—	—	

VLH 3-12-19

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

✓ **Indicates Blanks Received**

504 __ 524.2 __ TCP __ TTHM __ 537 __

8260/624 __

Labeled by: mc @ 1133 Labels checked by: VLH @ 1157 RUSH Paged by: _____ @ _____

CERES Analytical Laboratory, Inc.
4919 Windplay Dr. Suite 1, El Dorado Hills, CA 95762

March 22, 2019 Ceres ID: 12694

BSK Associates
1414 Stanislaus St.
Fresno, CA 93706

The following report contains the results for the one drinking water sample received on March 19, 2019. This sample was analyzed for 2,3,7,8-TCDD by EPA method 1613B. Routine turn-around time was provided for this work.

This work was authorized under your Subcontract Order # A9C1008.

Continuing Calibration Verification (CCV) Requirements
All associated calibration verification standard(s) (CCV) met the acceptance criteria.

The report consists of a Cover Letter, Sample Inventory (Section I), Data Summary (Section II), Sample Tracking (Section VI), and Qualifiers/Abbreviations (Section VII). Raw Data (Section III), Continuing Calibration (Section IV), and Initial Calibration (Section V) are available in a full report (.pdf format) upon request.

If you have any questions regarding this report, please feel free to contact me at (916)932-5011.

Sincerely,



James M. Hedin
Director of Operations/CEO
jhedin@ceres-lab.com

Section I: Sample Inventory

Ceres Sample ID:	Sample ID	Date Received	Collection Date	&Time
12694-001	Sample Set Zone 3 A9C1008-01	3/19/2019	3/7/2019	9:40

Section II: Data Summary

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Quality Assurance Sample **Method Blank**	**QC Batch #:** 1954	**Date Received:** NA
	Matrix: Drinking Water	**Date Extracted:** 3/21/2019
Project ID: A9C1008	**Sample Size:** 1.000 L	**ZB-5MS Analysis:** 3/21/2019

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 4.53	1.49	5.00		13C-2378-TCDD	81.0	31-137	
					CRS			
					37Cl4-2378-TCDD	62.9	35-197	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Quality Assurance Sample Ongoing Precision and Recovery			Date Received: NA
	QC Batch #: 1954		Date Extracted: 3/21/2019
	Matrix: Drinking Water		ZB-5MS Analysis: 3/21/2019
Project ID: A9C1008	Sample Size: 1.000 L		

Analyte	Conc. (ng/mL)	Limits (a)	Labeled Standards	% Rec.	Limits (a)
2,3,7,8-TCDD	11.2	7.3-14.6	13C-2378-TCDD	76.8	25-141
			CRS		
			37Cl4-2378-TCDD	82.3	37-158

(a) Limits based on method acceptance criteria.

Analyst: JMH **Reviewed by: BS**

CERES Analytical Laboratory, Inc.
4919 Windplay Dr Suite 1, El Dorado Hills, CA 95762

EPA Method 1613B

Client Sample ID: Sample Set Zone 3 A9C1008-01		
Project ID: A9C1008	**Ceres Sample ID:** 12694-001	**Date Received:** 3/19/2019
	QC Batch #: 1954	**Date Extracted:** 3/21/2019
Date Collected: 3/7/2019	**Matrix:** Drinking Water	**ZB-5MS Analysis:** 3/21/2019
Time Collected: 9:40	**Sample Size:** 1.029 L	

Analyte	Conc. (pg/L)	MDL	RL	Qual.	Labeled Standards	% R	LCL-UCL (a)	Qualifiers
2,3,7,8-TCDD	DL= 3.89	1.49	4.86		13C-2378-TCDD	79.0	31-137	
					CRS			
					37Cl4-2378-TCDD	80.3	42-164	

DL - Signifies Non-Detect (ND) at sample specific detection limit.
EMPC - Estimated Maximum Possible Concentration due to ion abundance ratio failure.
(a) - Lower control limit - Upper control limit

Analyst: JMH **Reviewed by: BS**

Section VI: Sample Tracking

BSK ASSOCIATES

SUBCONTRACT ORDER

A9C1008

SENDING LABORATORY:

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
Phone: 559-497-2888
Fax: 559-485-6935
Project Manager: Jaime Lee LaFave
E-mail: jlafave@bskassociates.com

RECEIVING LABORATORY:

Ceres Analytical Laboratory, Inc
4919 Windplay Drive, Suite 1
El Dorado Hills, CA 95762
Phone :(916) 932-5011
Fax: -
Turnaround (Days): Standard
QC Deliverables: / Std III IV

Sample ID	Samp Desc		Sample Date
A9C1008-01	**Sample Set Zone 3**	**Client Matrix** Drinking Water	**03/07/2019 09:40**

Sample Alias: 190307_13-01
Lab Matrix: Water

Analysis:
EXT-Dioxin-DW matrix, EPA 1613 2,3,7,8-TCDD

Released By	Date	Received By	Date
[signature]	3-18-19	[signature]	3/19/19 11:03
Released By	Date	Received By	Date

Sample Receipt Check List Logged by: J (initials)

Ceres ID: 12694		Date/Time: 3/19/19 11:03
Client Project ID: A9C1008		Received Temp: 2.4 °C Acceptable: (Y) / N
Chain of Custody Relinquished by signed?		(Y) / N
Chain of Custody Received by signed?		(Y) / N
Custody Seals?	Present?	Y / N
	Intact?	Y / N
	NA:	(NA)
Unlabeled / Illegible Samples		Y / (N)
Proper Containers:		(Y) / N
Preservation Acceptable (Chemical or Temperature)?		(Y) / N
Drinking Water, Sodium Thiosulfate present?		Y / (N) / NA
Residual Cl?		Y / (N)
Aqueous sample pH: 7		

List COC discrepancies:

J 3/19/19

List Damaged Samples:

J 3/19/19

Section VII: Qualifiers/Abbreviations

J	Concentration found below the lower quantitation limit but greater than zero.
B	Analyte present in the associated Method Blank.
E	Concentration found exceeds the Calibration range of the HRGC/HRMS.
D	This analyte concentration was calculated from a dilution.
X	The concentration found is the estimated maximum possible concentration due to chlorinated diphenyl ethers present in the sample.
H	Recovery limits exceeded. See cover letter.
*****	Results taken from dilution.
I	Interference. See cover letter.
Conc.	Concentration Found
DL	Calculated Detection Limit
ND	Non-Detect
% Rec.	Percent Recovery

April 5, 2019

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Lab ID : SP 1903284
Customer : 2-19144

Laboratory Report

Introduction: This report package contains total of 5 pages divided into 3 sections:

Case Narrative	(2 pages)	: An overview of the work performed at FGL.
Sample Results	(1 page)	: Results for each sample submitted.
Quality Control	(2 pages)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
Sample Set Zone 3	03/07/2019	03/12/2019	SP 1903284-001	DW

Sampling and Receipt Information: The sample was received, prepared and analyzed within the method specified holding except those as listed in the table below.

Lab ID	Analyte/Method	Required Holding Time	Actual Holding Time
SP 1903284-001	Radon-222	4	5 Days

All samples arrived at 3 °C. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Radio QC

900.0	03/27/2019:204329 All analysis quality controls are within established criteria
	03/25/2019:203199 All preparation quality controls are within established criteria
903.0	03/18/2019:203911 All analysis quality controls are within established criteria
	03/14/2019:202823 All preparation quality controls are within established criteria
906.0	04/04/2019:204836 All analysis quality controls are within established criteria

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CA ELAP Certification No. 2810

April 5, 2019 Lab ID : SP 1903284
Monterey Bay Analytical Services Customer : 2-19144

Radio QC

906.0	04/02/2019:203520 All preparation quality controls are within established criteria
Ra - 05	03/28/2019:204516 All analysis quality controls are within established criteria
	03/18/2019:202831 All preparation quality controls are within established criteria
SM7500Rn	03/12/2019:203633 All analysis quality controls are within established criteria
	03/12/2019:202700 All preparation quality controls are within established criteria

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-04-05

April 5, 2019

Lab ID : SP 1903284-001
Customer ID : 2-19144

Monterey Bay Analytical Services
4 Justin Court
Monterey, CA 93940

Sampled On : March 7, 2019-09:40
Sampled By : Dylan Jones
Received On : March 12, 2019-11:42
Matrix : Drinking Water

Description : Sample Set Zone 3
Project : Twin Lakes Church Injection Well

Sample Result - Radio

Constituent	Result ± Error	MDA	Units	MCL/AL	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Radio Chemistry								
Gross Alpha	3.24 ± 1.75	1.51	pCi/L		900.0	03/25/19-09:07 2P1903199	900.0	03/27/19-10:14 2A1904329
Gross Beta	2.14 ± 1.10	1.21	pCi/L		900.0	03/25/19-09:07 2P1903199	900.0	03/27/19-10:14 2A1904329
Radon-222	278 ± 39.6	19.3	pCi/L		SM7500Rn	03/12/19-14:23 2P1902700	SM7500Rn	03/12/19-20:24 2A1903633
Total Alpha Radium (226)	0.006 ± 0.064	0.418	pCi/L		903.0	03/14/19-18:30 2P1902823	903.0	03/18/19-18:00 2A1903911
Tritium	0.000 ± 269	434	pCi/L		906.0	04/02/19-09:15 2P1903520	906.0	04/04/19-15:23 2A1904836
Ra 228	0.000 ± 0.572	0.383	pCi/L		Ra - 05	03/18/19-18:30 2P1902831	Ra - 05	03/28/19-18:40 2A1904516

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:
Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.

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CA ELAP Certification No. 2810

April 5, 2019 Lab ID : SP 1903284
Monterey Bay Analytical Services Customer : 2-19144

Quality Control - Radio

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Radio								
Alpha	900.0	03/27/19:204329IWC	CCV	cpm	7933	43.4 %	35-47	
			CCB	cpm		0.1600	0.18	
Beta	900.0	03/27/19:204329IWC	CCV	cpm	7933	92.0 %	83-94	
			CCB	cpm		0.4000	0.48	
Gross Alpha	900.0	03/25/19:203199iwc	Blank	pCi/L		1.19	3	
			LCS	pCi/L	130.0	110 %	75-125	
			MS	pCi/L	130.0	123 %	60-140	
		(SP 1903815-001)	MSD	pCi/L	130.0	105 %	60-140	
			MSRPD	pCi/L	130.0	16.1%	≤30	
Gross Beta	900.0	03/25/19:203199iwc	Blank	pCi/L		0.18	4	
			LCS	pCi/L	69.11	141 %	84-160	
			MS	pCi/L	69.11	96.8 %	80-130	
		(SP 1903815-001)	MSD	pCi/L	69.11	97.5 %	80-130	
			MSRPD	pCi/L	130.0	0.7%	≤30	
Alpha	903.0	03/18/19:203911JCA	CCV	cpm	8296	40.2 %	37-46	
			CCB	cpm		0.0400	0.16	
Total Alpha Radium (226)	903.0	03/14/19:202823emv	RgBlk	pCi/L		-0.02	2	
			LCS	pCi/L	23.33	68.4 %	52-107	
			BS	pCi/L	23.33	58.1 %	43-111	
			BSD	pCi/L	23.33	56.5 %	43-111	
			BSRPD	pCi/L	23.33	2.6%	≤35.5	
Tritium	906.0	04/02/19:203520JCA	Blank	pCi/L		82	300	
			LCS	pCi/L	1663	99.3 %	75-125	
			BS	pCi/L	1663	86.0 %	75-125	
			BSD	pCi/L	1663	77.6 %	75-125	
			BSRPD	pCi/L	1663	140	≤300	
	906.0	04/04/19:204836JCA	CCV	pCi/L	26100	104 %	90-110	
			CCB	pCi/L		221	500	
Beta	Ra - 05	03/28/19:204516emv	CCV	cpm	8289	87.0 %	84-94	
			CCB	cpm		0.3000	0.51	
Ra 228	Ra - 05	03/18/19:202831emv	RgBlk	pCi/L		-0.03	3	
			LRS	pCi/L	12.03	75.1 %	65-108	
			BS	pCi/L	12.03	84.5 %	75-125	
			BSD	pCi/L	12.03	106 %	75-125	
			BSRPD	pCi/L	12.03	2.6	≤3	
Radon	SM7500Rn	(SP 1903284-001)	Dup	pCi/L		8.2%	25	
	SM7500Rn	03/12/19:203633JCA	CCV	pCi/L	2582	96.7 %	90-110	
			CCB	pCi/L		-9.3	20	

Definition

CCV : Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
CCB : Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
RgBlk : Method Reagent Blank - Prepared to correct for any reagent contributions to sample result.
LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
LRS : Laboratory Recovery Standard - Prepared to establish the batch recovery factor used in result calculations.
MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
BS : Blank Spikes - A blank is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
BSD : Blank Spike Duplicate of BS/BSD pair - A blank duplicate is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery.
Dup : Duplicate Sample - A random sample with each batch is prepared and analyzed in duplicate. The relative percent difference is an indication of precision for the preparation and analysis.

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TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

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FAX: (805)783-2912
CA ELAP Certification No. 2775

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TEL: (559)734-9473
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CA ELAP Certification No. 2810

April 5, 2019 Lab ID : SP 1903284
Monterey Bay Analytical Services Customer : 2-19144

Quality Control - Radio

Definition	
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
BSRPD	: BS/BSD Relative Percent Difference (RPD) - The BS relative percent difference is an indication of precision for the preparation and analysis.
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.

ENVIRONMENTAL AGRICULTURAL
Analytical Chemists

www.fglinc.com

CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT

Client: Monterey Bay Analytical Services
Customer Number: 2019144
Address: 4 Justin Court
Monterey, CA 93940

Phone: (831)375-6227 Fax: (831)641-0734
Email Address: info@mbasinc.com
Contact Person: David Holland
Project Name: Twin Lakes Church Injection Well
Purchase Order Number:
Quote Number:

Rush Analysis: ☐ 5 Day ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 24 hour
Rush pre-approval by lab (initals): _____
Electronic Data Transfer: ☑ No ☐ State ☐ Client Other: _____

Sampler(s): Dylan Jones

Sampling Fee: _____ Pickup Fee: _____
Compositor Setup Date: _____ Time: _____

Lab Number: 1403704

TEST DESCRIPTION AND ANALYSES REQUESTED

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite (C) Grab (G)	Number of Containers	Type of Containers: (G)Glass (P)Plastic (V)VOA (MT)Metal Tube	Potable (P) Non-Potable (NP) Ag Water (AgW)	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (WW) Waste Water (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sys) System (SRC) Source (W) Waste	BacT: (ROUT)Routine (RPT)Repeat (OTH)Other (RPL)Replace	(LT) Leaf Tissue (PET) Petiole Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc (2) NaOH, (3) HCl (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other_____	Gross Alpha	Gross Beta	Radium 226	Radium 228	Radon	Tritium
1.	Sample Set Zone 3	3/7/19	9:40	G	5	var	P	DW						X	X	X	X	X	X
																			X

Tracking #: 544058661

Remarks
190307_13-01
Radon is out of Hold time. Please test. - MBAS

Relinquished	Date:	Time:
[signature]	3/7	1600

Received By:	Date:	Time:

Relinquished	Date:	Time:
GSO	3/8/19	1142

Received By:	Date:	Time:
[signature]	3/8/19	1142

Relinquished	Date:	Time:

Received By:	Date:	Time:

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No.1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

Condition Upon Receipt (Attach to COC)

Sample Receipt at SP:

1. Number of ice chests/packages received: **1**
2. Shipper tracking numbers **544058661**
3. Were samples received in a chilled condition?
   Temps: **3** / _____ / _____ / _____ / _____ / _____ / _____
4. Surface water (SWTR) bact samples: A sample that has a temperature upon receipt of >10C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.
5. Do the number of bottles received agree with the COC? **Yes** No N/A
6. Verify sample date, time, sampler **Yes** No N/A
7. Were the samples received intact? (i.e. no broken bottles, leaks, etc.) **Yes** No
8. Were sample custody seals intact? Yes No **N/A**

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? **Yes** No
2. Did bottle labels correspond with the client's ID's? **Yes** No
3. Were all bottles requiring sample preservation properly preserved? Yes No **N/A** **FGL**
   [Exception: Oil & Grease, VOA and CrVI verified in lab]
4. VOAs checked for Headspace? **Yes** No N/A
5. Were all analyses within holding times at time of receipt? Yes **No**
6. Have rush or project due dates been checked and accepted? Yes No **N/A**

Include a copy of the COC for lab delivery. (Bacti. Inorganics and Radio)

Sample Receipt, Login and Verification completed by: Reviewed and Approved By **Inez Covarrubias** Digitally signed by Inez Covarrubias Title: Sample Receiving Date: 03/12/2019-13:31:34

Discrepency Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: Phone Number:
   Initiated By: Date: 2019-03-12
   Problem: **Radons out of hold.**
   Resolution: **Proceed with analysis. Remarks on COC.**
2. Person Contacted: Phone Number:
   Initiated By: Date:
   Problem:
   Resolution:

(2019144)
Monterey Bay Analytical Services
SP 1903284
IV-03/12/2019-13:31:34

March 8, 2019
Lab no. 219045

Ms. Kelly Donahue
Brown and Caldwell
1527 Cole Blvd, Suite 300
Golden, Colorado 80401

Dear Ms. Donahue:

Enclosed are the x-ray diffraction (XRD) results for five samples received last week. This report will be mailed and emailed to you. The samples will be held for future SEM analysis, as requested.

The samples were received wet so were air-dried for several days before grinding and analysis. A representative portion of each air-dried sample was ground to approximately -400 mesh in a steel swing mill, packed into a well-type plastic holder ("bulk mount") and then scanned with the diffractometer over the range, 3-61° 2θ using Cu-Kα radiation. The ground samples were also prepared as oriented mounts by mixing ground sample with distilled water, drawing the mixture onto a cellulose acetate filter and then rolling the deposited material onto a glass disk. The oriented mounts were scanned over the range 2-30°; treated with glycol and then re-scanned over the range 2-22°. Analysis of oriented mounts aids in the identification of clay minerals. The results of the scans are summarized as approximate mineral weight percent concentrations on the enclosed table. Estimates of mineral concentrations were made using our XRF-determined elemental compositions and the relative peak areas on the bulk XRD scans. The detection limit for an average mineral in these samples is ~1-3% and the analytical reproducibility is approximately equal to the square root of the amount. "Unidentified" accounts for that portion of the XRD scan which could not be resolved and a "?" indicates doubt in both mineral identification and amount.

Thank you for the opportunity to be of service to Brown and Caldwell.

Sincerely,

Peggy Dalheim

Brown and Caldwell **March 8, 2019**
XRD Results for Samples Received February 25 **Lab no. 219045**

		Approx. Wt %				
Mineral Name	**Chemical Formula**	**AA-880-930**	**A-555-875**	**B-420-550**	**BC-210-415**	**D-175-205**
Quartz	SiO_2	30	28	25	27	33
Plagioclase feldspar	$(Na,Ca)Al(Si,Al)_3O_8$	39	32	37	27	30
K-feldspar	$KAlSi_3O_8$	12	13	10	10	10
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$	<3	<3	<3	<2	<3
Smectite	$(Ca,Na)_x(Al,Mg,Fe)_4(Si,Al)_8O_{20}(OH,F)_4 \bullet nH_2O$	<10	<5	13	20	<10
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH,F)_2$	—	—	<3?	5	<5
Kaolinite	$Al_2Si_2O_5(OH)_4$	—	—	<5	6	<5
Clinoptilolite	$(Na,K,Ca)_6(Si,Al)_{36}O_{72} \bullet 20H_2O$	—	—	<3	—	<3
Calcite	$CaCO_3$	7	17	—	—	<3?
Pyrite	FeS_2	<3	<2	<2	<3	<2
“Unidentified”	?	<5	<5	<5	<5	<5

Initial _____

Date _____

Analysis performed by The Mineral Lab, Inc

March 18, 2019
Lab no. 219060

Ms. Kelly Donahue
Brown and Caldwell
1527 Cole Blvd, Suite 300
Golden, Colorado 80401

Dear Ms. Donahue:

Enclosed are the x-ray diffraction (XRD) results for two “Drill Mud” samples received last week. This report will be mailed and emailed to you.

The samples were received wet so were air-dried for several days before grinding and analysis. A representative portion of each air-dried sample was ground to approximately -400 mesh in a steel swing mill, packed into a well-type plastic holder (“bulk mount”) and then scanned with the diffractometer over the range, 3-61° 2θ using Cu-Kα radiation. The ground samples were also prepared as oriented mounts by mixing ground sample with distilled water, drawing the mixture onto a cellulose acetate filter and then rolling the deposited material onto a glass disk. The oriented mounts were scanned over the range 2-30°; treated with glycol and then re-scanned over the range 2-22°. Analysis of oriented mounts aids in the identification of clay minerals. The results of the scans are summarized as approximate mineral weight percent concentrations on the enclosed table. Estimates of mineral concentrations were made using our XRF-determined elemental compositions and the relative peak areas on the bulk XRD scans. The detection limit for an average mineral in these samples is ~1-3% and the analytical reproducibility is approximately equal to the square root of the amount. “Unidentified" accounts for that portion of the XRD scan which could not be resolved and a “?” indicates doubt in both mineral identification and amount.

Thank you for the opportunity to be of service to Brown and Caldwell.

Sincerely,

Peggy Dalheim

Brown and Caldwell **March 18, 2019**
XRD Results for "Drill Mud" Samples **Lab no. 219060**

Mineral Name	Chemical Formula	Approx. Wt % LS0021-01	Approx. Wt % LS0021-02
Quartz	SiO_2	9	11
Plagioclase feldspar	$(Na,Ca)Al(Si,Al)_3O_8$	29	33
K-feldspar	$KAlSi_3O_8$	5	5
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$	<3?	<3
Smectite	$(Ca,Na)_x(Al,Mg,Fe)_4(Si,Al)_8O_{20}(OH,F)_4 \bullet nH_2O$	38	33
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH,F)_2$	<5	<3?
Chlorite	$(Mg,Fe,Al)_6(Si,Al)_4O_{10}(OH)$	5	<5
Clinoptilolite	$(Na,K,Ca)_6(Si,Al)_{36}O_{72} \bullet 20H_2O$	<5	<3
Calcite	$CaCO_3$	—	<3
Pyrite	FeS_2	<3	<3
"Unidentified"	?	<5	<5

Initial _____

Date _____

Analysis performed by The Mineral Lab, Inc

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

March 13, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300
Golden, CO 80401

Bill to:
Deb Friede
Brown and Caldwell
1697 Cole Blvd., Suite 200
Golden, CO 80401

Project ID:
ACZ Project ID: L50021

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on February 19, 2019. This project has been assigned to ACZ's project number, L50021. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L50021. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 12, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: DRILL MUD 1

ACZ Sample ID: ***L50021-01***
Date Sampled: *02/16/19 00:30*
Date Received: *02/19/19*
Sample Matrix: *Leachate*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/12/19 11:13	ttg

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U	*	mg/L	0.03	0.2	03/06/19 21:00	aeh
Antimony, dissolved	M200.8 ICP-MS	1	0.0043		*	mg/L	0.0004	0.002	03/06/19 15:31	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0076		*	mg/L	0.0002	0.001	03/06/19 15:31	mfm
Barium, dissolved	M200.7 ICP	1	0.024		*	mg/L	0.003	0.02	03/06/19 21:00	aeh
Beryllium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00008	0.0003	03/06/19 15:31	mfm
Cadmium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/06/19 15:31	mfm
Calcium, dissolved	M200.7 ICP	1	66.8		*	mg/L	0.1	0.5	03/06/19 21:00	aeh
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:00	aeh
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:00	aeh
Iron, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.05	03/06/19 21:00	aeh
Lead, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	03/06/19 15:31	mfm
Magnesium, dissolved	M200.7 ICP	1	14.9		*	mg/L	0.2	1	03/06/19 21:00	aeh
Manganese, dissolved	M200.7 ICP	1	0.054		*	mg/L	0.005	0.03	03/06/19 21:00	aeh
Mercury, dissolved	M245.1 CVAA	1		U	*	mg/L	0.0002	0.001	03/08/19 14:24	che
Molybdenum, dissolved	M200.7 ICP	1	0.12		*	mg/L	0.02	0.1	03/06/19 21:00	aeh
Nickel, dissolved	M200.7 ICP	1		U	*	mg/L	0.008	0.04	03/06/19 21:00	aeh
Phosphorus, dissolved	M200.7 - ICP	1		U	*	mg/L	0.1	0.5	03/06/19 21:00	aeh
Potassium, dissolved	M200.7 ICP	1	10.4		*	mg/L	0.2	1	03/06/19 21:00	aeh
Selenium, dissolved	M200.8 ICP-MS	1	0.0031		*	mg/L	0.0001	0.0003	03/06/19 15:31	mfm
Silica, dissolved	M200.7 ICP	1	22.4		*	mg/L	0.2	1	03/06/19 21:00	aeh
Silver, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.03	03/06/19 21:00	aeh
Sodium, dissolved	M200.7 ICP	1	184		*	mg/L	0.2	1	03/06/19 21:00	aeh
Strontium, dissolved	M200.7 ICP	1	0.631		*	mg/L	0.005	0.03	03/06/19 21:00	aeh
Thallium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	03/06/19 15:31	mfm
Uranium, dissolved	M200.8 ICP-MS	1	0.0074		*	mg/L	0.0001	0.0005	03/06/19 15:31	mfm
Zinc, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:00	aeh

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Pressure Filter (0.45um)	SOPWC050								02/27/19 11:30	cra

Brown and Caldwell
Project ID:
Sample ID: DRILL MUD 1

ACZ Sample ID: ***L50021-01***
Date Sampled: *02/16/19 00:30*
Date Received: *02/19/19*
Sample Matrix: *Leachate*

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	174	H	*	mg/L	2	20	03/06/19 0:00	kja
Carbonate as CaCO3		1		UH	*	mg/L	2	20	03/06/19 0:00	kja
Hydroxide as CaCO3		1		UH	*	mg/L	2	20	03/06/19 0:00	kja
Total Alkalinity		1	174	H	*	mg/L	2	20	03/06/19 0:00	kja
Chloride	SM4500Cl-E	10	120		*	mg/L	5	20	03/11/19 9:41	rbt
Fluoride	SM4500F-C	1	0.28	B	*	mg/L	0.05	0.3	03/07/19 14:54	emk
Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1		UH	*	mg/L	0.02	0.1	03/06/19 21:37	pjb
Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1		UH	*	mg/L	0.01	0.05	03/06/19 21:37	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	0.41		*	mg/L	0.05	0.2	03/11/19 12:20	mss2
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.5		*	mg/L	0.1	0.5	03/12/19 22:05	pjb
Sulfate	D516-02/-07 - Turbidimetric	15	269		*	mg/L	15	75	03/12/19 9:12	rbt

Brown and Caldwell
Project ID:
Sample ID: DRILL MUD 2

ACZ Sample ID: ***L50021-02***
Date Sampled: *02/17/19 10:00*
Date Received: *02/19/19*
Sample Matrix: *Leachate*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/12/19 11:28	ttg

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U	*	mg/L	0.03	0.2	03/06/19 21:03	aeh
Antimony, dissolved	M200.8 ICP-MS	1	0.0042		*	mg/L	0.0004	0.002	03/06/19 15:33	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0092		*	mg/L	0.0002	0.001	03/06/19 15:33	mfm
Barium, dissolved	M200.7 ICP	1	0.041		*	mg/L	0.003	0.02	03/06/19 21:03	aeh
Beryllium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00008	0.0003	03/06/19 15:33	mfm
Cadmium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/06/19 15:33	mfm
Calcium, dissolved	M200.7 ICP	1	84.0		*	mg/L	0.1	0.5	03/06/19 21:03	aeh
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:03	aeh
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:03	aeh
Iron, dissolved	M200.7 ICP	1	0.05		*	mg/L	0.02	0.05	03/06/19 21:03	aeh
Lead, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	03/06/19 15:33	mfm
Magnesium, dissolved	M200.7 ICP	1	18.7		*	mg/L	0.2	1	03/06/19 21:03	aeh
Manganese, dissolved	M200.7 ICP	1	0.057		*	mg/L	0.005	0.03	03/06/19 21:03	aeh
Mercury, dissolved	M245.1 CVAA	1		U	*	mg/L	0.0002	0.001	03/08/19 14:25	che
Molybdenum, dissolved	M200.7 ICP	1	0.12		*	mg/L	0.02	0.1	03/06/19 21:03	aeh
Nickel, dissolved	M200.7 ICP	1	0.010	B	*	mg/L	0.008	0.04	03/06/19 21:03	aeh
Phosphorus, dissolved	M200.7 - ICP	1		U	*	mg/L	0.1	0.5	03/06/19 21:03	aeh
Potassium, dissolved	M200.7 ICP	1	10.7		*	mg/L	0.2	1	03/06/19 21:03	aeh
Selenium, dissolved	M200.8 ICP-MS	1	0.0021		*	mg/L	0.0001	0.0003	03/06/19 15:33	mfm
Silica, dissolved	M200.7 ICP	1	25.1		*	mg/L	0.2	1	03/06/19 21:03	aeh
Silver, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.03	03/06/19 21:03	aeh
Sodium, dissolved	M200.7 ICP	1	239		*	mg/L	0.2	1	03/06/19 21:03	aeh
Strontium, dissolved	M200.7 ICP	1	0.699		*	mg/L	0.005	0.03	03/06/19 21:03	aeh
Thallium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	03/06/19 15:33	mfm
Uranium, dissolved	M200.8 ICP-MS	1	0.0072		*	mg/L	0.0001	0.0005	03/06/19 15:33	mfm
Zinc, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	03/06/19 21:03	aeh

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Pressure Filter (0.45um)	SOPWC050								02/27/19 11:30	cra

Brown and Caldwell
Project ID:
Sample ID: DRILL MUD 2

ACZ Sample ID: ***L50021-02***
Date Sampled: *02/17/19 10:00*
Date Received: *02/19/19*
Sample Matrix: *Leachate*

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	200	H	*	mg/L	2	20	03/06/19 0:00	kja
Carbonate as CaCO3		1		UH	*	mg/L	2	20	03/06/19 0:00	kja
Hydroxide as CaCO3		1		UH	*	mg/L	2	20	03/06/19 0:00	kja
Total Alkalinity		1	200	H	*	mg/L	2	20	03/06/19 0:00	kja
Chloride	SM4500Cl-E	10	201		*	mg/L	5	20	03/11/19 9:41	rbt
Fluoride	SM4500F-C	1	0.32		*	mg/L	0.05	0.3	03/07/19 15:02	emk
Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1	0.05	BH	*	mg/L	0.02	0.1	03/06/19 21:39	pjb
Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1		UH	*	mg/L	0.01	0.05	03/06/19 21:39	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/11/19 12:21	mss2
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.4	B	*	mg/L	0.1	0.5	03/12/19 22:06	pjb
Sulfate	D516-02/-07 - Turbidimetric	15	292		*	mg/L	15	75	03/12/19 9:12	rbt

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4)	EPA SW-846. Test Methods for Evaluating Solid Waste.
(5)	Standard Methods for the Examination of Water and Wastewater.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5)	If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

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ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467551													
WG467551PBW1	PBW	03/06/19 15:19				20.5	mg/L		-20	20			B4 B7
WG467551LCSW3	LCSW	03/06/19 15:36	WC190221-1	820.0001		786	mg/L	96	90	110			
L50261-01DUP	DUP	03/06/19 17:30			130	144	mg/L				10	20	
WG467551LCSW6	LCSW	03/06/19 19:15	WC190221-1	820.0001		789	mg/L	96	90	110			
WG467551PBW2	PBW	03/06/19 19:22				3.5	mg/L		-20	20			
WG467551LCSW9	LCSW	03/06/19 22:11	WC190221-1	820.0001		796	mg/L	97	90	110			
WG467551PBW3	PBW	03/06/19 22:17				2.3	mg/L		-20	20			
WG467551LCSW12	LCSW	03/07/19 2:36	WC190221-1	820.0001		802	mg/L	98	90	110			
WG467551PBW4	PBW	03/07/19 2:43				2.6	mg/L		-20	20			
WG467551LCSW15	LCSW	03/07/19 6:38	WC190221-1	820.0001		808	mg/L	99	90	110			

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.969	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.09	0.09			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	1.0006		.998	mg/L	100	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	1.0006	U	1.023	mg/L	102	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	1.0006	U	1.015	mg/L	101	85	115	1	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.02		.02099	mg/L	105	90	110			
WG467567ICB	ICB	03/06/19 15:27				.00069	mg/L		-0.00088	0.00088			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.01		.00944	mg/L	94	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.01	.0007	.00928	mg/L	86	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.01	.0007	.00941	mg/L	87	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.05038	mg/L	101	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00044	0.00044			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.05005		.05072	mg/L	101	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.05005	.002	.05676	mg/L	109	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.05005	.002	.05531	mg/L	107	70	130	3	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		2.0035	mg/L	100	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.009	0.009			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.4995		.4915	mg/L	98	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.4995	U	.4838	mg/L	97	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.4995	U	.4892	mg/L	98	85	115	1	20	

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ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.049839	mg/L	100	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.000176	0.000176			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.05005		.048958	mg/L	98	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.05005	U	.04523	mg/L	90	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.05005	U	.044723	mg/L	89	70	130	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.049639	mg/L	99	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00011	0.00011			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.05005		.04899	mg/L	98	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.05005	.00116	.052983	mg/L	104	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.05005	.00116	.052123	mg/L	102	70	130	2	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	100		97.85	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.3	0.3			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	68.01315		68.08	mg/L	100	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	68.01315	3.5	71.15	mg/L	99	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	68.01315	3.5	71.16	mg/L	99	85	115	0	20	

Chloride SM4500Cl-E

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467733													
WG467733ICB	ICB	03/11/19 8:38				U	mg/L		-1.5	1.5			
WG467733ICV	ICV	03/11/19 8:38	WI180530-1	54.89		54.5	mg/L	99	90	110			
WG467733LFB1	LFB	03/11/19 9:32	WI190111-6	30.03		31.26	mg/L	104	90	110			
L50274-04DUP	DUP	03/11/19 9:32			69.7	69.87	mg/L				0	20	
L50274-03AS	AS	03/11/19 9:41	10XCL	30	364	379.3	mg/L	51	90	110			M3
WG467733LFB2	LFB	03/11/19 9:49	WI190111-6	30.03		31.08	mg/L	103	90	110			

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.961	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.03	0.03			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.5025		.493	mg/L	98	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.5025	U	.487	mg/L	97	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.5025	U	.492	mg/L	98	85	115	1	20	

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ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.954	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.03	0.03			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.4995		.492	mg/L	98	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.4995	U	.484	mg/L	97	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.4995	U	.49	mg/L	98	85	115	1	20	

Fluoride SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467602													
WG467602ICV	ICV	03/07/19 11:56	WC190301-1	2.01		2.009	mg/L	100	90	110			
WG467602ICB	ICB	03/07/19 12:01				U	mg/L		-0.15	0.15			
WG467602LFB1	LFB	03/07/19 12:08	WC181119-2	5.015		5.023	mg/L	100	90	110			
L45960-32AS	AS	03/07/19 13:46	WC181119-2	5.015	.23	5.286	mg/L	101	90	110			
L45960-32ASD	ASD	03/07/19 13:54	WC181119-2	5.015	.23	5.3	mg/L	101	90	110	0	20	
WG467602LFB2	LFB	03/07/19 15:10	WC181119-2	5.015		5.188	mg/L	103	90	110			

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.941	mg/L	97	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.06	0.06			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	1.0018		1.001	mg/L	100	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	1.0018	U	.982	mg/L	98	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	1.0018	U	.986	mg/L	98	85	115	0	20	

Lead, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.05106	mg/L	102	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00022	0.00022			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.0496		.05052	mg/L	102	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.0496	.0003	.0504	mg/L	101	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.0496	.0003	.04929	mg/L	99	70	130	2	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	100		98.3	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.6	0.6			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	50.12891		49.82	mg/L	99	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	50.12891	.5	49.99	mg/L	99	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	50.12891	.5	50.23	mg/L	99	85	115	0	20	

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ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.9362	mg/L	97	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.015	0.015			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.4995		.4959	mg/L	99	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.4995	.01	.4973	mg/L	98	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.4995	.01	.504	mg/L	99	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467603													
WG467603ICV	ICV	03/08/19 13:55	HG190214-3	.004995		.00501	mg/L	100	95	105			
WG467603ICB	ICB	03/08/19 13:56				U	mg/L		-0.0002	0.0002			
WG467603LRB	LRB	03/08/19 13:58				U	mg/L		-0.00044	0.00044			
WG467603LFB	LFB	03/08/19 13:58	HG190228-3	.002002		.00174	mg/L	87	85	115			
L45960-32LFM	LFM	03/08/19 14:14	HG190228-3	.002002	U	.00178	mg/L	89	85	115			
L45960-32LFMD	LFMD	03/08/19 14:15	HG190228-3	.002002	U	.00176	mg/L	88	85	115	1	20	

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		2.015	mg/L	101	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.06	0.06			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.4975		.504	mg/L	101	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.4975	U	.486	mg/L	98	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.4975	U	.489	mg/L	98	85	115	1	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2.004		1.9718	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.024	0.024			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.5		.5008	mg/L	100	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.5	U	.5032	mg/L	101	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.5	U	.5032	mg/L	101	85	115	0	20	

Nitrate/Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467580													
WG467580ICV	ICV	03/06/19 21:31	WI190207-3	2.416		2.531	mg/L	105	90	110			
WG467580ICB	ICB	03/06/19 21:32				U	mg/L		-0.02	0.02			
WG467580LFB	LFB	03/06/19 21:36	WI181204-13	2		1.955	mg/L	98	90	110			
L50329-01DUP	DUP	03/06/19 21:44			3.54	3.565	mg/L				1	20	
L50036-01AS	AS	03/06/19 22:00	WI181204-13	4	2.22	6.172	mg/L	99	90	110			

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ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467580													
WG467580ICV	ICV	03/06/19 21:31	WI190207-3	.609		.553	mg/L	91	90	110			
WG467580ICB	ICB	03/06/19 21:32				U	mg/L		-0.01	0.01			
WG467580LFB	LFB	03/06/19 21:36	WI181204-13	1		.977	mg/L	98	90	110			
L50036-01AS	AS	03/06/19 21:41	WI181204-13	1	U	.991	mg/L	99	90	110			
L50329-01DUP	DUP	03/06/19 21:44			.01	.011	mg/L				10	20	RA

Nitrogen, ammonia M350.1 Auto Salicylate w/gas diffusion

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467746													
WG467746ICV	ICV	03/11/19 10:46	WI190206-2	12		11.71	mg/L	98	90	110			
WG467746ICB	ICB	03/11/19 10:48				U	mg/L		-0.05	0.05			
WG467760													
WG467760LFB	LFB	03/11/19 12:18	WI180918-3	10		9.958	mg/L	100	90	110			
L50313-01DUP	DUP	03/11/19 12:24			U	U	mg/L				0	20	RA
L50313-02AS	AS	03/11/19 12:27	WI180918-3	10	U	10.219	mg/L	102	90	110			

Nitrogen, total Kjeldahl M351.2 - TKN by Block Digester

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467890													
WG467890ICV	ICV	03/12/19 22:00	WI190304-2	4		4.25	mg/L	106	90	110			
WG467890ICB	ICB	03/12/19 22:01				U	mg/L		-0.1	0.1			
WG467819LRB	LRB	03/12/19 22:02				U	mg/L		-0.1	0.1			
WG467819LFB	LFB	03/12/19 22:04	WI190301-2	2.5		2.43	mg/L	97	90	110			
L50368-01DUP	DUP	03/12/19 22:10			2	2.34	mg/L				16	20	
L50336-03LFM	LFM	03/12/19 22:37	WI190301-2	2.5	2.5	5.41	mg/L	116	90	110			M1

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	5.0075		5.07	mg/L	101	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.3	0.3			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	1.004		1.04	mg/L	104	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	1.004	U	.99	mg/L	99	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	1.004	U	1.09	mg/L	109	85	115	10	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	20		19.95	mg/L	100	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.6	0.6			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	101.8741		99.86	mg/L	98	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	101.8741	1.6	100.4	mg/L	97	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	101.8741	1.6	101.1	mg/L	98	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.05202	mg/L	104	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00022	0.00022			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.05005		.05124	mg/L	102	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.05005	.0004	.05942	mg/L	118	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.05005	.0004	.056	mg/L	111	70	130	6	20	

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	42.8		42.54	mg/L	99	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.6	0.6			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	21.415		21.92	mg/L	102	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	21.415	1.4	23.23	mg/L	102	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	21.415	1.4	23.4	mg/L	103	85	115	1	20	

Silver, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	1.001		.97	mg/L	97	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.03	0.03			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.502		.498	mg/L	99	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.502	U	.4	mg/L	80	85	115			M2 ZA
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.502	U	.388	mg/L	77	85	115	3	20	M2 ZA

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	100		98.64	mg/L	99	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.6	0.6			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	100.2674		99.44	mg/L	99	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	100.2674	U	98.9	mg/L	99	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	100.2674	U	99.33	mg/L	99	85	115	0	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.9755	mg/L	99	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.015	0.015			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.5005		.4985	mg/L	100	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.5005	.007	.502	mg/L	99	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.5005	.007	.5035	mg/L	99	85	115	0	20	

Brown and Caldwell

ACZ Project ID: ***L50021***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sulfate D516-02/-07 - Turbidimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467818													
WG467818ICB	ICB	03/12/19 8:36				U	mg/L		-3	3			
WG467818ICV	ICV	03/12/19 8:36	WI190306-2	20		20.6	mg/L	103	90	110			
WG467818LFB	LFB	03/12/19 8:55	WI181024-4	10.03		9.3	mg/L	93	90	110			
L50313-02DUP	DUP	03/12/19 9:14			1410	1250	mg/L				12	20	
L50313-01AS	AS	03/12/19 9:57	SO4TURB75X	9.9999975	2640	2630	mg/L	-100	90	110			M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.05223	mg/L	104	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00022	0.00022			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.0501		.04927	mg/L	98	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.0501	U	.04636	mg/L	93	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.0501	U	.04547	mg/L	91	70	130	2	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467567													
WG467567ICV	ICV	03/06/19 15:26	MS190225-2	.05		.05025	mg/L	101	90	110			
WG467567ICB	ICB	03/06/19 15:27				U	mg/L		-0.00022	0.00022			
WG467567LFB	LFB	03/06/19 15:29	MS190208-2	.05		.04919	mg/L	98	85	115			
L50218-01AS	AS	03/06/19 15:36	MS190208-2	.05	.0001	.05263	mg/L	105	70	130			
L50218-01ASD	ASD	03/06/19 15:38	MS190208-2	.05	.0001	.05145	mg/L	103	70	130	2	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG467571													
WG467571ICV	ICV	03/06/19 19:13	II190211-1	2		1.96	mg/L	98	95	105			
WG467571ICB	ICB	03/06/19 19:19				U	mg/L		-0.03	0.03			
WG467571LFB	LFB	03/06/19 19:32	II190301-2	.4942		.508	mg/L	103	85	115			
L45963-32AS	AS	03/06/19 20:34	II190301-2	.4942	U	.514	mg/L	104	85	115			
L45963-32ASD	ASD	03/06/19 20:37	II190301-2	.4942	U	.512	mg/L	104	85	115	0	20	

Brown and Caldwell ACZ Project ID: ***L50021***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L50021-01	WG467567	Beryllium, dissolved	M200.8 ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
	WG467733	Chloride	SM4500Cl-E	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467580	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG467760	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG467890	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467571	Silver, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.7 ICP	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG467818	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467551	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
			SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.
L50021-02	WG467567	Beryllium, dissolved	M200.8 ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
	WG467733	Chloride	SM4500Cl-E	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467580	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG467760	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG467890	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467571	Silver, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.7 ICP	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG467818	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG467551	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
			SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.8 ICP-MS
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.7 ICP
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Bicarbonate as CaCO3	SM2320B - Titration
Carbonate as CaCO3	SM2320B - Titration
Chloride	SM4500Cl-E
Fluoride	SM4500F-C
Hydroxide as CaCO3	SM2320B - Titration
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester
Total Alkalinity	SM2320B - Titration

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L50021
Date Received: 02/19/2019 11:38
Received By:
Date Printed: 2/20/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	X		

A change was made in the Analyses Requested Sections 1 and 2 section prior to ACZ custody.

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
6153	0.6	NA	14	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L50021
Date Received:	02/19/2019 11:38
Received By:	
Date Printed:	2/20/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 50021

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd Ste. 300
Company: Brown and Caldwell	Golden CO 80401
E-mail: Kdonahue@brwncald.com	Telephone: 303-239-5408

Copy of Report to:

Name: Kelly Donahue	E-mail: Same
Company: BC	Telephone: Same

Invoice to:

Name: Kelly Donahue	Address: Same
Company: BC	
E-mail: same	Telephone: same

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: Kelly Donahue **Sampler's Site Information** **State** CA **Zip code** 90501 **Time Zone** PST

***Sampler's Signature:** Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL CREEK WD

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material?

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Metals	Major ions	Pressure Filter					
Drill Mud 1	2-16-19 0030	Mud	2	X	X	X					
Drill Mud 2	2-17-19 1000	Mud	2	X	X	X					

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please save filtercake and send to The Mineral Lab in Colorado for XRD Analysis. Call for clarification if needed

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	02-18-19 1200		2/19/19 11:38

L50021 Chain of Custod

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Bottle Order
Bottle List

Account: BAC/Brown and Caldwell
Bottle Order: BO41485

Bill to Account: Bill to ACZ
Ship Date Requested: 01/28/2019
Request Placed at: 01/25/2019 14:28
Service Requested: UPS Ground

Sampling supplies

PACK	Qty	ACZ ID	Type	Description
	1	COC	Chain of Custody	Chain of Custody, 1 for 10 samples.
	2	SEAL	Custody Seal	Custody seals for cooler, two for each cooler.
	1	RETURN	Return Address	Return Address label, one for each cooler.
	8	LABELS	Sample Labels	ACZ supplied labels for sample containers

ACZ Coolers

PACK	Qty	ACZ ID	Size	Weight	UPS Tracking Number
	1	6153	Large	10	1Z8101300317230837

Set number: ANIONS/METALS
Sample Quantity: 4

ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
	1	RAW	1000 ML	Raw	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.
	1	RAW PC	250 ML	Raw PC	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.

Prepared By/Date: _____

SW

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51315

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51315. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51315. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

May 24, 2019

Project ID:
ACZ Project ID: L51315

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 5 miscellaneous samples from Brown and Caldwell on April 24, 2019. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L51315. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with an "H3", received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. Silica (B1) - SiO2 is present in prep blank above the method reporting limit. The PBS was prepped using Ottawa sand containing SiO2.

Brown and Caldwell
Project ID:
Sample ID: AA-880-930

ACZ Sample ID: ***L51315-01***
Date Sampled: *02/18/19 18:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	10100	70500		*	mg/Kg	500	3000	05/24/19 13:40	jlw/ dc
Antimony, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	5	30	05/20/19 16:02	mfm
Arsenic, total (3052)	M6020B ICP-MS	12600	8	B		mg/Kg	3	10	05/20/19 16:02	mfm
Barium, total (3052)	M6010D ICP	10100	730		*	mg/Kg	70	400	05/24/19 13:40	jlw/ dc
Beryllium, total (3052)	M6020B ICP-MS	25300		U	*	mg/Kg	2	6	05/22/19 15:50	mfm
Cadmium, total (3052)	M6020B ICP-MS	12600	2.4	B		mg/Kg	0.6	3	05/20/19 16:02	mfm
Calcium, total (3052)	M6010D ICP	10100	45000			mg/Kg	1000	5000	05/24/19 13:40	jlw/ dc
Chromium, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	500	05/24/19 13:40	jlw/ dc
Copper, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:40	jlw/ dc
Iron, total (3052)	M6010D ICP	10100	34400		*	mg/Kg	300	800	05/24/19 13:40	jlw/ dc
Lead, total (3052)	M6020B ICP-MS	12600	12		*	mg/Kg	1	6	05/20/19 16:02	mfm
Magnesium, total (3052)	M6010D ICP	10100	13000		*	mg/Kg	2000	10000	05/24/19 13:40	jlw/ dc
Manganese, total (3052)	M6010D ICP	10100	600			mg/Kg	100	500	05/24/19 13:40	jlw/ dc
Mercury by Direct Combustion AA	M7473 CVAAS	1	26.4	H	*	ng/g	1.8	9	05/20/19 11:55	dcm
Molybdenum, total (3052)	M6010D ICP	10100		U	*	mg/Kg	200	1000	05/24/19 13:40	jlw/ dc
Nickel, total (3052)	M6010D ICP	10100		U	*	mg/Kg	80	400	05/24/19 13:40	jlw/ dc
Potassium, total (3052)	M6010D ICP	10100	15000			mg/Kg	2000	10000	05/24/19 13:40	jlw/ dc
Selenium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	3	05/20/19 16:02	mfm
Silica, total (3052)	M6010D ICP	10100	670000		*	mg/Kg	2000	10000	05/24/19 13:40	jlw/ dc
Silver, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	300	05/24/19 13:40	jlw/ dc
Sodium, total (3052)	M6010D ICP	10100	20000		*	mg/Kg	2000	10000	05/24/19 13:40	jlw/ dc
Strontium, total (3052)	M6010D ICP	10100	480	B		mg/Kg	90	500	05/24/19 13:40	jlw/ dc
Thallium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	6	05/20/19 16:02	mfm
Uranium, total (3052)	M6020B ICP-MS	12600	2	B	*	mg/Kg	1	6	05/20/19 16:02	mfm
Zinc, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:40	jlw/ dc

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	72.9		*	%	0.1	0.5	05/03/19 1:46	wd/ajm

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								05/01/19 13:36	ajm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								05/09/19 7:55	ajm
ICP 3052 Digestion	M3052								05/15/19 11:00	ajm
ICPMS 3052 Digestion	M3052								05/15/19 11:00	ajm

Brown and Caldwell
Project ID:
Sample ID: A-555-875

ACZ Sample ID: ***L51315-02***
Date Sampled: *02/19/19 09:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	10100	64100		*	mg/Kg	500	3000	05/24/19 13:44	jlw/ dc
Antimony, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	5	30	05/20/19 16:07	mfm
Arsenic, total (3052)	M6020B ICP-MS	12600	8	B		mg/Kg	3	10	05/20/19 16:07	mfm
Barium, total (3052)	M6010D ICP	10100	820		*	mg/Kg	70	400	05/24/19 13:44	jlw/ dc
Beryllium, total (3052)	M6020B ICP-MS	25200		U	*	mg/Kg	2	6	05/22/19 15:55	mfm
Cadmium, total (3052)	M6020B ICP-MS	12600	2.2	B		mg/Kg	0.6	3	05/20/19 16:07	mfm
Calcium, total (3052)	M6010D ICP	10100	56000			mg/Kg	1000	5000	05/24/19 13:44	jlw/ dc
Chromium, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	500	05/24/19 13:44	jlw/ dc
Copper, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:44	jlw/ dc
Iron, total (3052)	M6010D ICP	10100	32600		*	mg/Kg	300	800	05/24/19 13:44	jlw/ dc
Lead, total (3052)	M6020B ICP-MS	12600	12		*	mg/Kg	1	6	05/20/19 16:07	mfm
Magnesium, total (3052)	M6010D ICP	10100	11000		*	mg/Kg	2000	10000	05/24/19 13:44	jlw/ dc
Manganese, total (3052)	M6010D ICP	10100	700			mg/Kg	100	500	05/24/19 13:44	jlw/ dc
Mercury by Direct Combustion AA	M7473 CVAAS	1	15.2	H	*	ng/g	1.69	8.45	05/20/19 12:02	dcm
Molybdenum, total (3052)	M6010D ICP	10100		U	*	mg/Kg	200	1000	05/24/19 13:44	jlw/ dc
Nickel, total (3052)	M6010D ICP	10100		U	*	mg/Kg	80	400	05/24/19 13:44	jlw/ dc
Potassium, total (3052)	M6010D ICP	10100	17000			mg/Kg	2000	10000	05/24/19 13:44	jlw/ dc
Selenium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	3	05/20/19 16:07	mfm
Silica, total (3052)	M6010D ICP	10100	683000		*	mg/Kg	2000	10000	05/24/19 13:44	jlw/ dc
Silver, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	300	05/24/19 13:44	jlw/ dc
Sodium, total (3052)	M6010D ICP	10100	19000		*	mg/Kg	2000	10000	05/24/19 13:44	jlw/ dc
Strontium, total (3052)	M6010D ICP	10100	450	B		mg/Kg	90	500	05/24/19 13:44	jlw/ dc
Thallium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	6	05/20/19 16:07	mfm
Uranium, total (3052)	M6020B ICP-MS	12600	2	B	*	mg/Kg	1	6	05/20/19 16:07	mfm
Zinc, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:44	jlw/ dc

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	81.1		*	%	0.1	0.5	05/03/19 4:09	wd/ajm

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								05/01/19 14:00	ajm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								05/09/19 8:44	ajm
ICP 3052 Digestion	M3052								05/15/19 11:00	ajm
ICPMS 3052 Digestion	M3052								05/15/19 11:00	ajm

Brown and Caldwell
Project ID:
Sample ID: B-420-550

ACZ Sample ID: ***L51315-03***
Date Sampled: *02/19/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	10200	59700		*	mg/Kg	500	3000	05/24/19 13:48	jlw/ dc
Antimony, total (3052)	M6020B ICP-MS	12700		U	*	mg/Kg	5	30	05/20/19 16:09	mfm
Arsenic, total (3052)	M6020B ICP-MS	12700	9	B		mg/Kg	3	10	05/20/19 16:09	mfm
Barium, total (3052)	M6010D ICP	10200	540		*	mg/Kg	70	400	05/24/19 13:48	jlw/ dc
Beryllium, total (3052)	M6020B ICP-MS	25400		U	*	mg/Kg	2	6	05/22/19 15:57	mfm
Cadmium, total (3052)	M6020B ICP-MS	12700	2.6	B		mg/Kg	0.6	3	05/20/19 16:09	mfm
Calcium, total (3052)	M6010D ICP	10200	33000			mg/Kg	1000	5000	05/24/19 13:48	jlw/ dc
Chromium, total (3052)	M6010D ICP	10200		U	*	mg/Kg	100	500	05/24/19 13:48	jlw/ dc
Copper, total (3052)	M6010D ICP	10200		U		mg/Kg	100	500	05/24/19 13:48	jlw/ dc
Iron, total (3052)	M6010D ICP	10200	39900		*	mg/Kg	300	800	05/24/19 13:48	jlw/ dc
Lead, total (3052)	M6020B ICP-MS	12700	12		*	mg/Kg	1	6	05/20/19 16:09	mfm
Magnesium, total (3052)	M6010D ICP	10200	8000	B	*	mg/Kg	2000	10000	05/24/19 13:48	jlw/ dc
Manganese, total (3052)	M6010D ICP	10200	600			mg/Kg	100	500	05/24/19 13:48	jlw/ dc
Mercury by Direct Combustion AA	M7473 CVAAS	1	43.4	H	*	ng/g	1.72	8.6	05/20/19 12:15	dcm
Molybdenum, total (3052)	M6010D ICP	10200		U	*	mg/Kg	200	1000	05/24/19 13:48	jlw/ dc
Nickel, total (3052)	M6010D ICP	10200	90	B	*	mg/Kg	80	400	05/24/19 13:48	jlw/ dc
Potassium, total (3052)	M6010D ICP	10200	14000			mg/Kg	2000	10000	05/24/19 13:48	jlw/ dc
Selenium, total (3052)	M6020B ICP-MS	12700		U	*	mg/Kg	1	3	05/20/19 16:09	mfm
Silica, total (3052)	M6010D ICP	10200	654000		*	mg/Kg	2000	10000	05/24/19 13:48	jlw/ dc
Silver, total (3052)	M6010D ICP	10200		U	*	mg/Kg	100	300	05/24/19 13:48	jlw/ dc
Sodium, total (3052)	M6010D ICP	10200	19000		*	mg/Kg	2000	10000	05/24/19 13:48	jlw/ dc
Strontium, total (3052)	M6010D ICP	10200	490	B		mg/Kg	90	500	05/24/19 13:48	jlw/ dc
Thallium, total (3052)	M6020B ICP-MS	12700		U	*	mg/Kg	1	6	05/20/19 16:09	mfm
Uranium, total (3052)	M6020B ICP-MS	12700	2	B	*	mg/Kg	1	6	05/20/19 16:09	mfm
Zinc, total (3052)	M6010D ICP	10200		U		mg/Kg	100	500	05/24/19 13:48	jlw/ dc

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	69.0		*	%	0.1	0.5	05/03/19 6:32	wd/ajm

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								05/01/19 14:24	ajm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								05/09/19 9:33	ajm
ICP 3052 Digestion	M3052								05/15/19 11:00	ajm
ICPMS 3052 Digestion	M3052								05/15/19 11:00	ajm

Brown and Caldwell
Project ID:
Sample ID: BC-210-415

ACZ Sample ID: ***L51315-04***
Date Sampled: *02/19/19 13:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	10100	61700		*	mg/Kg	500	3000	05/24/19 13:56	jlw/ dc
Antimony, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	5	30	05/20/19 16:13	mfm
Arsenic, total (3052)	M6020B ICP-MS	12600	8	B		mg/Kg	3	10	05/20/19 16:13	mfm
Barium, total (3052)	M6010D ICP	10100	630		*	mg/Kg	70	400	05/24/19 13:56	jlw/ dc
Beryllium, total (3052)	M6020B ICP-MS	25200		U	*	mg/Kg	2	6	05/22/19 16:01	mfm
Cadmium, total (3052)	M6020B ICP-MS	12600	1.5	B		mg/Kg	0.6	3	05/20/19 16:13	mfm
Calcium, total (3052)	M6010D ICP	10100	40000			mg/Kg	1000	5000	05/24/19 13:56	jlw/ dc
Chromium, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	500	05/24/19 13:56	jlw/ dc
Copper, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:56	jlw/ dc
Iron, total (3052)	M6010D ICP	10100	32500		*	mg/Kg	300	800	05/24/19 13:56	jlw/ dc
Lead, total (3052)	M6020B ICP-MS	12600	11		*	mg/Kg	1	6	05/20/19 16:13	mfm
Magnesium, total (3052)	M6010D ICP	10100	13000		*	mg/Kg	2000	10000	05/24/19 13:56	jlw/ dc
Manganese, total (3052)	M6010D ICP	10100	700			mg/Kg	100	500	05/24/19 13:56	jlw/ dc
Mercury by Direct Combustion AA	M7473 CVAAS	1	22.9	H	*	ng/g	1.78	8.9	05/20/19 12:29	dcm
Molybdenum, total (3052)	M6010D ICP	10100		U	*	mg/Kg	200	1000	05/24/19 13:56	jlw/ dc
Nickel, total (3052)	M6010D ICP	10100	130	B	*	mg/Kg	80	400	05/24/19 13:56	jlw/ dc
Potassium, total (3052)	M6010D ICP	10100	17000			mg/Kg	2000	10000	05/24/19 13:56	jlw/ dc
Selenium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	3	05/20/19 16:13	mfm
Silica, total (3052)	M6010D ICP	10100	683000		*	mg/Kg	2000	10000	05/24/19 13:56	jlw/ dc
Silver, total (3052)	M6010D ICP	10100		U	*	mg/Kg	100	300	05/24/19 13:56	jlw/ dc
Sodium, total (3052)	M6010D ICP	10100	18000		*	mg/Kg	2000	10000	05/24/19 13:56	jlw/ dc
Strontium, total (3052)	M6010D ICP	10100	510			mg/Kg	90	500	05/24/19 13:56	jlw/ dc
Thallium, total (3052)	M6020B ICP-MS	12600		U	*	mg/Kg	1	6	05/20/19 16:13	mfm
Uranium, total (3052)	M6020B ICP-MS	12600	2	B	*	mg/Kg	1	6	05/20/19 16:13	mfm
Zinc, total (3052)	M6010D ICP	10100		U		mg/Kg	100	500	05/24/19 13:56	jlw/ dc

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	77.6		*	%	0.1	0.5	05/03/19 8:55	wd/ajm

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								05/01/19 14:48	ajm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								05/09/19 10:22	ajm
ICP 3052 Digestion	M3052								05/15/19 11:00	ajm
ICPMS 3052 Digestion	M3052								05/15/19 11:00	ajm

Brown and Caldwell
Project ID:
Sample ID: D-175-205

ACZ Sample ID: ***L51315-05***
Date Sampled: *02/19/19 17:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	10200	68700		*	mg/Kg	500	3000	05/24/19 14:00	jlw/ dc
Antimony, total (3052)	M6020B ICP-MS	12800		U	*	mg/Kg	5	30	05/20/19 16:18	mfm
Arsenic, total (3052)	M6020B ICP-MS	12800	9	B		mg/Kg	3	10	05/20/19 16:18	mfm
Barium, total (3052)	M6010D ICP	10200	530		*	mg/Kg	70	400	05/24/19 14:00	jlw/ dc
Beryllium, total (3052)	M6020B ICP-MS	25500		U	*	mg/Kg	2	6	05/22/19 16:02	mfm
Cadmium, total (3052)	M6020B ICP-MS	12800	2.2	B		mg/Kg	0.6	3	05/20/19 16:18	mfm
Calcium, total (3052)	M6010D ICP	10200	35000			mg/Kg	1000	5000	05/24/19 14:00	jlw/ dc
Chromium, total (3052)	M6010D ICP	10200	100	B	*	mg/Kg	100	500	05/24/19 14:00	jlw/ dc
Copper, total (3052)	M6010D ICP	10200		U		mg/Kg	100	500	05/24/19 14:00	jlw/ dc
Iron, total (3052)	M6010D ICP	10200	37300		*	mg/Kg	300	800	05/24/19 14:00	jlw/ dc
Lead, total (3052)	M6020B ICP-MS	12800	12		*	mg/Kg	1	6	05/20/19 16:18	mfm
Magnesium, total (3052)	M6010D ICP	10200	16000		*	mg/Kg	2000	10000	05/24/19 14:00	jlw/ dc
Manganese, total (3052)	M6010D ICP	10200	400	B		mg/Kg	100	500	05/24/19 14:00	jlw/ dc
Mercury by Direct Combustion AA	M7473 CVAAS	1	63	H	*	ng/g	1.48	7.4	05/20/19 12:36	dcm
Molybdenum, total (3052)	M6010D ICP	10200		U	*	mg/Kg	200	1000	05/24/19 14:00	jlw/ dc
Nickel, total (3052)	M6010D ICP	10200	120	B	*	mg/Kg	80	400	05/24/19 14:00	jlw/ dc
Potassium, total (3052)	M6010D ICP	10200	18000			mg/Kg	2000	10000	05/24/19 14:00	jlw/ dc
Selenium, total (3052)	M6020B ICP-MS	12800		U	*	mg/Kg	1	3	05/20/19 16:18	mfm
Silica, total (3052)	M6010D ICP	10200	649000		*	mg/Kg	2000	10000	05/24/19 14:00	jlw/ dc
Silver, total (3052)	M6010D ICP	10200		U	*	mg/Kg	100	300	05/24/19 14:00	jlw/ dc
Sodium, total (3052)	M6010D ICP	10200	16000		*	mg/Kg	2000	10000	05/24/19 14:00	jlw/ dc
Strontium, total (3052)	M6010D ICP	10200	390	B		mg/Kg	90	500	05/24/19 14:00	jlw/ dc
Thallium, total (3052)	M6020B ICP-MS	12800		U	*	mg/Kg	1	6	05/20/19 16:18	mfm
Uranium, total (3052)	M6020B ICP-MS	12800	2	B	*	mg/Kg	1	6	05/20/19 16:18	mfm
Zinc, total (3052)	M6010D ICP	10200	100	B		mg/Kg	100	500	05/24/19 14:00	jlw/ dc

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	71.0		*	%	0.1	0.5	05/03/19 11:18	wd/ajm

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								05/01/19 15:12	ajm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								05/09/19 11:11	ajm
ICP 3052 Digestion	M3052								05/15/19 11:00	ajm
ICPMS 3052 Digestion	M3052								05/15/19 11:00	ajm

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.954	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.15	0.15			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.25015		.235	mg/L	94	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	250.15		250	mg/L	100	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-150	150			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	59500		50250	mg/Kg		47600	71400			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	59500		53000	mg/Kg		47600	71400	5	20	
L51315-03SDL	SDL	05/24/19 13:52			59700	60300	mg/Kg				1	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	510	68700	71380	mg/Kg	525	75	125			M3
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.971	mg/L	97	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.15	0.15			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	510	68700	70970	mg/Kg	445	75	125	1	20	M3
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.97	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.15	0.15			

Antimony, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.02		.02026	mg/L	101	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0012	0.0012			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.002		.00199	mg/L	100	70	130			
WG472706ICSA	ICSA	05/20/19 15:50				U	mg/L		-0.002	0.002			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.01		.01047	mg/L	105	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-3	3			
WG472337LCSS	LCSS	05/20/19 15:59	PCN58899	52.5		51.1	mg/Kg		42	63			
WG472337LCSSD	LCSSD	05/20/19 16:00	PCN58899	52.5		59.7	mg/Kg		42	63	16	20	E6
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	25.2	U	9.3	mg/Kg	37	75	125			M2
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	25.2	U	9	mg/Kg	36	75	125	3	20	M2
L51315-03SDL	SDL	05/20/19 16:11			U	U	mg/Kg					10	
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.0125		.01204	mg/L	96	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0012	0.0012			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.0125		.01186	mg/L	95	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.0012	0.0012			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Arsenic, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.05018	mg/L	100	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0006	0.0006			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.001001		.00108	mg/L	108	70	130			
WG472706ICSA	ICSA	05/20/19 15:50				U	mg/L		-0.001	0.001			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02002		.02036	mg/L	102	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-1.5	1.5			
WG472337LCSS	LCSS	05/20/19 15:59	PCN58899	1540		1502.4	mg/Kg		1232	1848			
WG472337LCSSD	LCSSD	05/20/19 16:00	PCN58899	1540		1728.2	mg/Kg		1232	1848	14	20	
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	126.126	8	134.1	mg/Kg	100	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	126.126	8	124.3	mg/Kg	92	75	125	8	20	
L51315-03SDL	SDL	05/20/19 16:11			9	U	mg/Kg					10	
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.1001		.09617	mg/L	96	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0006	0.0006			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.1001		.09491	mg/L	95	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.0006	0.0006			

Barium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.986	mg/L	99	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.021	0.021			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.034965		.0331	mg/L	95	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.24975		.2457	mg/L	98	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-21	21			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	792		740	mg/Kg		663.6	950.4			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	792		760	mg/Kg		663.6	950.4	3	20	
L51315-03SDL	SDL	05/24/19 13:52			540	475	mg/Kg				12	10	ZG
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	530	824	mg/Kg	115	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.9857	mg/L	99	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.021	0.021			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	530	812	mg/Kg	111	75	125	1	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.9803	mg/L	98	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.021	0.021			

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ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Beryllium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472915													
WG472915ICV	ICV	05/22/19 15:29	MS190513-2	.05		.050511	mg/L	101	90	110			
WG472915ICB	ICB	05/22/19 15:31				U	mg/L		-0.00024	0.00024			
WG472915PQV	PQV	05/22/19 15:32	MS190415-2	.00025025		.000258	mg/L	103	70	130			
WG472915ICSA	ICSA	05/22/19 15:34				U	mg/L		-0.0003	0.0003			
WG472915ICSAB	ICSAB	05/22/19 15:36	MS190507-4	.02002		.018746	mg/L	94	80	120			
WG472337PBS	PBS	05/22/19 15:41				U	mg/Kg		-1.2	1.2			
WG472915CCV1	CCV	05/22/19 15:47	MS190430-4	.1001		.096943	mg/L	97	90	110			
WG472915CCB1	CCB	05/22/19 15:48				U	mg/L		-0.00024	0.00024			
L51315-01MS	MS	05/22/19 15:52	MS50XSOILS	126.5	U	120.1	mg/Kg	95	75	125			
L51315-01MSD	MSD	05/22/19 15:54	MS50XSOILS	126.5	U	119.2	mg/Kg	94	75	125	1	20	
L51315-03SDL	SDL	05/22/19 15:59			U	U	mg/Kg					10	
WG472915CCV2	CCV	05/22/19 16:04	MS190430-4	.1001		.093529	mg/L	93	90	110			
WG472915CCB2	CCB	05/22/19 16:06				U	mg/L		-0.00024	0.00024			

Cadmium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.049875	mg/L	100	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.00015	0.00015			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.00025025		.000255	mg/L	102	70	130			
WG472706ICSA	ICSA	05/20/19 15:50		.000244		.000244	mg/L		-0.0003	0.0003			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02002		.020047	mg/L	100	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-0.3	0.3			
WG472337LCSS	LCSS	05/20/19 15:59	PCN58899	12.3		12.03	mg/Kg		9.84	14.8			
WG472337LCSSD	LCSSD	05/20/19 16:00	PCN58899	12.3		13.77	mg/Kg		9.84	14.8	13	20	E6
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	126.252	2.4	133.13	mg/Kg	104	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	126.252	2.4	130.52	mg/Kg	101	75	125	2	20	
L51315-03SDL	SDL	05/20/19 16:11			2.6	U	mg/Kg					10	
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.1001		.098793	mg/L	99	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.00015	0.00015			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.1001		.096402	mg/L	96	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.00015	0.00015			

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ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Calcium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	100		97.82	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.3	0.3			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.5004		.48	mg/L	96	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	250.2		247.3	mg/L	99	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-300	300			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	9640		9430	mg/Kg		7712	11568			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	9640		9330	mg/Kg		7712	11568	1	20	
L51315-03SDL	SDL	05/24/19 13:52			33000	32000	mg/Kg				3	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	34639.7202	35000	71800	mg/Kg	106	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	50		48.83	mg/L	98	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.3	0.3			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	34639.7202	35000	72200	mg/Kg	107	75	125	1	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	50		48.39	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.3	0.3			

Chromium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.953	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.03	0.03			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.05025		.048	mg/L	96	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.25125		.235	mg/L	94	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-30	30			
L51315-03SDL	SDL	05/24/19 13:52			U	U	mg/Kg				0	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	100	360	mg/Kg	102	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.983	mg/L	98	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.03	0.03			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	100	350	mg/Kg	98	75	125	3	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.973	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.03	0.03			

Copper, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.947	mg/L	97	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.03	0.03			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.04995		.046	mg/L	92	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.24975		.243	mg/L	97	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-30	30			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	3420		3420	mg/Kg		2736	4104			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	3420		3399	mg/Kg		2736	4104	1	20	
L51315-03SDL	SDL	05/24/19 13:52			U	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	U	260	mg/Kg	102	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.963	mg/L	96	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.03	0.03			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	U	270	mg/Kg	106	75	125	4	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.961	mg/L	96	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.03	0.03			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.912	mg/L	96	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.09	0.09			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.075135		.072	mg/L	96	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	100.18		94.14	mg/L	94	80	120			
WG472337PBS	PBS	05/24/19 13:29				38	mg/Kg		-90	90			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	43200		43230	mg/Kg		34560	51840			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	43200		43080	mg/Kg		34560	51840	0	20	
L51315-03SDL	SDL	05/24/19 13:52			39900	39950	mg/Kg				0	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	510	37300	38120	mg/Kg	161	75	125			M3
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.959	mg/L	96	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.09	0.09			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	510	37300	38890	mg/Kg	312	75	125	2	20	M3
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.955	mg/L	96	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.09	0.09			

Lead, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.05079	mg/L	102	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0003	0.0003			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.0005005		.00057	mg/L	114	70	130			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02002		.0211	mg/L	105	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-0.9	0.9			
WG472337LCSS	LCSS	05/20/19 15:59	PCN58899	5520		3942	mg/Kg		4416	6624			E6 RL
WG472337LCSSD	LCSSD	05/20/19 16:00	PCN58899	5520		4418.6	mg/Kg		4416	6624	11	20	E6
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	126.126	12	151.3	mg/Kg	110	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	126.126	12	145.9	mg/Kg	106	75	125	4	20	
L51315-03SDL	SDL	05/20/19 16:11			12	14	mg/Kg				17	10	ZG
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.25025		.24593	mg/L	98	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0003	0.0003			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.25025		.24161	mg/L	97	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.0003	0.0003			

Magnesium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	100		96.24	mg/L	96	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.6	0.6			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	1		.92	mg/L	92	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	250.3		251.3	mg/L	100	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-600	600			
L51315-03SDL	SDL	05/24/19 13:52			8000	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	28013.9226	16000	42300	mg/Kg	94	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	50		47.99	mg/L	96	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.6	0.6			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	28013.9226	16000	42600	mg/Kg	95	75	125	1	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	50		47.69	mg/L	95	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Manganese, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.923	mg/L	96	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.03	0.03			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.05		.045	mg/L	90	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.25		.235	mg/L	94	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-30	30			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	2140		2156	mg/Kg		1712	2568			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	2140		2127	mg/Kg		1712	2568	1	20	
L51315-03SDL	SDL	05/24/19 13:52			600	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	400	650	mg/Kg	98	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.969	mg/L	97	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.03	0.03			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	400	660	mg/Kg	102	75	125	2	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.965	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.03	0.03			

Mercury by Direct Combustion AA M7473 CVAAS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG471544													
WG471544ICV1	ICV	05/03/19 8:14	HG190425-5	100		104	ng/g	104	90	110			
WG471544ICV2	ICV	05/03/19 10:13	HG190425-3	100		107	ng/g	107	90	110			
WG471544ICV3	ICV	05/03/19 10:53	HG190425-4	1000		1040	ng/g	104	90	110			
WG471544ICV4	ICV	05/03/19 11:01	HG190425-4	1000		961	ng/g	96	90	110			
WG472649													
WG472649ICV1	ICV	05/20/19 9:22	HG190520-2	100		104	ng/g	104	90	110			
WG472649ICV3	ICV	05/20/19 9:54	HG190520-1	1000		1020	ng/g	102	90	110			
WG472649ICV4	ICV	05/20/19 10:02	HG190520-1	1000		964	ng/g	96	90	110			
WG472649ICV2	ICV	05/20/19 10:24	HG190520-3	100		105	ng/g	105	90	110			
WG472649PBS	PBS	05/20/19 10:54				U	ng/g		-6	6			
WG472649LCSS	LCSS	05/20/19 11:00	PCN56165	80		82.3	ng/g		80	120			
WG472649LCSSD	LCSSD	05/20/19 11:07	PCN56165	80		83	ng/g		80	120	1	20	
L51315-02DUP	DUP	05/20/19 12:08			15.2	15.8	ng/g				4	20	RA
L51315-03MS	MS	05/20/19 12:22	PCN56165				ng/g	92	80	120			
WG472649CCV1	CCV	05/20/19 12:42	PCN56165	80		80.9	ng/g	101	80	120			
WG472649CCV2	CCV	05/20/19 14:13	PCN56165	80		80.6	ng/g	101	80	120			
WG472649CCV3	CCV	05/20/19 14:53	PCN56165	80		78.9	ng/g	99	80	120			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.994	mg/L	100	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.06	0.06			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.0995		.097	mg/L	97	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.4975		.477	mg/L	96	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-60	60			
L51315-03SDL	SDL	05/24/19 13:52			U	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	U	U	mg/Kg	0	75	125			M4
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		1.007	mg/L	101	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.06	0.06			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	U	200	mg/Kg	78	75	125		20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.998	mg/L	100	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.06	0.06			

Nickel, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2.004		1.939	mg/L	97	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.024	0.024			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.04		.0446	mg/L	112	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.5		.4711	mg/L	94	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-24	24			
L51315-03SDL	SDL	05/24/19 13:52			90	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	120	384	mg/Kg	104	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1.002		.9984	mg/L	100	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.024	0.024			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	120	365	mg/Kg	96	75	125	5	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1.002		.9883	mg/L	99	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.024	0.024			

Potassium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	20		19.68	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.6	0.6			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	1.001		.91	mg/L	91	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	25.025		25.72	mg/L	103	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-600	600			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	21700		20900	mg/Kg		17360	26040			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	21700		21300	mg/Kg		17360	26040	2	20	
L51315-03SDL	SDL	05/24/19 13:52			14000	14500	mg/Kg				4	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	51081.804	18000	71000	mg/Kg	104	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	10		9.86	mg/L	99	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.6	0.6			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	51081.804	18000	71500	mg/Kg	105	75	125	1	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	10		9.78	mg/L	98	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.0489	mg/L	98	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0003	0.0003			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.00025025		.00032	mg/L	128	70	130			
WG472706ICSA	ICSA	05/20/19 15:50				U	mg/L		-0.0003	0.0003			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02002		.01923	mg/L	96	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-0.9	0.9			
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	63.063	U	65.8	mg/Kg	104	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	63.063	U	60.5	mg/Kg	96	75	125	8	20	
L51315-03SDL	SDL	05/20/19 16:11			U	U	mg/Kg					10	E6
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.25025		.24409	mg/L	98	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0003	0.0003			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.25025		.23986	mg/L	96	90	110			
WG472706CCB2	CCB	05/20/19 16:21				.00029	mg/L		-0.0003	0.0003			

Silica, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	42.8		43.3	mg/L	101	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.6	0.6			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	1.07075		1.08	mg/L	101	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	5.35375		5.49	mg/L	103	80	120			
WG472337PBS	PBS	05/24/19 13:29				7610	mg/Kg		-600	600			B1
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	665540		674500	mg/Kg		532432	798648			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	665540		677500	mg/Kg		532432	798648	0	20	
L51315-03SDL	SDL	05/24/19 13:52			654000	713000	mg/Kg				9	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	10914	649000	659400	mg/Kg	95	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	21.4		22.2	mg/L	104	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.6	0.6			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	10914	649000	646500	mg/Kg	-23	75	125	2	20	M3
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	21.4		21.91	mg/L	102	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.6	0.6			

Silver, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	1.001		1.01	mg/L	101	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.03	0.03			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.0251		.021	mg/L	84	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.502		.495	mg/L	99	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-30	30			
L51315-03SDL	SDL	05/24/19 13:52			U	U	mg/Kg					10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	U	230	mg/Kg	90	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	.5005		.504	mg/L	101	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.03	0.03			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	U	260	mg/Kg	102	75	125	12	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	.5005		.498	mg/L	100	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.03	0.03			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sodium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	100		95.79	mg/L	96	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.6	0.6			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.998		.99	mg/L	99	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	24.95		25.58	mg/L	103	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-600	600			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	8940		9200	mg/Kg		7152	10728			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	8940		9200	mg/Kg		7152	10728	0	20	
L51315-03SDL	SDL	05/24/19 13:52			19000	22500	mg/Kg				18	10	ZG
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	50664.0936	16000	65900	mg/Kg	98	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	50		47.54	mg/L	95	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.6	0.6			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	50664.0936	16000	66200	mg/Kg	99	75	125	0	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	50		47.08	mg/L	94	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.6	0.6			

Solids, Percent D2216-80

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG471395													
L50982-01DUP	DUP	05/01/19 16:23			62.9	65.11	%				3	20	
WG471395PBS	PBS	05/03/19 16:05				U	%		-0.1	0.1			

Strontium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.963	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.027	0.027			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.045045		.0442	mg/L	98	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.5005		.4864	mg/L	97	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-27	27			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	255		241	mg/Kg		204	306			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	255		244	mg/Kg		204	306	1	20	
L51315-03SDL	SDL	05/24/19 13:52			490	465	mg/Kg				5	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	390	666	mg/Kg	108	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.9796	mg/L	98	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.027	0.027			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	390	669	mg/Kg	109	75	125	0	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.97	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.027	0.027			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.05138	mg/L	103	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0003	0.0003			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.000501		.00054	mg/L	108	70	130			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02004		.02201	mg/L	110	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-0.9	0.9			
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	126.126	U	140.4	mg/Kg	111	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	126.126	U	136.2	mg/Kg	108	75	125	3	20	
L51315-03SDL	SDL	05/20/19 16:11			U	U	mg/Kg					10	
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.1002		.09926	mg/L	99	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0003	0.0003			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.1002		.0976	mg/L	97	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.0003	0.0003			

Uranium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472706													
WG472706ICV	ICV	05/20/19 15:44	MS190513-2	.05		.05083	mg/L	102	90	110			
WG472706ICB	ICB	05/20/19 15:46				U	mg/L		-0.0003	0.0003			
WG472706PQV	PQV	05/20/19 15:48	MS190415-2	.0005		.00057	mg/L	114	70	130			
WG472706ICSA	ICSA	05/20/19 15:50				U	mg/L		-0.0005	0.0005			
WG472706ICSAB	ICSAB	05/20/19 15:51	MS190507-4	.02		.02222	mg/L	111	80	120			
WG472337PBS	PBS	05/20/19 15:57				U	mg/Kg		-0.9	0.9			
WG472337LCSS	LCSS	05/20/19 15:59	PCN58899	9.11		6.7	mg/Kg		7.28	10.9			E6 RL
WG472337LCSSD	LCSSD	05/20/19 16:00	PCN58899	9.11		7.5	mg/Kg		7.28	10.9	11	20	E6
L51315-01MS	MS	05/20/19 16:04	MS25XSOILS	63	2	76.7	mg/Kg	119	75	125			
L51315-01MSD	MSD	05/20/19 16:06	MS25XSOILS	63	2	74.7	mg/Kg	115	75	125	3	20	
L51315-03SDL	SDL	05/20/19 16:11			2	U	mg/Kg					10	
WG472706CCV1	CCV	05/20/19 16:14	MS190430-4	.1		.09766	mg/L	98	90	110			
WG472706CCB1	CCB	05/20/19 16:16				U	mg/L		-0.0003	0.0003			
WG472706CCV2	CCV	05/20/19 16:20	MS190430-4	.1		.09694	mg/L	97	90	110			
WG472706CCB2	CCB	05/20/19 16:21				U	mg/L		-0.0003	0.0003			

Brown and Caldwell

ACZ Project ID: ***L51315***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Zinc, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG473066													
WG473066ICV	ICV	05/24/19 13:01	II190424-1	2		1.952	mg/L	98	90	110			
WG473066ICB	ICB	05/24/19 13:05				U	mg/L		-0.03	0.03			
WG473066PQV	PQV	05/24/19 13:09	II190509-2	.05005		.049	mg/L	98	70	130			
WG473066ICSAB	ICSAB	05/24/19 13:13	II190301-3	.5005		.488	mg/L	98	80	120			
WG472337PBS	PBS	05/24/19 13:29				U	mg/Kg		-30	30			
WG472337LCSS	LCSS	05/24/19 13:33	PCN58899	4180		4310	mg/Kg		3344	5016			
WG472337LCSSD	LCSSD	05/24/19 13:37	PCN58899	4180		4315	mg/Kg		3344	5016	0	20	
L51315-03SDL	SDL	05/24/19 13:52			U	U	mg/Kg				0	10	
L51315-05MS	MS	05/24/19 14:04	II20XSOIL	255	100	320	mg/Kg	86	75	125			
WG473066CCV1	CCV	05/24/19 14:07	II190509-3	1		.983	mg/L	98	90	110			
WG473066CCB1	CCB	05/24/19 14:11				U	mg/L		-0.03	0.03			
L51315-05MSD	MSD	05/24/19 14:15	II20XSOIL	255	100	320	mg/Kg	86	75	125	0	20	
WG473066CCV2	CCV	05/24/19 14:19	II190509-3	1		.973	mg/L	97	90	110			
WG473066CCB2	CCB	05/24/19 14:23				U	mg/L		-0.03	0.03			

Brown and Caldwell ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51315-01	WG473066	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG473066	Barium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472915	Beryllium, total (3052)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Chromium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Lead, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG473066	Magnesium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472649	Mercury by Direct Combustion AA	M7473 CVAAS	H3	Sample was received and analyzed past holding time.
			M7473 CVAAS	QR	Sample matrix is solid rock and a homogenous sample aliquot could not be created for Hg analysis prior to preparation and air drying. Hg analysis was performed on crushed, homogenized, and air dried (40C) sub sample. Some loss of Hg may have occurred. Residual moisture on the prepped sample fraction was used for data correction.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG473066	Molybdenum, total (3052)	M6010D ICP	M4	The spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472706	Selenium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Silver, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of

Brown and Caldwell

ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472706	Thallium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Uranium, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Brown and Caldwell ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51315-02	WG473066	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG473066	Barium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472915	Beryllium, total (3052)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Chromium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Lead, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG473066	Magnesium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472649	Mercury by Direct Combustion AA	M7473 CVAAS	H3	Sample was received and analyzed past holding time.
			M7473 CVAAS	QR	Sample matrix is solid rock and a homogenous sample aliquot could not be created for Hg analysis prior to preparation and air drying. Hg analysis was performed on crushed, homogenized, and air dried (40C) sub sample. Some loss of Hg may have occurred. Residual moisture on the prepped sample fraction was used for data correction.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG473066	Molybdenum, total (3052)	M6010D ICP	M4	The spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472706	Selenium, total (3052)	M6020B ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS

Brown and Caldwell

ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					or LFB) was acceptable.
		Silver, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472706	Thallium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Uranium, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Brown and Caldwell ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51315-03	WG473066	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG473066	Barium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472915	Beryllium, total (3052)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Chromium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Lead, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG473066	Magnesium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472649	Mercury by Direct Combustion AA	M7473 CVAAS	H3	Sample was received and analyzed past holding time.
			M7473 CVAAS	QR	Sample matrix is solid rock and a homogenous sample aliquot could not be created for Hg analysis prior to preparation and air drying. Hg analysis was performed on crushed, homogenized, and air dried (40C) sub sample. Some loss of Hg may have occurred. Residual moisture on the prepped sample fraction was used for data correction.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG473066	Molybdenum, total (3052)	M6010D ICP	M4	The spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472706	Selenium, total (3052)	M6020B ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS

Brown and Caldwell

ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					or LFB) was acceptable.
		Silver, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472706	Thallium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Uranium, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Brown and Caldwell ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51315-04	WG473066	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG473066	Barium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472915	Beryllium, total (3052)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Chromium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Lead, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG473066	Magnesium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472649	Mercury by Direct Combustion AA	M7473 CVAAS	H3	Sample was received and analyzed past holding time.
			M7473 CVAAS	QR	Sample matrix is solid rock and a homogenous sample aliquot could not be created for Hg analysis prior to preparation and air drying. Hg analysis was performed on crushed, homogenized, and air dried (40C) sub sample. Some loss of Hg may have occurred. Residual moisture on the prepped sample fraction was used for data correction.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG473066	Molybdenum, total (3052)	M6010D ICP	M4	The spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472706	Selenium, total (3052)	M6020B ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS

Brown and Caldwell

ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					or LFB) was acceptable.
		Silver, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472706	Thallium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Uranium, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Brown and Caldwell ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51315-05	WG473066	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG473066	Barium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472915	Beryllium, total (3052)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Chromium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472706	Lead, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG473066	Magnesium, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472649	Mercury by Direct Combustion AA	M7473 CVAAS	H3	Sample was received and analyzed past holding time.
			M7473 CVAAS	QR	Sample matrix is solid rock and a homogenous sample aliquot could not be created for Hg analysis prior to preparation and air drying. Hg analysis was performed on crushed, homogenized, and air dried (40C) sub sample. Some loss of Hg may have occurred. Residual moisture on the prepped sample fraction was used for data correction.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG473066	Molybdenum, total (3052)	M6010D ICP	M4	The spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG472706	Selenium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG473066	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Silver, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of

Brown and Caldwell

ACZ Project ID: ***L51315***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG472706	Thallium, total (3052)	M6020B ICP-MS	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Uranium, total (3052)	M6020B ICP-MS	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Brown and Caldwell ACZ Project ID: ***L51315***

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	D2216-80

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L51315
Date Received: 04/24/2019 10:51
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51315
Date Received:	04/24/2019 10:51
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 51315 — **CHAIN of CUSTODY**

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd #300
Company: Brown and Caldwell	Lakewood CO 80401
E-mail: kdonahue@brwncald	Telephone: 303-239-5401

Copy of Report to:

Name: Kelly Donahue	E-mail: kdonahue@brwncald.com
Company:	Telephone:

Invoice to:

Name: Same	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD Sampler's Site Information State CA Zip code 90501 Time Zone PST

*Sampler's Signature: Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQVEL-CREEK-2052

PO#: MWMP/MOD-SPLP-MOD, TESTEE Lead

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tests for Lead	HNO3-HCl	SPLP	Whole rock 3050	Column MWMP				
AA-880-930	2/18/19 1800	SO	1	☒	☒	☒	☐	☐	☐	☐	☐	☐
A-555-875	2/19/19 0900	SO	3	☒	☒	☒	☒	☐	☐	☐	☐	☐
B-420-550	2/19/19 1000	SO	1	☒	☒	☒	☐	☐	☐	☐	☐	☐
BC-210-415	2/19/19 1300	SO	3	☒	☒	☒	☒	☐	☐	☐	☐	☐
D-175-205	2/19/19 1700	SO	1	☒	☒	☒	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000		2/25/19 13:06

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L51315 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51316

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51316. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51316. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: AA-880-930

ACZ Sample ID: ***L51316-01***
Date Sampled: *02/18/19 18:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								05/15/19 10:31	ajm

Brown and Caldwell
Project ID:
Sample ID: AA-880-930-STEP 1

ACZ Sample ID: ***L51316-02***
Date Sampled: *05/15/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.48		*	mg/L	0.05	0.3	05/17/19 13:08	jlw/ ae
Antimony, dissolved	M200.8 ICP-MS	1	0.0005	B	*	mg/L	0.0004	0.002	05/20/19 15:35	bsu
Arsenic, dissolved	M200.8 ICP-MS	1	0.0097		*	mg/L	0.0002	0.001	05/20/19 15:35	bsu
Barium, dissolved	M200.7 ICP	1	0.921		*	mg/L	0.007	0.04	05/17/19 13:08	jlw/ ae
Beryllium, dissolved	M200.8 ICP-MS	5	0.0009	B	*	mg/L	0.0004	0.001	05/20/19 18:19	bsu
Boron, dissolved	M200.7 ICP	1	0.19		*	mg/L	0.02	0.1	05/17/19 13:08	jlw/ ae
Cadmium, dissolved	M200.8 ICP-MS	1	0.00495		*	mg/L	0.00005	0.0003	05/20/19 15:35	bsu
Calcium, dissolved	M200.7 ICP	1	654		*	mg/L	0.1	0.5	05/17/19 13:08	jlw/ ae
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:08	jlw/ ae
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:08	jlw/ ae
Iron, dissolved	M200.7 ICP	1	57.5		*	mg/L	0.03	0.08	05/17/19 13:08	jlw/ ae
Lead, dissolved	M200.7 ICP	1		U	*	mg/L	0.03	0.2	05/17/19 13:08	jlw/ ae
Magnesium, dissolved	M200.7 ICP	1	43.1		*	mg/L	0.2	1	05/17/19 13:08	jlw/ ae
Manganese, dissolved	M200.7 ICP	1	9.20		*	mg/L	0.01	0.05	05/17/19 13:08	jlw/ ae
Mercury, dissolved	M245.1 CVAA	2		U	*	mg/L	0.0004	0.002	05/23/19 14:23	slm
Molybdenum, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.1	05/17/19 13:08	jlw/ ae
Nickel, dissolved	M200.7 ICP	1	0.171		*	mg/L	0.008	0.04	05/17/19 13:08	jlw/ ae
Phosphorus, dissolved	M200.7 - ICP	1	0.3	B	*	mg/L	0.1	0.5	05/17/19 13:08	jlw/ ae
Potassium, dissolved	M200.7 ICP	1	34.4		*	mg/L	0.2	1	05/17/19 13:08	jlw/ ae
Selenium, dissolved	M200.8 ICP-MS	1	0.0006		*	mg/L	0.0001	0.0003	05/20/19 15:35	bsu
Silica, dissolved	M200.7 ICP	1	184		*	mg/L	0.2	1	05/17/19 13:08	jlw/ ae
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	05/20/19 15:35	bsu
Sodium, dissolved	M200.7 ICP	1	16.2		*	mg/L	0.2	1	05/17/19 13:08	jlw/ ae
Strontium, dissolved	M200.7 ICP	1	1.53		*	mg/L	0.009	0.05	05/17/19 13:08	jlw/ ae
Thallium, dissolved	M200.8 ICP-MS	1	0.0011		*	mg/L	0.0001	0.0005	05/20/19 15:35	bsu
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B	*	mg/L	0.0001	0.0005	05/20/19 15:35	bsu
Zinc, dissolved	M200.7 ICP	1	0.20		*	mg/L	0.01	0.05	05/17/19 13:08	jlw/ ae

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.966	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.15	0.15			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0006		1.041	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0012	U	2.1	mg/L	105	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0012	U	2.03	mg/L	101	85	115	3	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02		.02054	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00088	0.00088			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01		.00975	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.05	U	.0498	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.05	U	.0491	mg/L	98	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05099	mg/L	102	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00044	0.00044			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04832	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.006	.2564	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.006	.2539	mg/L	99	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.0052	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.021	0.021			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.4812	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	U	.988	mg/L	99	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	U	.982	mg/L	98	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472723													
WG472723ICV	ICV	05/20/19 18:14	MS190513-2	.05		.049128	mg/L	98	90	110			
WG472723ICB	ICB	05/20/19 18:16				.000092	mg/L		-0.000176	0.000176			
WG472723LFB	LFB	05/20/19 18:18	MS190507-2	.05005		.045573	mg/L	91	85	115			
L51657-01AS	AS	05/20/19 18:29	MS190507-2	.05005	U	.048246	mg/L	96	70	130			
L51657-01ASD	ASD	05/20/19 18:30	MS190507-2	.05005	U	.05187	mg/L	104	70	130	7	20	

Brown and Caldwell

ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.032	mg/L	102	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.521	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	.37	1.352	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	.37	1.359	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049831	mg/L	100	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00011	0.00011			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046506	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.24595	mg/L	98	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.24776	mg/L	99	70	130	1	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.62	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	68.01315		66.58	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	136.0263	400	516.2	mg/L	85	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	136.0263	400	512.4	mg/L	83	85	115	1	20	MA

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.958	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5025		.492	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.005	U	.966	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.005	U	.967	mg/L	96	85	115	0	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.955	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.487	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	U	.971	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	U	.983	mg/L	98	85	115	1	20	

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ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.942	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0018		1.01	mg/L	101	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0036	.09	2.032	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0036	.09	2.046	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	4		3.982	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0017		1	mg/L	100	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0034	U	1.972	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0034	U	1.989	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		95.52	mg/L	96	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	50.00434		48.09	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	100.00868	180	268.8	mg/L	89	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	100.00868	180	265.4	mg/L	85	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.953	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.493	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	.2	1.166	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	.2	1.157	mg/L	96	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472730													
WG472730ICV2	ICV	05/23/19 13:39	HG190404-3	.004995		.00482	mg/L	96	95	105			
WG472730ICV3	ICV	05/23/19 13:40	HG190404-3	.004995		.00483	mg/L	97	95	105			
WG472730ICB	ICB	05/23/19 13:41				U	mg/L		-0.0002	0.0002			
WG472731													
WG472731LRB	LRB	05/23/19 14:21				U	mg/L		-0.00044	0.00044			
WG472731LFB	LFB	05/23/19 14:22	HG190521-3	.002002		.00188	mg/L	94	85	115			
L51723-01LFM	LFM	05/23/19 14:28	HG190521-3	.002002	U	.00183	mg/L	91	85	115			
L51723-01LFMD	LFMD	05/23/19 14:31	HG190521-3	.002002	U	.00186	mg/L	93	85	115	2	20	

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ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.028	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4975		.515	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.995	U	1.008	mg/L	101	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.995	U	.98	mg/L	98	85	115	3	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2.004		1.9342	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.024	0.024			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5		.4832	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1	U	.943	mg/L	94	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1	U	.958	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	5.0075		5.03	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.004		1.04	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.008	U	2	mg/L	100	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.008	U	2.14	mg/L	107	85	115	7	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	20		19.59	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	101.8741		97.46	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	203.7482	16.6	214.8	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	203.7482	16.6	208.6	mg/L	94	85	115	3	20	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05126	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				.00011	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04662	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.0008	.22721	mg/L	90	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.0008	.2294	mg/L	91	70	130	1	20	

Brown and Caldwell

ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	42.8		43.18	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	21.415		22.08	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	42.83	7.9	52.38	mg/L	104	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	42.83	7.9	52.14	mg/L	103	85	115	0	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02004		.02075	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01002		.01003	mg/L	100	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.0501	U	.05006	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.0501	U	.04916	mg/L	98	70	130	2	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.81	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	98.14307		95.09	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	196.28614	103	292	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	196.28614	103	287.4	mg/L	94	85	115	2	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.974	mg/L	99	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.027	0.027			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.4975	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	10.1	10.702	mg/L	60	85	115			M3
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	10.1	10.65	mg/L	55	85	115	0	20	M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05177	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.0501		.0492	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.2505	U	.27051	mg/L	108	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.2505	U	.27163	mg/L	108	70	130	0	20	

Brown and Caldwell

ACZ Project ID: ***L51316***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05247	mg/L	105	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05		.04852	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25	.0006	.27609	mg/L	110	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25	.0006	.27539	mg/L	110	70	130	0	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.956	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.50075		.514	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.0015	U	1.025	mg/L	102	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.0015	U	1	mg/L	100	85	115	2	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L51316***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51316-02	WG472723	Beryllium, dissolved	M200.8 ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M200.8 ICP-MS	DC	Sample required dilution. Non-target analyte exceeded calibration range.
	WG472580	Calcium, dissolved	M200.7 ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG472731	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG472580	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L51316
Date Received: 04/24/2019 10:55
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51316
Date Received:	04/24/2019 10:55
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 51316

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald
Address: 1527 Cole Blvd #300
Lakewood CO 80401
Telephone: 303-239-5401

Copy of Report to:

Name: Kelly Donahue
Company:
E-mail: kdonahue@brwncaldwell.com
Telephone:

Invoice to:

Name: Same
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD
*Sampler's Signature: Kelly Donahue
Sampler's Site Information State CA Zip code 90501 Time Zone PST

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL-CREEK-2052
PO#: MW/MP/MW-SPLP-MCO, TESSIER lead
Reporting state for compliance testing:
Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier Lead HA-HCl	SPLP	Whole rock 3050	Column MW/MP				
AA-880-930	2/18/19 1800	SO	1	X	X	X					
A-555-875	2/19/19 0900	SO	3	X	X	X	X				
B-420-550	2/19/19 1080	SO	1	X	X	X					
BC-210-415	2/19/19 1300	SO	3	X	X	X	X				
D-175-205	2/19/19 1700	SO	1	X	X	X					

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000		2/25/19 13:04

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

COPY

L51316 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51317

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51317. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51317. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: A-555-875

ACZ Sample ID: ***L51317-01***
Date Sampled: *02/19/19 09:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								05/15/19 12:02	ajm

Brown and Caldwell
Project ID:
Sample ID: A-555-875-STEP 1

ACZ Sample ID: ***L51317-02***
Date Sampled: *05/15/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U	*	mg/L	0.05	0.3	05/17/19 13:12	jlw/ ae
Antimony, dissolved	M200.8 ICP-MS	5		U	*	mg/L	0.002	0.01	05/20/19 15:37	bsu
Arsenic, dissolved	M200.8 ICP-MS	5	0.006		*	mg/L	0.001	0.005	05/20/19 15:37	bsu
Barium, dissolved	M200.7 ICP	1	0.543		*	mg/L	0.007	0.04	05/17/19 13:12	jlw/ ae
Beryllium, dissolved	M200.8 ICP-MS	5		U	*	mg/L	0.0004	0.001	05/20/19 15:37	bsu
Boron, dissolved	M200.7 ICP	1	0.12		*	mg/L	0.02	0.1	05/17/19 13:12	jlw/ ae
Cadmium, dissolved	M200.8 ICP-MS	5		U	*	mg/L	0.0003	0.001	05/20/19 15:37	bsu
Calcium, dissolved	M200.7 ICP	2	1280		*	mg/L	0.2	1	05/20/19 13:08	jlw/aeh
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:12	jlw/ ae
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:12	jlw/ ae
Iron, dissolved	M200.7 ICP	1		U	*	mg/L	0.03	0.08	05/17/19 13:12	jlw/ ae
Lead, dissolved	M200.7 ICP	1		U	*	mg/L	0.03	0.2	05/17/19 13:12	jlw/ ae
Magnesium, dissolved	M200.7 ICP	1	26.7		*	mg/L	0.2	1	05/17/19 13:12	jlw/ ae
Manganese, dissolved	M200.7 ICP	1	4.87		*	mg/L	0.01	0.05	05/17/19 13:12	jlw/ ae
Mercury, dissolved	M245.1 CVAA	2		U	*	mg/L	0.0004	0.002	05/23/19 14:24	slm
Molybdenum, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.1	05/17/19 13:12	jlw/ ae
Nickel, dissolved	M200.7 ICP	1		U	*	mg/L	0.008	0.04	05/17/19 13:12	jlw/ ae
Phosphorus, dissolved	M200.7 - ICP	1		U	*	mg/L	0.1	0.5	05/17/19 13:12	jlw/ ae
Potassium, dissolved	M200.7 ICP	1	30.4		*	mg/L	0.2	1	05/17/19 13:12	jlw/ ae
Selenium, dissolved	M200.8 ICP-MS	5	0.0008	B	*	mg/L	0.0005	0.001	05/20/19 15:37	bsu
Silica, dissolved	M200.7 ICP	1	80.5		*	mg/L	0.2	1	05/17/19 13:12	jlw/ ae
Silver, dissolved	M200.8 ICP-MS	5		U	*	mg/L	0.0005	0.003	05/20/19 15:37	bsu
Sodium, dissolved	M200.7 ICP	1	14.9		*	mg/L	0.2	1	05/17/19 13:12	jlw/ ae
Strontium, dissolved	M200.7 ICP	1	1.56		*	mg/L	0.009	0.05	05/17/19 13:12	jlw/ ae
Thallium, dissolved	M200.8 ICP-MS	5		U	*	mg/L	0.0005	0.003	05/20/19 15:37	bsu
Uranium, dissolved	M200.8 ICP-MS	5	0.0006	B	*	mg/L	0.0005	0.003	05/20/19 15:37	bsu
Zinc, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:12	jlw/ ae

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.966	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.15	0.15			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0006		1.041	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0012	U	2.1	mg/L	105	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0012	U	2.03	mg/L	101	85	115	3	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02		.02054	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00088	0.00088			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01		.00975	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.05	U	.0498	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.05	U	.0491	mg/L	98	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05099	mg/L	102	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00044	0.00044			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04832	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.006	.2564	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.006	.2539	mg/L	99	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.0052	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.021	0.021			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.4812	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	U	.988	mg/L	99	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	U	.982	mg/L	98	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049268	mg/L	99	90	110			
WG472667ICB	ICB	05/20/19 14:50				.000093	mg/L		-0.000176	0.000176			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046617	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.22919	mg/L	92	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.22692	mg/L	91	70	130	1	20	

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.032	mg/L	102	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.521	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	.37	1.352	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	.37	1.359	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049831	mg/L	100	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00011	0.00011			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046506	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.24595	mg/L	98	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.24776	mg/L	99	70	130	1	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472670													
WG472670ICV	ICV	05/20/19 12:23	II190503-1	100		95.74	mg/L	96	95	105			
WG472670ICB	ICB	05/20/19 12:30				U	mg/L		-0.3	0.3			
WG472670LFB	LFB	05/20/19 12:42	II190509-6	68.01315		67.9	mg/L	100	85	115			
L49991-14AS	AS	05/20/19 12:52	II190509-6	68.01315	47.9	110.2	mg/L	92	85	115			
L49991-14ASD	ASD	05/20/19 12:55	II190509-6	68.01315	47.9	111.2	mg/L	93	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.958	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5025		.492	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.005	U	.966	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.005	U	.967	mg/L	96	85	115	0	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.955	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.487	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	U	.971	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	U	.983	mg/L	98	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.942	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0018		1.01	mg/L	101	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0036	.09	2.032	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0036	.09	2.046	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	4		3.982	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0017		1	mg/L	100	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0034	U	1.972	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0034	U	1.989	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		95.52	mg/L	96	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	50.00434		48.09	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	100.00868	180	268.8	mg/L	89	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	100.00868	180	265.4	mg/L	85	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.953	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.493	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	.2	1.166	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	.2	1.157	mg/L	96	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472730													
WG472730ICV2	ICV	05/23/19 13:39	HG190404-3	.004995		.00482	mg/L	96	95	105			
WG472730ICV3	ICV	05/23/19 13:40	HG190404-3	.004995		.00483	mg/L	97	95	105			
WG472730ICB	ICB	05/23/19 13:41				U	mg/L		-0.0002	0.0002			
WG472731													
WG472731LRB	LRB	05/23/19 14:21				U	mg/L		-0.00044	0.00044			
WG472731LFB	LFB	05/23/19 14:22	HG190521-3	.002002		.00188	mg/L	94	85	115			
L51723-01LFM	LFM	05/23/19 14:28	HG190521-3	.002002	U	.00183	mg/L	91	85	115			
L51723-01LFMD	LFMD	05/23/19 14:31	HG190521-3	.002002	U	.00186	mg/L	93	85	115	2	20	

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.028	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4975		.515	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.995	U	1.008	mg/L	101	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.995	U	.98	mg/L	98	85	115	3	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2.004		1.9342	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.024	0.024			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5		.4832	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1	U	.943	mg/L	94	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1	U	.958	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	5.0075		5.03	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.004		1.04	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.008	U	2	mg/L	100	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.008	U	2.14	mg/L	107	85	115	7	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	20		19.59	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	101.8741		97.46	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	203.7482	16.6	214.8	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	203.7482	16.6	208.6	mg/L	94	85	115	3	20	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05126	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				.00011	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04662	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.0008	.22721	mg/L	90	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.0008	.2294	mg/L	91	70	130	1	20	

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	42.8		43.18	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	21.415		22.08	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	42.83	7.9	52.38	mg/L	104	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	42.83	7.9	52.14	mg/L	103	85	115	0	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02004		.02075	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01002		.01003	mg/L	100	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.0501	U	.05006	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.0501	U	.04916	mg/L	98	70	130	2	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.81	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	98.14307		95.09	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	196.28614	103	292	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	196.28614	103	287.4	mg/L	94	85	115	2	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.974	mg/L	99	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.027	0.027			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.4975	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	10.1	10.702	mg/L	60	85	115			M3
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	10.1	10.65	mg/L	55	85	115	0	20	M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05177	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.0501		.0492	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.2505	U	.27051	mg/L	108	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.2505	U	.27163	mg/L	108	70	130	0	20	

Brown and Caldwell

ACZ Project ID: ***L51317***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05247	mg/L	105	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05		.04852	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25	.0006	.27609	mg/L	110	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25	.0006	.27539	mg/L	110	70	130	0	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.956	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.50075		.514	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.0015	U	1.025	mg/L	102	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.0015	U	1	mg/L	100	85	115	2	20	

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L51317***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51317-02	WG472667	Antimony, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Beryllium, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Cadmium, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG472731	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG472667	Selenium, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Silver, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG472580	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG472667	Thallium, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Uranium, dissolved	M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.

Brown and Caldwell ACZ Project ID: ***L51317***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L51317
Date Received: 04/24/2019 11:12
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51317
Date Received:	04/24/2019 11:12
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 51317

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd #300
Company: Brown and Caldwell	Lakewood CO 80401
E-mail: kdonahue@brwncald	Telephone: 303-239-5401

Copy of Report to:

Name: Kelly Donahue	E-mail: kdonahue@brwncald.com
Company:	Telephone:

Invoice to:

Name: Same	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD Sampler's Site Information State CA Zip code 90501 Time Zone PST

*Sampler's Signature: Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL-CREEK-2052

PO#: MW/MP/MSD-SPLP-MCU, TESTER Lead

Reporting state for compliance testing:

Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tester Lead HH-HCl	SPLP	Whole Rock 3050	Column MW/MP				
AA-880-930	2/18/19 1800	SO	1	X	X	X					
A-555-875	2/19/19 0900	SO	3	X	X	X	X				
B-420-550	2/19/19 1000	SO	1	X	X	X					
BC-210-415	2/19/19 1300	SO	3	X	X	X	X				
D-175-205	2/19/19 1700	SO	1	X	X	X					

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000	JJ	2/25/19 13:06

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L51317 Chain of Custod

COPY

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51318

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51318. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51318. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: B-420-550

ACZ Sample ID: ***L51318-01***
Date Sampled: *02/19/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								05/15/19 13:33	ajm

Brown and Caldwell
Project ID:
Sample ID: B-420-550-STEP 1

ACZ Sample ID: ***L51318-02***
Date Sampled: *05/15/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	2.04		*	mg/L	0.05	0.3	05/17/19 13:15	jlw/ ae
Antimony, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0004	0.002	05/20/19 15:42	bsu
Arsenic, dissolved	M200.8 ICP-MS	1	0.0151		*	mg/L	0.0002	0.001	05/20/19 15:42	bsu
Barium, dissolved	M200.7 ICP	1	0.668		*	mg/L	0.007	0.04	05/17/19 13:15	jlw/ ae
Beryllium, dissolved	M200.8 ICP-MS	5	0.0026		*	mg/L	0.0004	0.001	05/20/19 18:21	bsu
Boron, dissolved	M200.7 ICP	1	0.36		*	mg/L	0.02	0.1	05/17/19 13:15	jlw/ ae
Cadmium, dissolved	M200.8 ICP-MS	1	0.00534		*	mg/L	0.00005	0.0003	05/20/19 15:42	bsu
Calcium, dissolved	M200.7 ICP	1	542		*	mg/L	0.1	0.5	05/17/19 13:15	jlw/ ae
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:15	jlw/ ae
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:15	jlw/ ae
Iron, dissolved	M200.7 ICP	1	90.7		*	mg/L	0.03	0.08	05/17/19 13:15	jlw/ ae
Lead, dissolved	M200.7 ICP	1	0.04	B	*	mg/L	0.03	0.2	05/17/19 13:15	jlw/ ae
Magnesium, dissolved	M200.7 ICP	1	54.7		*	mg/L	0.2	1	05/17/19 13:15	jlw/ ae
Manganese, dissolved	M200.7 ICP	1	10.9		*	mg/L	0.01	0.05	05/17/19 13:15	jlw/ ae
Mercury, dissolved	M245.1 CVAA	2		U	*	mg/L	0.0004	0.002	05/23/19 14:25	slm
Molybdenum, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.1	05/17/19 13:15	jlw/ ae
Nickel, dissolved	M200.7 ICP	1	0.479		*	mg/L	0.008	0.04	05/17/19 13:15	jlw/ ae
Phosphorus, dissolved	M200.7 - ICP	1	0.5		*	mg/L	0.1	0.5	05/17/19 13:15	jlw/ ae
Potassium, dissolved	M200.7 ICP	1	46.0		*	mg/L	0.2	1	05/17/19 13:15	jlw/ ae
Selenium, dissolved	M200.8 ICP-MS	1	0.0018		*	mg/L	0.0001	0.0003	05/20/19 15:42	bsu
Silica, dissolved	M200.7 ICP	2	245		*	mg/L	0.4	2	05/20/19 13:11	jlw/aeh
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	05/20/19 15:42	bsu
Sodium, dissolved	M200.7 ICP	1	52.4		*	mg/L	0.2	1	05/17/19 13:15	jlw/ ae
Strontium, dissolved	M200.7 ICP	1	4.71		*	mg/L	0.009	0.05	05/17/19 13:15	jlw/ ae
Thallium, dissolved	M200.8 ICP-MS	1	0.0011		*	mg/L	0.0001	0.0005	05/20/19 15:42	bsu
Uranium, dissolved	M200.8 ICP-MS	1	0.0004	B	*	mg/L	0.0001	0.0005	05/20/19 15:42	bsu
Zinc, dissolved	M200.7 ICP	1	0.33		*	mg/L	0.01	0.05	05/17/19 13:15	jlw/ ae

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

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ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.966	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.15	0.15			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0006		1.041	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0012	U	2.1	mg/L	105	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0012	U	2.03	mg/L	101	85	115	3	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02		.02054	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00088	0.00088			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01		.00975	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.05	U	.0498	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.05	U	.0491	mg/L	98	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05099	mg/L	102	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00044	0.00044			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04832	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.006	.2564	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.006	.2539	mg/L	99	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.0052	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.021	0.021			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.4812	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	U	.988	mg/L	99	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	U	.982	mg/L	98	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472723													
WG472723ICV	ICV	05/20/19 18:14	MS190513-2	.05		.049128	mg/L	98	90	110			
WG472723ICB	ICB	05/20/19 18:16				.000092	mg/L		-0.000176	0.000176			
WG472723LFB	LFB	05/20/19 18:18	MS190507-2	.05005		.045573	mg/L	91	85	115			
L51657-01AS	AS	05/20/19 18:29	MS190507-2	.05005	U	.048246	mg/L	96	70	130			
L51657-01ASD	ASD	05/20/19 18:30	MS190507-2	.05005	U	.05187	mg/L	104	70	130	7	20	

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ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.032	mg/L	102	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.521	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	.37	1.352	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	.37	1.359	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049831	mg/L	100	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00011	0.00011			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046506	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.24595	mg/L	98	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.24776	mg/L	99	70	130	1	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.62	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	68.01315		66.58	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	136.0263	400	516.2	mg/L	85	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	136.0263	400	512.4	mg/L	83	85	115	1	20	MA

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.958	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5025		.492	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.005	U	.966	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.005	U	.967	mg/L	96	85	115	0	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.955	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.487	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	U	.971	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	U	.983	mg/L	98	85	115	1	20	

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ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.942	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0018		1.01	mg/L	101	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0036	.09	2.032	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0036	.09	2.046	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	4		3.982	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0017		1	mg/L	100	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0034	U	1.972	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0034	U	1.989	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		95.52	mg/L	96	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	50.00434		48.09	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	100.00868	180	268.8	mg/L	89	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	100.00868	180	265.4	mg/L	85	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.953	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.493	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	.2	1.166	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	.2	1.157	mg/L	96	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472730													
WG472730ICV2	ICV	05/23/19 13:39	HG190404-3	.004995		.00482	mg/L	96	95	105			
WG472730ICV3	ICV	05/23/19 13:40	HG190404-3	.004995		.00483	mg/L	97	95	105			
WG472730ICB	ICB	05/23/19 13:41				U	mg/L		-0.0002	0.0002			
WG472731													
WG472731LRB	LRB	05/23/19 14:21				U	mg/L		-0.00044	0.00044			
WG472731LFB	LFB	05/23/19 14:22	HG190521-3	.002002		.00188	mg/L	94	85	115			
L51723-01LFM	LFM	05/23/19 14:28	HG190521-3	.002002	U	.00183	mg/L	91	85	115			
L51723-01LFMD	LFMD	05/23/19 14:31	HG190521-3	.002002	U	.00186	mg/L	93	85	115	2	20	

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ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.028	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4975		.515	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.995	U	1.008	mg/L	101	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.995	U	.98	mg/L	98	85	115	3	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2.004		1.9342	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.024	0.024			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5		.4832	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1	U	.943	mg/L	94	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1	U	.958	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	5.0075		5.03	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.004		1.04	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.008	U	2	mg/L	100	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.008	U	2.14	mg/L	107	85	115	7	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	20		19.59	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	101.8741		97.46	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	203.7482	16.6	214.8	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	203.7482	16.6	208.6	mg/L	94	85	115	3	20	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05126	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				.00011	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04662	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.0008	.22721	mg/L	90	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.0008	.2294	mg/L	91	70	130	1	20	

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ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472670													
WG472670ICV	ICV	05/20/19 12:23	II190503-1	42.8		43.47	mg/L	102	95	105			
WG472670ICB	ICB	05/20/19 12:30				U	mg/L		-0.6	0.6			
WG472670LFB	LFB	05/20/19 12:42	II190509-6	21.415		22.71	mg/L	106	85	115			
L49991-14AS	AS	05/20/19 12:52	II190509-6	21.415	1.4	23.14	mg/L	102	85	115			
L49991-14ASD	ASD	05/20/19 12:55	II190509-6	21.415	1.4	23.56	mg/L	103	85	115	2	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02004		.02075	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01002		.01003	mg/L	100	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.0501	U	.05006	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.0501	U	.04916	mg/L	98	70	130	2	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.81	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	98.14307		95.09	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	196.28614	103	292	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	196.28614	103	287.4	mg/L	94	85	115	2	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.974	mg/L	99	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.027	0.027			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.4975	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	10.1	10.702	mg/L	60	85	115			M3
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	10.1	10.65	mg/L	55	85	115	0	20	M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05177	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.0501		.0492	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.2505	U	.27051	mg/L	108	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.2505	U	.27163	mg/L	108	70	130	0	20	

Brown and Caldwell

ACZ Project ID: ***L51318***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05247	mg/L	105	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05		.04852	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25	.0006	.27609	mg/L	110	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25	.0006	.27539	mg/L	110	70	130	0	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.956	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.50075		.514	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.0015	U	1.025	mg/L	102	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.0015	U	1	mg/L	100	85	115	2	20	

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L51318***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51318-02	WG472580	Calcium, dissolved	M200.7 ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG472731	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG472580	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell ACZ Project ID: ***L51318***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L51318
Date Received: 04/24/2019 11:14
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51318
Date Received:	04/24/2019 11:14
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L51318

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald
Address: 1527 Cole Blvd #300
Lakewood CO 80401
Telephone: 303-239-5407

Copy of Report to:

Name: Kelly Donahue
Company:
E-mail: kdonahue@brwncald.com
Telephone:

Invoice to:

Name: Same
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD **Sampler's Site Information** **State** CA **Zip code** 90501 **Time Zone** PST

***Sampler's Signature:** Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL-CREEK-3052
PO#: MWMP/MOD-SPLP-MOD, TESSIER Leach
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier Leach HA-HCl	SPLP	Whole rock 3052	Column MWMP				
AA-880-930	2/18/19 1800	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
A-555-875	2/19/19 0900	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
3. B-420-550	2/19/19 1000	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
BC-210-415	2/19/19 1300	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
D-175-205	2/19/19 1700	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000	[signature]	

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

COPY

L51318 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51319

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51319. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51319. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: BC-210-415

ACZ Sample ID: ***L51319-01***
Date Sampled: *02/19/19 13:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								05/15/19 15:04	ajm

Brown and Caldwell
Project ID:
Sample ID: BC-210-415-STEP 1

ACZ Sample ID: ***L51319-02***
Date Sampled: *05/15/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.10	B	*	mg/L	0.05	0.3	05/17/19 13:18	jlw/ ae
Antimony, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0004	0.002	05/20/19 15:44	bsu
Arsenic, dissolved	M200.8 ICP-MS	1	0.007		*	mg/L	0.0002	0.001	05/20/19 15:44	bsu
Barium, dissolved	M200.7 ICP	1	0.525		*	mg/L	0.007	0.04	05/17/19 13:18	jlw/ ae
Beryllium, dissolved	M200.8 ICP-MS	1	0.00021	B	*	mg/L	0.00008	0.0003	05/20/19 15:44	bsu
Boron, dissolved	M200.7 ICP	1	0.16		*	mg/L	0.02	0.1	05/17/19 13:18	jlw/ ae
Cadmium, dissolved	M200.8 ICP-MS	1	0.00252		*	mg/L	0.00005	0.0003	05/20/19 15:44	bsu
Calcium, dissolved	M200.7 ICP	2	757		*	mg/L	0.2	1	05/20/19 13:21	jlw/aeh
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:18	jlw/ ae
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:18	jlw/ ae
Iron, dissolved	M200.7 ICP	1	40.4		*	mg/L	0.03	0.08	05/17/19 13:18	jlw/ ae
Lead, dissolved	M200.7 ICP	1	0.04	B	*	mg/L	0.03	0.2	05/17/19 13:18	jlw/ ae
Magnesium, dissolved	M200.7 ICP	1	69.2		*	mg/L	0.2	1	05/17/19 13:18	jlw/ ae
Manganese, dissolved	M200.7 ICP	1	17.0		*	mg/L	0.01	0.05	05/17/19 13:18	jlw/ ae
Mercury, dissolved	M245.1 CVAA	2		U	*	mg/L	0.0004	0.002	05/23/19 14:26	slm
Molybdenum, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.1	05/17/19 13:18	jlw/ ae
Nickel, dissolved	M200.7 ICP	1	0.226		*	mg/L	0.008	0.04	05/17/19 13:18	jlw/ ae
Phosphorus, dissolved	M200.7 - ICP	1	0.3	B	*	mg/L	0.1	0.5	05/17/19 13:18	jlw/ ae
Potassium, dissolved	M200.7 ICP	1	39.9		*	mg/L	0.2	1	05/17/19 13:18	jlw/ ae
Selenium, dissolved	M200.8 ICP-MS	1	0.001		*	mg/L	0.0001	0.0003	05/20/19 15:44	bsu
Silica, dissolved	M200.7 ICP	1	163		*	mg/L	0.2	1	05/17/19 13:18	jlw/ ae
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	05/20/19 15:44	bsu
Sodium, dissolved	M200.7 ICP	1	32.7		*	mg/L	0.2	1	05/17/19 13:18	jlw/ ae
Strontium, dissolved	M200.7 ICP	1	4.45		*	mg/L	0.009	0.05	05/17/19 13:18	jlw/ ae
Thallium, dissolved	M200.8 ICP-MS	1	0.0007		*	mg/L	0.0001	0.0005	05/20/19 15:44	bsu
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B	*	mg/L	0.0001	0.0005	05/20/19 15:44	bsu
Zinc, dissolved	M200.7 ICP	1	0.10		*	mg/L	0.01	0.05	05/17/19 13:18	jlw/ ae

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.966	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.15	0.15			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0006		1.041	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0012	U	2.1	mg/L	105	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0012	U	2.03	mg/L	101	85	115	3	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02		.02054	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00088	0.00088			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01		.00975	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.05	U	.0498	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.05	U	.0491	mg/L	98	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05099	mg/L	102	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00044	0.00044			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04832	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.006	.2564	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.006	.2539	mg/L	99	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.0052	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.021	0.021			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.4812	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	U	.988	mg/L	99	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	U	.982	mg/L	98	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049268	mg/L	99	90	110			
WG472667ICB	ICB	05/20/19 14:50				.000093	mg/L		-0.000176	0.000176			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046617	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.22919	mg/L	92	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.22692	mg/L	91	70	130	1	20	

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.032	mg/L	102	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.521	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	.37	1.352	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	.37	1.359	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049831	mg/L	100	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00011	0.00011			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046506	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.24595	mg/L	98	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.24776	mg/L	99	70	130	1	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472670													
WG472670ICV	ICV	05/20/19 12:23	II190503-1	100		95.74	mg/L	96	95	105			
WG472670ICB	ICB	05/20/19 12:30				U	mg/L		-0.3	0.3			
WG472670LFB	LFB	05/20/19 12:42	II190509-6	68.01315		67.9	mg/L	100	85	115			
L49991-14AS	AS	05/20/19 12:52	II190509-6	68.01315	47.9	110.2	mg/L	92	85	115			
L49991-14ASD	ASD	05/20/19 12:55	II190509-6	68.01315	47.9	111.2	mg/L	93	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.958	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5025		.492	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.005	U	.966	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.005	U	.967	mg/L	96	85	115	0	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.955	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.487	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	U	.971	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	U	.983	mg/L	98	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.942	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0018		1.01	mg/L	101	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0036	.09	2.032	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0036	.09	2.046	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	4		3.982	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0017		1	mg/L	100	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0034	U	1.972	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0034	U	1.989	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		95.52	mg/L	96	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	50.00434		48.09	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	100.00868	180	268.8	mg/L	89	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	100.00868	180	265.4	mg/L	85	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.953	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.493	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	.2	1.166	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	.2	1.157	mg/L	96	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472730													
WG472730ICV2	ICV	05/23/19 13:39	HG190404-3	.004995		.00482	mg/L	96	95	105			
WG472730ICV3	ICV	05/23/19 13:40	HG190404-3	.004995		.00483	mg/L	97	95	105			
WG472730ICB	ICB	05/23/19 13:41				U	mg/L		-0.0002	0.0002			
WG472731													
WG472731LRB	LRB	05/23/19 14:21				U	mg/L		-0.00044	0.00044			
WG472731LFB	LFB	05/23/19 14:22	HG190521-3	.002002		.00188	mg/L	94	85	115			
L51723-01LFM	LFM	05/23/19 14:28	HG190521-3	.002002	U	.00183	mg/L	91	85	115			
L51723-01LFMD	LFMD	05/23/19 14:31	HG190521-3	.002002	U	.00186	mg/L	93	85	115	2	20	

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.028	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4975		.515	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.995	U	1.008	mg/L	101	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.995	U	.98	mg/L	98	85	115	3	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2.004		1.9342	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.024	0.024			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5		.4832	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1	U	.943	mg/L	94	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1	U	.958	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	5.0075		5.03	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.004		1.04	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.008	U	2	mg/L	100	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.008	U	2.14	mg/L	107	85	115	7	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	20		19.59	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	101.8741		97.46	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	203.7482	16.6	214.8	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	203.7482	16.6	208.6	mg/L	94	85	115	3	20	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05126	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				.00011	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04662	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.0008	.22721	mg/L	90	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.0008	.2294	mg/L	91	70	130	1	20	

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	42.8		43.18	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	21.415		22.08	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	42.83	7.9	52.38	mg/L	104	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	42.83	7.9	52.14	mg/L	103	85	115	0	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02004		.02075	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01002		.01003	mg/L	100	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.0501	U	.05006	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.0501	U	.04916	mg/L	98	70	130	2	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.81	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	98.14307		95.09	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	196.28614	103	292	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	196.28614	103	287.4	mg/L	94	85	115	2	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.974	mg/L	99	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.027	0.027			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.4975	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	10.1	10.702	mg/L	60	85	115			M3
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	10.1	10.65	mg/L	55	85	115	0	20	M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05177	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.0501		.0492	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.2505	U	.27051	mg/L	108	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.2505	U	.27163	mg/L	108	70	130	0	20	

Brown and Caldwell

ACZ Project ID: ***L51319***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05247	mg/L	105	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05		.04852	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25	.0006	.27609	mg/L	110	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25	.0006	.27539	mg/L	110	70	130	0	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.956	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.50075		.514	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.0015	U	1.025	mg/L	102	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.0015	U	1	mg/L	100	85	115	2	20	

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L51319***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51319-02	WG472731	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG472580	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell ACZ Project ID: ***L51319***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L51319
Date Received: 04/24/2019 11:17
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51319
Date Received:	04/24/2019 11:17
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L51319

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald
Address: 1527 Cole Blvd #300 Lakewood CO 80401
Telephone: 303-239-5407

Copy of Report to:

Name: Kelly Donahue
Company:
E-mail: kdonahue@brwncald.com
Telephone:

Invoice to:

Name: Same
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD **Sampler's Site Information** State CA Zip code 90501 Time Zone PST

***Sampler's Signature:** Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL-CREEK-3052
PO#: MWMP/MOD-SPLP-MOD, TESSIER Leach
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier Leach HA-HCl	SPLP	Whole rock 3052	Column MWMP				
AA-880-930	2/18/19 1800	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
A-555-875	2/19/19 0900	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
B-420-550	2/19/19 1000	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
4. BC-210-415	2/19/19 1300	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
D-175-205	2/19/19 1700	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000	[signature]	2/25/19 13:04

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

COPY

L51319 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

May 24, 2019

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L51320

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 24, 2019. This project has been assigned to ACZ's project number, L51320. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L51320. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 23, 2019. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell
Project ID:
Sample ID: D-175-205

ACZ Sample ID: ***L51320-01***
Date Sampled: *02/19/19 17:00*
Date Received: *04/24/19*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								05/15/19 16:35	ajm

Brown and Caldwell
Project ID:
Sample ID: D-175-205-STEP 1

ACZ Sample ID: ***L51320-02***
Date Sampled: *05/15/19 10:00*
Date Received: *04/24/19*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.21	B	*	mg/L	0.05	0.3	05/17/19 13:22	jlw/ ae
Antimony, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0004	0.002	05/20/19 15:46	bsu
Arsenic, dissolved	M200.8 ICP-MS	1	0.0102		*	mg/L	0.0002	0.001	05/20/19 15:46	bsu
Barium, dissolved	M200.7 ICP	1	0.682		*	mg/L	0.007	0.04	05/17/19 13:22	jlw/ ae
Beryllium, dissolved	M200.8 ICP-MS	5	0.0005	B	*	mg/L	0.0004	0.001	05/20/19 18:23	bsu
Boron, dissolved	M200.7 ICP	1	0.19		*	mg/L	0.02	0.1	05/17/19 13:22	jlw/ ae
Cadmium, dissolved	M200.8 ICP-MS	1	0.00327		*	mg/L	0.00005	0.0003	05/20/19 15:46	bsu
Calcium, dissolved	M200.7 ICP	2	927		*	mg/L	0.2	1	05/20/19 13:24	jlw/aeh
Chromium, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:22	jlw/ ae
Copper, dissolved	M200.7 ICP	1		U	*	mg/L	0.01	0.05	05/17/19 13:22	jlw/ ae
Iron, dissolved	M200.7 ICP	1	40.3		*	mg/L	0.03	0.08	05/17/19 13:22	jlw/ ae
Lead, dissolved	M200.7 ICP	1	0.04	B	*	mg/L	0.03	0.2	05/17/19 13:22	jlw/ ae
Magnesium, dissolved	M200.7 ICP	1	67.3		*	mg/L	0.2	1	05/17/19 13:22	jlw/ ae
Manganese, dissolved	M200.7 ICP	1	5.57		*	mg/L	0.01	0.05	05/17/19 13:22	jlw/ ae
Mercury, dissolved	M245.1 CVAA	2		U	*	mg/L	0.0004	0.002	05/23/19 14:27	slm
Molybdenum, dissolved	M200.7 ICP	1		U	*	mg/L	0.02	0.1	05/17/19 13:22	jlw/ ae
Nickel, dissolved	M200.7 ICP	1	0.435		*	mg/L	0.008	0.04	05/17/19 13:22	jlw/ ae
Phosphorus, dissolved	M200.7 - ICP	1	0.3	B	*	mg/L	0.1	0.5	05/17/19 13:22	jlw/ ae
Potassium, dissolved	M200.7 ICP	1	52.1		*	mg/L	0.2	1	05/17/19 13:22	jlw/ ae
Selenium, dissolved	M200.8 ICP-MS	1	0.0026		*	mg/L	0.0001	0.0003	05/20/19 15:46	bsu
Silica, dissolved	M200.7 ICP	1	186		*	mg/L	0.2	1	05/17/19 13:22	jlw/ ae
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	05/20/19 15:46	bsu
Sodium, dissolved	M200.7 ICP	1	18.1		*	mg/L	0.2	1	05/17/19 13:22	jlw/ ae
Strontium, dissolved	M200.7 ICP	1	6.03		*	mg/L	0.009	0.05	05/17/19 13:22	jlw/ ae
Thallium, dissolved	M200.8 ICP-MS	1	0.0006		*	mg/L	0.0001	0.0005	05/20/19 15:46	bsu
Uranium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	05/20/19 15:46	bsu
Zinc, dissolved	M200.7 ICP	1	0.11		*	mg/L	0.01	0.05	05/17/19 13:22	jlw/ ae

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.966	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.15	0.15			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0006		1.041	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0012	U	2.1	mg/L	105	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0012	U	2.03	mg/L	101	85	115	3	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02		.02054	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00088	0.00088			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01		.00975	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.05	U	.0498	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.05	U	.0491	mg/L	98	70	130	1	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05099	mg/L	102	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00044	0.00044			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04832	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.006	.2564	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.006	.2539	mg/L	99	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.0052	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.021	0.021			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.4812	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	U	.988	mg/L	99	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	U	.982	mg/L	98	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472723													
WG472723ICV	ICV	05/20/19 18:14	MS190513-2	.05		.049128	mg/L	98	90	110			
WG472723ICB	ICB	05/20/19 18:16				.000092	mg/L		-0.000176	0.000176			
WG472723LFB	LFB	05/20/19 18:18	MS190507-2	.05005		.045573	mg/L	91	85	115			
L51657-01AS	AS	05/20/19 18:29	MS190507-2	.05005	U	.048246	mg/L	96	70	130			
L51657-01ASD	ASD	05/20/19 18:30	MS190507-2	.05005	U	.05187	mg/L	104	70	130	7	20	

Brown and Caldwell

ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.032	mg/L	102	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.521	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	.37	1.352	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	.37	1.359	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.049831	mg/L	100	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00011	0.00011			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.046506	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	U	.24595	mg/L	98	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	U	.24776	mg/L	99	70	130	1	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472670													
WG472670ICV	ICV	05/20/19 12:23	II190503-1	100		95.74	mg/L	96	95	105			
WG472670ICB	ICB	05/20/19 12:30				U	mg/L		-0.3	0.3			
WG472670LFB	LFB	05/20/19 12:42	II190509-6	68.01315		67.9	mg/L	100	85	115			
L49991-14AS	AS	05/20/19 12:52	II190509-6	68.01315	47.9	110.2	mg/L	92	85	115			
L49991-14ASD	ASD	05/20/19 12:55	II190509-6	68.01315	47.9	111.2	mg/L	93	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.958	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5025		.492	mg/L	98	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.005	U	.966	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.005	U	.967	mg/L	96	85	115	0	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.955	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.487	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	U	.971	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	U	.983	mg/L	98	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.942	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0018		1.01	mg/L	101	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0036	.09	2.032	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0036	.09	2.046	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	4		3.982	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.09	0.09			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.0017		1	mg/L	100	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.0034	U	1.972	mg/L	98	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.0034	U	1.989	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		95.52	mg/L	96	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	50.00434		48.09	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	100.00868	180	268.8	mg/L	89	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	100.00868	180	265.4	mg/L	85	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.953	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4995		.493	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.999	.2	1.166	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.999	.2	1.157	mg/L	96	85	115	1	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472730													
WG472730ICV2	ICV	05/23/19 13:39	HG190404-3	.004995		.00482	mg/L	96	95	105			
WG472730ICV3	ICV	05/23/19 13:40	HG190404-3	.004995		.00483	mg/L	97	95	105			
WG472730ICB	ICB	05/23/19 13:41				U	mg/L		-0.0002	0.0002			
WG472731													
WG472731LRB	LRB	05/23/19 14:21				U	mg/L		-0.00044	0.00044			
WG472731LFB	LFB	05/23/19 14:22	HG190521-3	.002002		.00188	mg/L	94	85	115			
L51723-01LFM	LFM	05/23/19 14:28	HG190521-3	.002002	U	.00183	mg/L	91	85	115			
L51723-01LFMD	LFMD	05/23/19 14:31	HG190521-3	.002002	U	.00186	mg/L	93	85	115	2	20	

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ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		2.028	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.06	0.06			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.4975		.515	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	.995	U	1.008	mg/L	101	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	.995	U	.98	mg/L	98	85	115	3	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2.004		1.9342	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.024	0.024			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5		.4832	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1	U	.943	mg/L	94	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1	U	.958	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 - ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	5.0075		5.03	mg/L	100	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.3	0.3			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	1.004		1.04	mg/L	104	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	2.008	U	2	mg/L	100	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	2.008	U	2.14	mg/L	107	85	115	7	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	20		19.59	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	101.8741		97.46	mg/L	96	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	203.7482	16.6	214.8	mg/L	97	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	203.7482	16.6	208.6	mg/L	94	85	115	3	20	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05126	mg/L	103	90	110			
WG472667ICB	ICB	05/20/19 14:50				.00011	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05005		.04662	mg/L	93	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25025	.0008	.22721	mg/L	90	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25025	.0008	.2294	mg/L	91	70	130	1	20	

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ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	42.8		43.18	mg/L	101	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	21.415		22.08	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	42.83	7.9	52.38	mg/L	104	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	42.83	7.9	52.14	mg/L	103	85	115	0	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.02004		.02075	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.01002		.01003	mg/L	100	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.0501	U	.05006	mg/L	100	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.0501	U	.04916	mg/L	98	70	130	2	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	100		96.81	mg/L	97	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.6	0.6			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	98.14307		95.09	mg/L	97	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	196.28614	103	292	mg/L	96	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	196.28614	103	287.4	mg/L	94	85	115	2	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.974	mg/L	99	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.027	0.027			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.5005		.4975	mg/L	99	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.001	10.1	10.702	mg/L	60	85	115			M3
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.001	10.1	10.65	mg/L	55	85	115	0	20	M3

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05177	mg/L	104	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.0501		.0492	mg/L	98	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.2505	U	.27051	mg/L	108	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.2505	U	.27163	mg/L	108	70	130	0	20	

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ACZ Project ID: ***L51320***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472667													
WG472667ICV	ICV	05/20/19 14:48	MS190513-2	.05		.05247	mg/L	105	90	110			
WG472667ICB	ICB	05/20/19 14:50				U	mg/L		-0.00022	0.00022			
WG472667LFB	LFB	05/20/19 14:52	MS190507-2	.05		.04852	mg/L	97	85	115			
L51317-02AS	AS	05/20/19 15:39	MS190507-2	.25	.0006	.27609	mg/L	110	70	130			
L51317-02ASD	ASD	05/20/19 15:41	MS190507-2	.25	.0006	.27539	mg/L	110	70	130	0	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG472580													
WG472580ICV	ICV	05/17/19 11:53	II190503-1	2		1.956	mg/L	98	95	105			
WG472580ICB	ICB	05/17/19 11:59				U	mg/L		-0.03	0.03			
WG472580LFB	LFB	05/17/19 12:13	II190509-6	.50075		.514	mg/L	103	85	115			
L51533-01AS	AS	05/17/19 13:35	II190509-6	1.0015	U	1.025	mg/L	102	85	115			
L51533-01ASD	ASD	05/17/19 13:38	II190509-6	1.0015	U	1	mg/L	100	85	115	2	20	

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Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L51320***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L51320-02	WG472723	Beryllium, dissolved	M200.8 ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M200.8 ICP-MS	DC	Sample required dilution. Non-target analyte exceeded calibration range.
	WG472731	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG472580	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 - ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silica, dissolved	M200.7 ICP
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

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Sample Receipt

Brown and Caldwell

ACZ Project ID: L51320
Date Received: 04/24/2019 11:18
Received By:
Date Printed: 4/25/2019

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L51320
Date Received:	04/24/2019 11:18
Received By:	
Date Printed:	4/25/2019

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L51320

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald
Address: 1527 Cole Blvd #300 Lakewood CO 80401
Telephone: 303-239-5407

Copy of Report to:

Name: Kelly Donahue
Company:
E-mail: kdonahue@brwncald.com
Telephone:

Invoice to:

Name: Same
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KD **Sampler's Site Information** **State** CA **Zip code** 90501 **Time Zone** PST

***Sampler's Signature:** Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL-CREEK-3052
PO#: MWMP/MOD-SPLP-MOD, TESSIER Leach
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier Leach HA-HCl	SPLP	Whole rock 3052	Column MWMP				
AA-880-930	2/18/19 1800	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
A-555-875	2/19/19 0900	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
B-420-550	2/19/19 1000	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
BC-210-415	2/19/19 1300	SO	3	☒	☒	☒	☒	☐	☐	☐	☐
5 D-175-205	2/19/19 1700	SO	1	☒	☒	☒	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please Hold all Samples until further notice

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	2/20/19 1000	[signature]	2/25/19 13:03

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

COPY

L51320 Chain of Custod



Brown AND Caldwell

San Jose Office

75 E. Santa Clara, Suite 375
San Jose, CA 95113Tel:
408.703.2528

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Appendix G: Final Phase III Potential Injection Aquifer Geochemical Characterization Report

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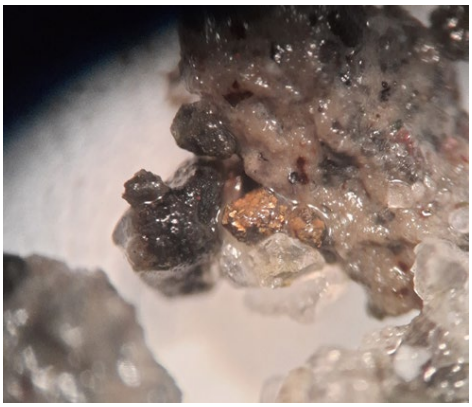
Brown AND Caldwell

Prepared for
Soquel Creek Water District, Soquel, California

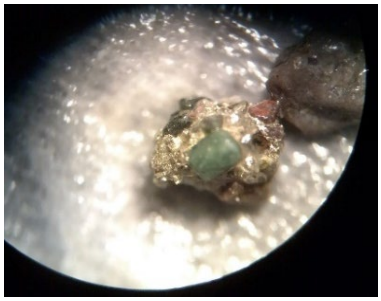
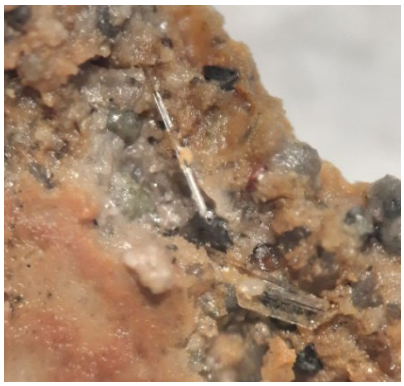
FINAL

Phase III Geochemical Characterization of Potential Injection Aquifer

December 2022







FINAL

Phase III Geochemical Characterization of Potential Injection Aquifer

Prepared for
Soquel Creek Water District, Soquel, California
December 2022

Brown AND Caldwell
75 E. Santa Clara St. Suite 375
San Jose, CA 95113

Table of Contents

List of Figures iv
List of Tables iv
List of Photographs v
List of Abbreviations vi
1. Introduction 1-1
1.1 Project Background 1-1
1.2 Purpose of Geochemical Characterization 1-2
1.3 Regional Geochemical Investigations 1-3
1.4 Summary of Phase I and II Geochemical Investigations 1-4
1.5 Geochemical Modeling 1-6
1.6 Phase III Geochemical Analysis 1-7
2. Sample Collection and Analysis 2-1
2.1 Drill Cuttings Sample Collection 2-1
2.2 Geochemical Laboratory Analyses 2-3
2.2.1 Soil Leaching Analysis 2-3
2.2.2 Mineralogical Analysis 2-6
3. Geochemical Analysis Results 3-1
3.1.1 Purified Water Chemistry 3-1
3.1.2 Purified Water Soil Leaching 3-2
3.1.3 Soil Leaching Phase I, II, and III 3-3
3.1.4 Modified Meteoric Water Mobility Procedure – Column Testing 3-13
3.1.5 Hydroxylamine-Hydrochloride Extraction Leaching 3-27
3.2 Mineralogical Analysis 3-31
3.2.1 Visual Examination 3-31
3.2.2 XRD Analysis 3-33
3.2.3 Whole-rock Analysis 3-34
3.2.4 XRF Analysis 3-39
4. Geochemical Observations 4-1
5. Recommendations 5-1
6. Limitations 6-1
7. References 7-1
Appendix A: Sample Photos ..... A
Appendix B: Lab Reports ..... B

Use of contents on this sheet is subject to the limitations specified at the end of this document.
Final Phase_III_ Geochemical Testing_Final.docx

List of Figures

Figure 1-1. PWS Facilities....1-2
Figure 1-2. Groundwater well locations....1-5
Figure 3-1. Phase III modified SPLP leaching for purified waters and AWPF water chemistry....3-6
Figure 3-2. Phase III metals concentrations of the modified SPLP soil leaching for purified waters and AWPF water chemistry....3-7
Figure 3-3. Phase II and III modified SPLP soil leaching arsenic with calcium and magnesium concentrations....3-8
Figure 3-4. Phase I, II, and III modified SPLP leaching results....3-9
Figure 3-5. Phase I, II, and III modified SPLP leaching metals concentrations....3-10
Figure 3-6. Phase III Modified MWMP column test results with sulfate....3-17
Figure 3-7. Phase III Modified MWMP column test results with sulfate....3-18
Figure 3-8. Phase III Modified MWMP column test results with leachate pH....3-19
Figure 3-9. Modified MWMP column concentrations with sulfate....3-25
Figure 3-10. Modified MWMP column concentration with leachate pH....3-26
Figure 3-11. HA-HCL Phase II and Phase III test results....3-29
Figure 3-12. HA-HCL Phase II and Phase III test results....3-30
Figure 3-13. Whole-rock Phase II and Phase III test results....3-37

List of Tables

Table 1-1 Comparisons of Pure Water Soquel Geochemical Testing Phases....1-8
Table 2-1 Phase III Geochemical Analysis Sample Depths Composited....2-1
Table 2-2. Phase III Geochemical Characterization Laboratory Analysis....2-3
Table 2-3. Analytical Parameters for Soil Leaching Analysis....2-4
Table 2-3. Advanced Water Purification Facilities Treatment Technologies....2-5
Table 3-1. Water Quality of Purified Waters for Soil Leaching Analysis for Phase III Analysis....3-1
Table 3-2. Phase III Soil Leaching Results from Modified SPLP Analysis....3-5
Table 3-3. Soil Leaching Results from Modified MWMP Column Analysis....3-20
Table 3-4. Water Quality of Tannery II Groundwater for Column Tests....3-24
Table 3-5. Soil Leaching HA-HCl Extraction Results....3-27
Table 3-6. Drill Cutting XRD Mineral Analysis....3-33
Table 3-7. Whole-rock Data....3-34
Table 3-8. X-ray Fluorescence Data....3-40

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Final Phase_III_ Geochemical Testing_Final.docx

List of Photographs

Photograph 2-1. Example of color change due to sulfide mineral oxidation in TLC sample bag 760 feet (photo taken 3/23/2021).....2-2

Photograph 2-2. Example of color changes of archived drilling materials in TLC sample bag 720 feet (photo taken 3/23/2021).....2-2

Photograph 3-1. Example of sulfide mineral phases oxidation in TLC sample bag 710 feet (photo taken 3/23/2021)..... 3-11

Photograph 3-2. Sulfide minerals in TLC sample bag 735 feet. Photograph taken at the time of well drilling (photo taken 02/14/2019)..... 3-12

Photograph 3-3. Example of possible sulfate mineral phases in TLC sample bag 715 feet (photo taken 3/23/2021)..... 3-13

Photograph 3-4. Sulfide minerals within a sand-grain rock fragment from TLC 720 ft 3-32

Photograph 3-5. Sulfide minerals within a sand-grain rock fragment from Willowbrook 650 ft 3-32

Use of contents on this sheet is subject to the limitations specified at the end of this document.
Final Phase_III_ Geochemical Testing_Final.docx

List of Abbreviations

ASTM	American Society of Testing Materials
AWPF	advanced water purification facility
BC	Brown and Caldwell
bgs	below ground surface
District	Soquel Creek Water District
HA-HCl	hydroxylamine-hydrochloride
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MWMP	Meteoric Water Mobility Procedure
NWRI	National Water Research Institute
pCi/L	picocuries per liter
ppm	parts per million
PWS	Pure Water Soquel
SMCL	Secondary Maximum Contaminant Level
SPLP	Synthetic Precipitation Leachate Procedure
SqCWD	Soquel Creek Water District
SWIP	seawater intrusion prevention
TLC	Twin Lakes Church
wt	weight
XRD	X-ray diffraction
XRF	X-ray fluorescence

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Final Phase_III_ Geochemical Testing_Final.docx

Section 1

Introduction

1.1 Project Background

The Soquel Creek Water District (SqCWD) is a county water district formed under Section §30000 et. seq. of the California Water Code that provides potable drinking water and groundwater resource management in a portion of Santa Cruz County, California. SqCWD's service area includes portions of the City of Capitola and the unincorporated communities of Aptos, La Selva Beach, Rio Del Mar, Seascape, Seacliff Beach, and Soquel. SqCWD serves approximately 16,047 connections, with 82% of total water deliveries to residential customers, and a population of approximately 38,706 (WSC, 2020). SqCWD currently obtains 100 percent of its water supply from aquifers in the Santa Cruz Mid-County Groundwater Basin. These aquifers are located within two geologic formations that underlie SqCWD's service area—the Purisima Formation and the Aromas Red Sands aquifer. The Purisima Formation provides most of SqCWD's water needs.

SqCWD has determined a supplemental water supply is required to restore groundwater levels basin-wide, create a seawater barrier, and aid in meeting the mandates of the Sustainable Groundwater Management Act that requires basin groundwater use be sustainable by 2040. In November 2017, SqCWD completed a Recycled Water Feasibility Study (Carollo, 2017) to assess options for recharging the local groundwater aquifer with advanced purified water and identified the Pure Water Soquel Project (PWS Project). As part of this project, SqCWD is planning to replenish approximately 1,500 afy of purified water into the groundwater basin. The planned PWS Project facilities are shown in Figure 1-1. The source water for purification will be secondary effluent from the Santa Cruz Wastewater Treatment Facility (SC WWTF). The PWS source water pump station (SWPS) at the SC WWTF will pump the source water to an advanced water purification facility (AWPF) at the Chanticleer site utilizing the PWS source water pipeline. After purification, purified water will then be pumped to the SWIP injection well sites through the purified water pipeline. In addition, reverse osmosis concentrate (ROC) will be directed back to the SC WWTF to the City's ocean outfall using the ROC pipeline. The TLC site, Monterey Avenue Well site, and the Willowbrook Lane site are the locations for the SWIP wells. These three locations will house SWIP wells used to recharge purified water into the groundwater basin.

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Final Phase_III_ Geochemical Testing_Final.docx

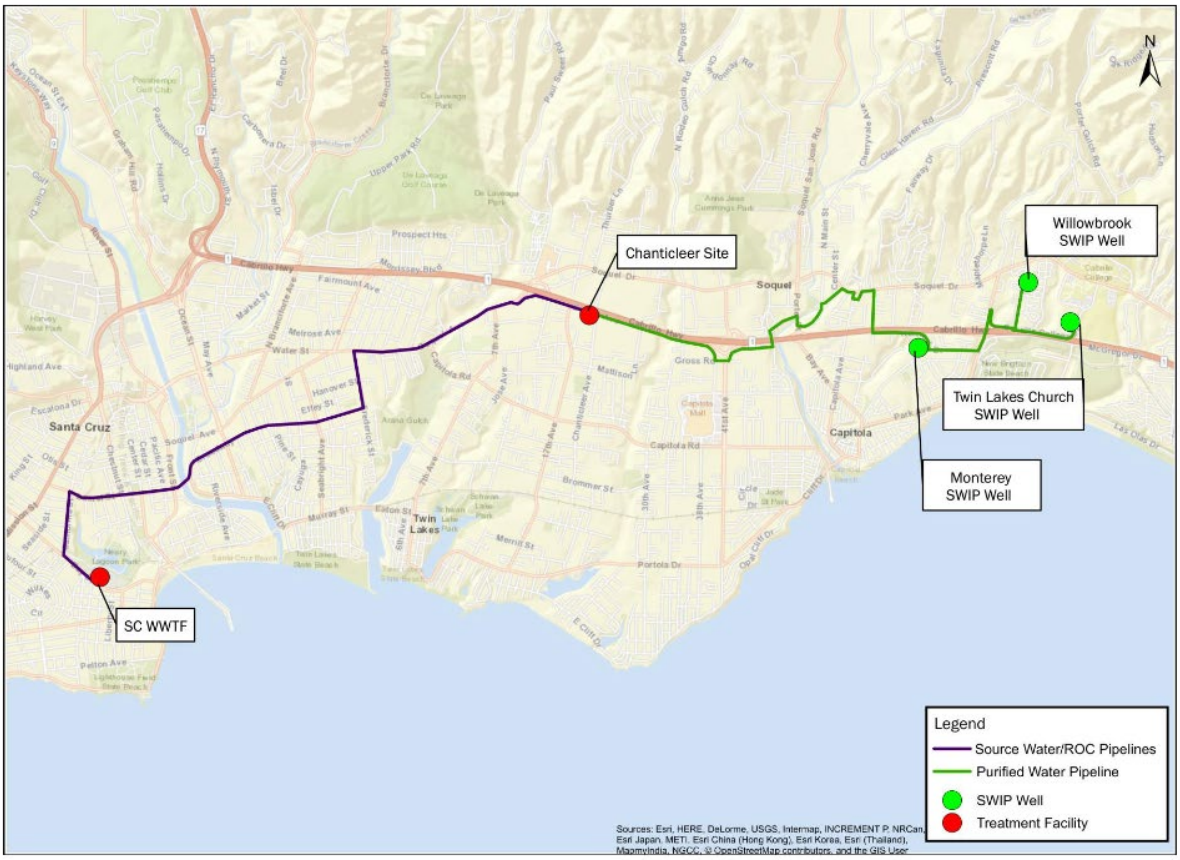

Figure 1-1. PWS Facilities

Construction on the PWS Project began in 2019 with a pilot recharge well that was constructed at the Twin Lakes Church (TLC) site. Data collected from the pilot recharge well was incorporated into groundwater modeling and seawater intrusion prevention (SWIP) well design. In addition, SqCWD conducted additional technical evaluation and completed a Basis of Design Report in 2019 (BC, 2019). In 2021, SqCWD completed construction of the SWIP wells, including the Willowbrook well, and in spring 2021 construction of the monitoring wells began. An equipping contractor for the SWIP well sites is scheduled to be procured in 2022.

In 2020, SqCWD executed an agreement with two Design-Build contractors for the design and construction of the conveyance pipelines and treatment facilities, respectively. The same two Design-Build contractors were awarded the construction phase of their agreements in spring and fall 2021, respectively. SqCWD Board's goal is to have the PWS project in operation by 2023. The PWS Project aims to prevent further seawater intrusion and will increase water supply reliability for SqCWD's only water supply source.

1.2 Purpose of Geochemical Characterization

In the state of California, the recycling or reuse of treated municipal wastewater has been utilized as a method to increase water supply sustainability either through direct or indirect reuse. Advanced treated purified water is defined as the treatment of municipal wastewater beyond secondary or biological water treatment to remove nutrients such as phosphorus, nitrogen, suspended solids and other constituents to below drinking water standards.

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Replenishment of advanced treated purified water into a groundwater aquifer can lead to geochemical reactions, such as mineral dissolution, oxidation, or desorption (Pyne, 2005). Naturally occurring metals can be released due to mineral dissolution or desorption from iron and manganese oxide minerals. Oxidation of mineral phases, such as sulfides, can also occur due to the higher oxidation-reduction potential of the purified water injected into the groundwater aquifer.

Changes in water quality could lead to operational difficulties and potentially degrade the water quality of the aquifer. The potential for oxidation or mineral dissolution to occur can be mitigated through purified water post-treatment stabilization prior to injection. For example, Orange County Water District observed arsenic mobilization in a small portion of its groundwater aquifer due to injection of purified water and implemented a revised post-treatment water quality target to help mitigate against arsenic mobilization (Wang et al., 2015; Fakhreddine et al., 2015). Therefore, geochemical characterization for the Pure Water Soquel project was conducted to better understand the geochemical reactions that may occur and possible methods to mitigate changes in water quality for the project.

1.3 Regional Geochemical Investigations

Several municipal districts in California are conducting feasibility investigations to utilize advanced treated purified water or surface water for groundwater augmentation. The Orange County Water District (OCWD), Pure Water Monterey, and Santa Cruz Water District (SCWD) are a few examples of operations planning to use advanced treated purified water or surface water to achieve groundwater replenishment objectives such as sea water intrusion prevention. Observations and data collected during the geochemical characterization analyses and pilot test operations conducted by other districts in the region can provide context for the data collected for the Pure Water Soquel project.

Geochemical investigations conducted by OCWD identified the potential to mobilize naturally occurring arsenic from the aquifer materials. Changes in the redox conditions in the aquifer occurred during the injection of oxygenated advanced treated purified water into the aquifer (Fakhreddine et al., 2020). Oxidation of arsenic-bearing sulfide mineral present in the aquifer material can lead to a short increase in arsenic concentrations in the groundwater before the arsenic is adsorbed onto iron-hydroxides formed during the injection operation. Mobilization of arsenic can be managed by maintaining a pH below 8.5, increasing the calcium concentration of the injection water to limit calcite dissolution from the aquifer materials, and maintaining an oxidized condition to maintain the geochemical stability of newly formed iron hydroxides (Fakhreddine et al., 2020).

The City of Santa Cruz conducted an aquifer storage and recovery (ASR) pilot test at the Beltz 8 well in 2020 and 2021 using potable feed water from the SCWD distribution system. The Beltz 8 ASR pilot test program consisted of 3 repeated cycles of injection, storage and recovery. The volume of injected water and duration of storage was increased with each subsequent ASR pilot test cycle (City of Santa Cruz Water Commission, 2021). Groundwater levels and water quality were monitored at multiple wells in proximity to the Beltz 8 well prior to, during and after each ASR cycle. Groundwater quality data collected from a monitoring well in close proximity to the Beltz 8 ASR well indicated a temporary increase of arsenic concentrations above the background groundwater concentrations but below the groundwater MCL (City of Santa Cruz Water Commission, 2021).

A geochemical assessment was conducted on core samples collected from the Aromas sand unit during the monitoring well drilling operations of the Pure Water Monterey project (Pure Water Monterey, 2019). The geochemical methods used were similar to those used for the Pure Water Soquel project Phase II and III. In additional to the laboratory tests, geochemical modeling was conducted to evaluate the potential mobilization of arsenic, chromium and lead. Laboratory data

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suggested naturally occurring arsenic was likely adsorbed onto iron hydroxide mineral found within the Aromas sand unit. Results of the geochemical modeling indicated the changes in the groundwater due to injection of related water would result in the desorption of arsenic at sustained concentrations below the MCL (Pure Water Monterey, 2019).

1.4 Summary of Phase I and II Geochemical Investigations

In 2016, an initial geochemical characterization investigation was conducted to determine the mineralogical composition and leaching potential of aquifer units and adjacent aquitard materials within SqCWD's service area, hereafter called the Phase I geochemical characterization.

Sediment samples from the Phase I geochemical characterization were derived from archived cuttings from previously drilled wells within the vicinity of proposed recharge wells for the PWS program, and the volume of material available for analysis was limited. Samples were analyzed for mineralogical composition using x-ray diffraction (XRD) and soil leaching using a modified Synthetic Precipitation Leachate Procedure (SPLP) method. These methods required very little sample volume (which was limited) and provided preliminary evaluations on the mineralogy and mobilization of constituents.

Data from the Phase I geochemical investigation (BC, 2016) suggested there is a potential for aquifer and aquitard materials to react with simulated non-stabilized purified water in a way that could release constituents from naturally occurring minerals. The National Water Research Institute Advisory Panel commissioned by SqCWD concluded that: 1) the samples used in the Phase I geochemical investigation may have been oxidized during storage prior to analysis; therefore, the results may not represent the in situ geochemical conditions, and 2) the non-stabilized deionized water used in the soil leaching analysis may not be representative of the future injection water and supported bench-scale geochemical and additional mineralogical analysis (NWRI, 2016).

The limited quantities of sample materials available for the Phase I analysis meant a limited number of geochemical tests could be conducted. The objective of the Phase I analysis was to evaluate the potential for and which constituents could be mobilization. The potential effects of advanced treated purified water on constituent mobilization could not be evaluated as there was only enough sample material available to conduct one round of soil leaching tests using laboratory grade de-ionized water. Laboratory grade de-ionized water is highly reactive in dissolving soluble mineral phases and was selected to identify the full range of potentially mobile constituents.

In 2019, additional geochemical characterization work (Phase II) was conducted to address the data gaps using samples collected during the drilling and installation of the TLC SWIP pilot well, the location of which is shown on Figure 1-2 with various treated and stabilized purified water samples (from three Advanced Water Purification facilities (AWPF) in California as well as non-stabilized de-ionized water). The objective of using water samples collected from three different AWPF was to evaluate effectiveness in mitigating the mobilization of constituents between three different advanced water treatment designs. Drill cuttings were collected at approximately 5-foot intervals throughout the entire depth of the pilot borehole. Geophysical and lithologic logs were reviewed to define four permeable zones in which to conduct isolated depth-specific zone testing.

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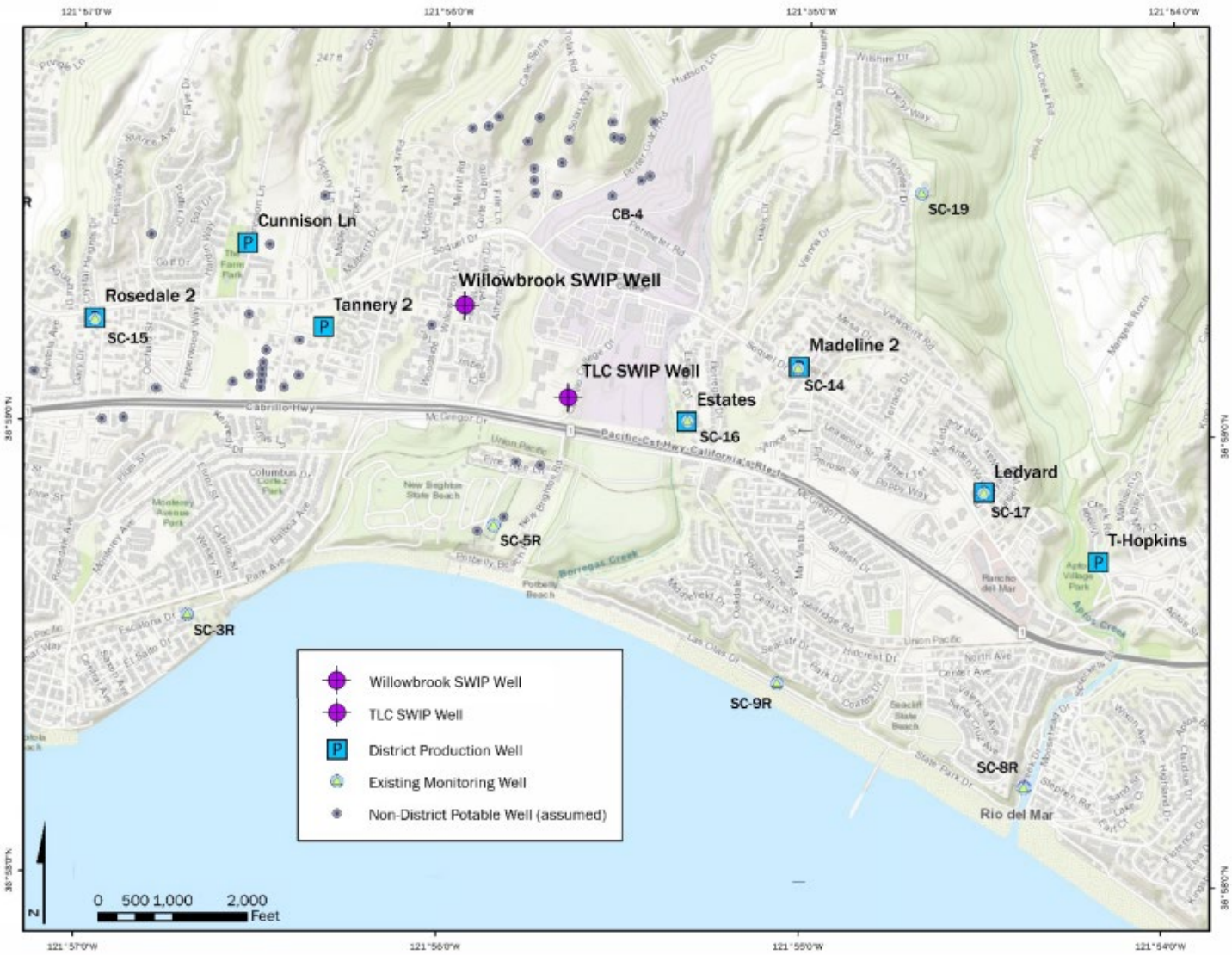

Figure 1-2. Groundwater well locations

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The objectives of the Phase II geochemical characterization analysis were to:

- Collect samples from the pilot borehole for geochemical laboratory analyses.
- Evaluate the geochemical conditions present in the aquifer units of the injection well.
- Identify the constituents that could become mobilized during the injection process.
- Evaluate if the chemistry of the advanced treated purified water could be adjusted to minimize or mitigate constituent mobilization.

The geochemical characterization program was not designed to replicate the geochemical conditions that would occur during the injection process due to the logistical difficulties of collecting undisturbed core samples and retaining the redox conditions of the aquifer during drilling and laboratory analysis. However, results from the Phase II geochemical characterization indicated several metals, such as beryllium, cadmium, iron, lead, mercury, and zinc, were either not present or immobile (BC, 2020). The mobilization of other metals, such as arsenic, may be due to desorption or the dissolution of mineral phases present in the aquifer materials. Soil leaching data from the Phase II analysis indicated the advanced treated purified water geochemistry could reduce the mobilization of arsenic, as evidenced by the range in the arsenic concentrations results from three AWPF waters.

1.5 Geochemical Modeling

A geochemical model was developed to further investigate the observations from the Phase II geochemical characterization program of the potential geochemical reactions that could occur between the advanced treated purified water and the Purisima Formation geologic units. The primary objective of the geochemical modeling analysis was to estimate the potential processes observed in the laboratory data and the potential methods to mitigate constituent mobilization.

The SqCWD geochemical model was developed using PHREEQC, a thermodynamic equilibrium geochemical model developed by the U.S. Geological Survey (Parkhurst and Appelo, 1999). Model simulations were designed to simulate the laboratory soil leaching analyses by “mixing” the defined mineral phases with each of the three advanced treated purified waters and the deionized laboratory grade water. The model output concentrations from each of the simulations were compared to the laboratory soil leaching results, which were used as model calibration points.

Several modeling simulations were conducted to attempt to replicate the water quality data from the laboratory soil leaching analysis. The modeling approaches can be grouped into three categories:

1. **Initial Model** – the initial model used only the mineral phases identified during the XRD analysis and mineral phases included in the geochemical modeling database. The mineral phases identified in the XRD analysis were consistent across all units, with slight variability in the relative abundances of the mineral phases identified. The geochemical model was developed to include each mineral phase identified. The abundances of the mineral phases were adjusted in several model runs to evaluate the sensitivity of the predicted water quality to the individual mineral phases. The purpose of the initial model simulations was to evaluate if the minerals identified in the XRD analysis were the only sources of constituents released during the soil leaching analysis.
2. **Desorption Model** – a generic mineral surface was added to the initial model mineralogy to allow for metals to sorb to the surface and desorb when mixed with the deionized water and advanced purified waters. The generic mineral surface did not represent a specific type of mineral either identified or suspected to be present in the Purisima unit. The purpose of the desorption model was to evaluate if the constituents released during the soil leaching analysis could be due to desorption from mineral phases present in the aquifer units.

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3. **Mineralogy Model** – additional mineral phases not identified in the XRD analysis were added to the initial model mineralogy. The purpose of the mineralogy model was to evaluate the source of specific constituents, such as arsenic, boron, and fluoride, that were measured during the soil leaching analysis; however, mineral phases containing these constituents were not identified using the XRD analysis.

Multiple simulations were generated using each model approach by slightly changing the relative amounts of a particular mineral phase in an attempt to calibrate the model to the measured laboratory data. For example, the amount of a particular mineral phase may have been increased or decreased in the mineralogy model approach to attempt to replicate the laboratory soil leaching data.

Several modeling simulation configurations and approaches were conducted to attempt to calibrate the model to the laboratory soil leaching data; however, the geochemical model was not able to replicate the water chemistry from the soil leaching results for all metals and major ions. The lack of calibration indicates that one or more geochemical processes or mineral phase(s) were not being accurately represented in the geochemical model. Modeling results were not able to replicate laboratory results, which indicates the geochemical processes occurring in the soil leaching analyses are likely a combination of mineral dissolution and desorption. The geochemical modeling analysis indicated mineral phases not identified through visual examination or XRD analysis may be reacting during the soil leaching analysis.

1.6 Phase III Geochemical Analysis

Results from the Phase I and II geochemical characterization and geochemical modeling analysis indicated the mechanism for the metals mobilization is likely a combination of desorption and/or mineral dissolution. Mineral dissolution could also include the oxidation of sulfide minerals. Results from geochemical studies conducted by other water districts in California identified potential reactions between advanced treated purified waters and naturally occurring mineral phases within the aquifer resulted in the mobilization of elements such as arsenic (Water Research Foundation, 2020; Fakhreddine et al., 2020). The metals mobilization can be minimized by adjusting the advanced treated purified water quality for parameters such as pH, dissolved oxygen, and calcium concentration. However, the formulation of the advanced treated purified water quality parameters are unique to each project as the geochemistry of aquifer material can vary.

A summary of the analytical methods and materials tests in Phase I and II are compared to the methods used for this Phase III analysis (Table 1-1) to illustrate the simulates and differences across the three geochemical analysis phases.

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Table 1-1 Comparisons of Pure Water Soquel Geochemical Testing Phases

Geochemical Characterization	Materials Tested	Analysis	Method/Benefit
Phase I (2016)	Archived drill cuttings from monitoring wells	Modified SPLP	Soil and lab-grade deionized water
		XRD	Mineralogy
		Groundwater quality	Identify groundwater chemistry
Phase II (2019)	Drill cuttings collected during the installation of the TLC well	Modified SPLP	Soil, 3 treated waters and lab-grade deionized water
		HA-HCl	Adsorbed constituent identification
		Modified MWMP columns	Identify water quality trends with time
		XRD	Mineralogy
		Whole rock	Total elemental concentrations
		Pre- and Post-injection groundwater quality	Site-specific groundwater chemistry
		Drilling mud water quality and XRD	Verify drilling mud had no impact on samples
Phase III (2021)	Archived drill cuttings from the TLC and Willowbrook wells	Modified SPLP	Soil, 4 treated waters - 2 waters from facilities used in Phase II - 2 waters from facilities not used before
		HA-HCl	Adsorbed constituent identification
		Modified MWMP columns	Identify water quality trends with time
		XRD	Mineralogy
		XRF	Total elemental concentrations
		Whole rock	Total elemental concentrations

Discussions with the Regional Water Quality Control Board (RWQCB)on the results of the Phase II analysis led to the identification of data gaps where additional information would increase the confidence in the PWS project. A work plan for Phase III was developed and feedback on the plan was provided by the RWQCB. Phase III geochemical characterization was proposed by SqCWD to address the specific data gaps listed below:

- Spatial variability of the mineralogy within the Purisima aquifer
- Characterization of the high-transmissivity zone within the injection aquifer
- Optimization of post-treatment advanced treated purified water stabilization by evaluating multiple waters from different AWPF with different post-treatment stabilization methods and materials
- Potential effects of sample storage on sampled materials
- Changes in metals mobilization if groundwater contacted aquifer materials previously exposed to advanced treated purified water

Potential variability in the mineralogy of the Purisima A unit was investigated by collecting and analyzing samples from the Willowbrook SWIP Well (as shown previously on Figure 1-1).

Data from the geophysical and lithological logs were evaluated to identify zones within the Purisima A unit most likely to move the majority of the advanced treated purified water into the aquifer. Samples were composited from the archived sample bags of the TLC (collected in February 2019) and Willowbrook SWIP wells (collected in August 2020).

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Phase III soil leaching tests were conducted with advanced treated purified water samples from multiple AWPFs to evaluate the different treatment designs and materials used to assess the potential for mitigating metals mobilization.

Groundwater was collected from the Tannery II well to be used in the modified MWMP column tests to evaluate the changes in the mobilization of constituents with groundwater after the aquifer material had been rinsed with advanced treated purified water.

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Section 2

Sample Collection and Analysis

This section summarizes the sample collection process and laboratory analyses conducted for the Phase III geochemical analysis. Samples of the entire Purisima A unit from the Willowbrook Well were composited from individual depth-specific sample bags to compare the results of the Phase III geochemical analysis with results of the Phase II geochemical characterization from the TLC Purisima A unit. Samples from a higher-transmissivity zones within Purisima A unit were also composited to represent the individual zones from the TLC and Willowbrook wells (Table 2-1). The zones of higher transmissivity were selected based on the geophysical logs and observations of grain-size made during the well drilling operations. The sample depths selected (Table 2-1) represent one of possibly several zones within the Purisima A with potentially higher transmissivity.

Table 2-1 Phase III Geochemical Analysis Sample Depths Composited

Sample ID	Well ID	Depth Composited	Units Represented
WBA-480-720	Willowbrook	480 - 720	Purisima A
WBHT-640-710*	Willowbrook	640 - 710	High-transmissivity Zone Purisima A
TLCHT-670-720	Twin Lake Church	670 - 720	High-transmissivity Zone Purisima A

Note: Sample WBHT-640-710 is listed as WHAT-640-710 in the laboratory reports

2.1 Drill Cuttings Sample Collection

Grab samples for aquifer soil drill cuttings were collected at 5-foot intervals during the drilling operations for the TLC well and Willowbrook. Samples were described during the drilling operation and stored in zip-top sample bags. For this Phase III analysis, composite samples were generated from the archived 5-foot interval sample bags of the TLC and Willowbrook materials stored at SqCWD. An equal volume of material was split from the individual 5-foot intervals sample bags and was composited into a larger volume of material. The multiple smaller splits were homogenized by hand until the large composite of material was a homogenous color. For example, a uniform volume of material was taken from each individual Willowbrook well sample bags from 480 ft to 720 ft and placed into one large homogenous composite sample sent for laboratory analysis.

The condition of the archived drill cuttings was noted and photographed prior to collecting materials for sample compositing. The archived samples were double bagged, the plastic bags were intact, and the samples were moist. There were noted changes in color, including a dark brown, rust coloration on the sulfide minerals observed on the outside of several of the sample bags from the TLC wells (Photograph 2-1). Materials from the interior of the bag were a slightly different color (gray) than the materials closest to the bag surface (brownish gray). Since the bags were sealed and the samples were still moist with the drilling fluids, it is likely the very minor amounts of atmospheric air within the bag prior to sealing reacted with the outermost portion of the materials (Photograph 2-2). Efforts were taken to collect materials that appeared to not be altered during storage. Materials from the center of the sample bag were scooped out and composited when possible. The color of the sample material was used to evaluate the potential for alteration during storage. Sample materials from the individual depth bags were combined into larger samples to represent the entire unit intervals (Table 2-1). Materials were homogenized and mixed until the composited material was a uniform color.

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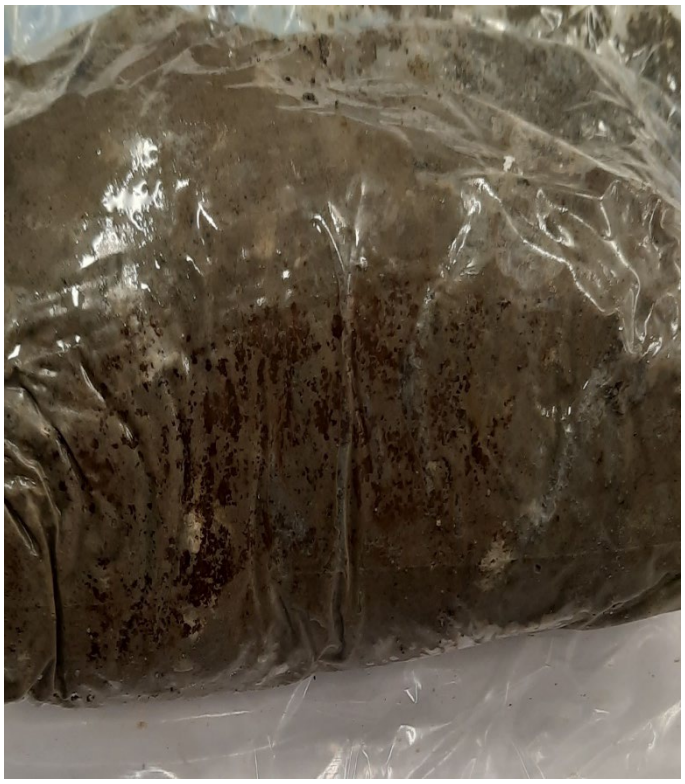

Photograph 2-1. Example of color change due to sulfide mineral oxidation in TLC sample bag 760 feet (photo taken 3/23/2021)



Photograph 2-2. Example of color changes of archived drilling materials in TLC sample bag 720 feet (photo taken 3/23/2021)

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Color changes in the TLC drill cutting samples provide evidence of sulfide oxidation during 25 months of storage. Color changes or other signs of alteration during the 6 months of sample storage were not prevalent in the Willowbrook archived samples. Photographs of all archived sample bags prior to sample collection can be found in Appendix A.

2.2 Geochemical Laboratory Analyses

The Phase III geochemical analyses were selected to build upon the data collected from the Phase I and II geochemical characterization and to attempt to fill data gaps by using several of the same laboratory analytical methods as the previous studies. The objective of the Phase III geochemical analysis was to provide SqCWD with additional information to optimize the advanced purified water treatment design and minimize the potential for constituent mobilization. The laboratory analyses were not designed to simulate the geochemical conditions in situ in the target injection units (low oxygen and low temperature) as all laboratory analyses are performed under normal atmospheric conditions and room temperature. An overview of the analytical methods, the units to be analyzed, and additional notes on the methodology are summarized in Table 2-2.

Table 2-2. Phase III Geochemical Characterization Laboratory Analysis

Analysis	Target Units	Number of Composite Samples	Previous Investigation	Phase III Geochemical Analysis Methodology Details
Soil Leaching				
Modified SPLP (EPA, 1994)	Purisima A	3	Phase I and Phase II	4 AWPF waters, 24 hour test duration
Modified MWMP (ASTM, 2013)	Only high-transmissivity zone of the Purisima A	2	Phase II	One AWPF water , week-long submersion, repeated 5 times; followed by Tannery II groundwater repeated twice
HA-HCl (Tessier et al., 1979)	Purisima A	3	Phase II	Metals only
Mineralogical Characterization				
Whole-rock Chemistry	Purisima A	3	Phase II	Major, minor, and trace elements
XRD	Purisima A	3	Phase I and Phase II	Major and trace mineral phases
XRF	Purisima A	3	None	Major and minor mineral elements

ASTM = American Society of Testing Materials; EPA = Environmental Protection Agency; HA-HCl = hydroxylamine-hydrochloride; MWMP = Meteoric Water Mobility Procedure; XRF = X-ray fluorescence

2.2.1 Soil Leaching Analysis

Three types of soil leach tests (modified SPLP, modified MWMP column, and hydroxylamine-hydrochloride [HA-HCl] extraction) were conducted to provide an indication of the leachability of aquifer materials when exposed to purified water. The analytes selected for the soil leaching analysis are listed in Table 2-2 and are based on California State Water Resources Control Board Drinking Water regulated constituents and major ions for water characterization, and are the same list of parameters that was used for the Phase I and II geochemical characterization investigations (BC, 2016 and 2020).

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Table 2-3. Analytical Parameters for Soil Leaching Analysis		
Major Anions		
Chloride	Fluoride[a]	Sulfate
Major Cations		
Calcium	Magnesium	Potassium
Sodium		
Dissolved Metals		
Aluminum[a]	Antimony[a]	Arsenic[a]
Barium[a]	Beryllium[a]	Boron
Cadmium[a]	Chromium[a]	Copper[a]
Iron	Lead[a]	Manganese
Mercury[a]	Molybdenum	Nickel[a]
Selenium[a]	Silver	Silica
Strontium[a]	Thallium[a]	Uranium[a]
Zinc		

a. Constituent is a regulated drinking water contaminant.

2.2.1.1 Modified SPLP Analysis

SPLP Method 1312 uses a 20:1 solution to solids mass ratio to extract readily dissolvable solid phases (EPA, 1994); however, the high solution to solids ratio can also dilute constituents below the analytical detection limit. The modified SPLP test used a 4:1 ratio of water to soil to avoid diluting leached constituents below the analytical detection limit and to more closely simulate the ratio of solids the purified water would contact in the injection formation relative to the standard 20:1 water to soil ratio. Advanced purified water provided by four California ~~water~~ AWPF facilities was used in the modified SPLP analysis. Details on the treatment plant system for each of the four AWPF facilities, as well as the planned PWS facility for comparison, are provided in Table 2-3. Water from AWPF1 and AWPF2 were utilized in the Phase II analysis. Water from AWPF3 was used in the Phase II analysis but was not used again in Phase III. Waters from AWPF4 and AWPF5 were selected for the Phase III analysis based on the water treatment design of these facilities.

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Table 2-3. Advanced Water Purification Facilities Treatment Technologies

Advanced Water Purification Technology	Pure Water Soquel (Planned)	AWPF1	AWPF2	AWPF4	AWPF5
Ozone	X	X			
Membrane Filtration	X	X	X	X	X
Reverse Osmosis	X	X	X	X	X
Ultraviolet/Advanced Oxidation Process (hydrogen peroxide)	X	X	X		
Ultraviolet/Advanced Oxidation Process (chlorine)				X	X
Decarbonation	X			X	
Post-Treatment/Stabilization (lime)			X		
Post-Treatment/Stabilization (calcium chloride)	X	X		X	X
Full-scale operational		X	X	X	X
Purified Water End Use	Groundwater Replenishment (in construction)	Groundwater Replenishment	Groundwater Replenishment	Groundwater Replenishment	Groundwater Replenishment

Samples selected for modified SPLP analysis included the targets from the high-transmissivity zone within the Purisima A unit from the TLC and Willowbrook wells and the sample representing the entire A unit from the Willowbrook Well. The objective of testing each well sample with each type of water was to determine the potential mobility of constituents with the potential mitigation benefits of water stabilization.

An additional modified SPLP analysis was conducted using the AWPF2 water with sodium bisulfite added in the laboratory to reduce the oxygen-reduction potential (ORP) of the purified water prior to use in the soil leaching analysis. The purpose of this additional soil leaching analysis was to evaluate if adding a post-treatment and pre-injection step to reduce the ORP would mitigate the oxidation of mineral phases within the aquifer. Unfortunately, the concentration of sodium bisulfite added in the laboratory was several orders of magnitude higher than the potential amount that would be used during SWIP well operation, and therefore, the laboratory results were not informative. The data are included in the laboratory reports (Appendix B) but are not included in the tables and graphs in Section 3 of this report.

2.2.1.2 Modified Meteoric Water Mobility Procedure Column Analysis

Soil leaching column analyses were conducted to evaluate the release of constituents and identify changes in the water quality parameters with prolonged and repeated exposure of the Purisima A unit to purified water. Purified water will be continuously recharged into and moving through the target unit over the course of the PWS program. Column leaching may provide a better estimate of constituent release over time by repeatedly exposing the soil materials to purified water for longer periods than the modified SPLP analyses.

Standard modified meteoric water mobility procedure (MWMP) analysis methodology (American Society of Testing Materials [ASTM], 2013) is commonly used in the environmental compliance industry to evaluate the mobility of contaminants from mining industry rockpile materials subjected to precipitation. The MWMP method was modified by extending the length of time in which the solution and solids can react and using multiple consecutive rinses. The purpose of the modifications was to observe concentration changes over multiple rinses to simulate the target unit

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reacting to continuous recharge of advanced treated purified water during the PWS operations. Modifications to the standard MWMP test included fully saturating the column material at a 1:1 ratio at the beginning of the test instead of slowly percolating the solution into the column over 24 hours. Additionally, the modified method increased the length of time the fluid can react to 6 days, and allowing the column to drain for 24 hours on the seventh day. Leachate from the modified MWMP column was collected on the seventh day and analyzed for the parameters listed in Table 2-3. At the completion of the first week of leaching and draining of the leachate, the column was then filled with purified water solution at a 1:1 ratio and allowed to react for another 6 days. The modified column tests were repeated for a total of four cycles using the same solid materials each week. The purified water leachate that is drained from the column was not reused in subsequent column cycles to avoid dissolved constituents being redeposited in subsequent test cycles. The modifications were designed to more closely simulate the injection water saturating and reacting with the aquifer materials.

Only samples from the higher-transmissivity zones within the Purisima A from the TLC and Willowbrook wells were used in the modified column analysis. The purified water from the AWPF1 facility was used for the modified MWMP column analysis as it represents the most similar water treatment design for PWS. After the five weekly rinses with the AWPF1 water, groundwater collected from the Tannery II well was used in the modified column tests to simulate the conditions of groundwater interacting with Purisima A unit materials if the SWIP well operations has stopped and native groundwater rebounds into the region of the PWS injection.

2.2.1.3 Hydroxylamine-Hydrochloride Extraction Test

Metals bound to iron or manganese oxide mineral phases through adsorption could be a potential source of constituents released when purified water is injected into the aquifer. HA-HCl extraction tests were conducted to measure the amount of hydrous ferric oxide in the samples and estimate the potential for metals to desorb from iron and manganese oxide mineral phases (Tessier et al., 1979). The Purisima A units were analyzed for the HA-HCl extraction analysis for comparisons with the Phase II analysis. Leachate from the HA-HCl analysis were only analyzed for metals listed in Table 2-3, due to interferences from the extraction solution for major anions and cations.

2.2.2 Mineralogical Analysis

Mineral phases were evaluated using visual observations, whole-rock chemistry, and XRD analysis. These data were used to identify potential reactive mineral phases, such as sulfides or iron oxides, that could leach constituents.

2.2.2.1 Visual Examination

General descriptions of the particle size, color, texture, predominant mineral forms, and geological characteristics of the drill cuttings were described of the archived individual sample materials by a geologist prior to sample compositing. Visual examination of the archived samples was performed using a binocular scope with up to 30 times magnification. Photographs were taken through the binocular scope of observed mineral phases and textures when possible (Appendix A). Due to the fine-grained nature of the materials, mineral identification was approximated using the mineral color, shape, luster, and habit.

2.2.2.2 Whole-Rock Chemical Analysis

Whole-rock chemical analysis was conducted using EPA Method 3052 to determine the elemental composition of the composite samples. Solid samples were digested prior to analysis by inductively coupled plasma with mass spectrometry to quantify the concentrations of major, minor, and trace elemental composition of the solid samples. Results from the whole-rock chemical analysis, when

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combined with the visual observations and XRD analysis, provided information on the potential mineral phases. Additionally, the whole-rock chemical analysis data were compared to the soil leaching results to evaluate which constituents were mobile or immobile.

2.2.2.3 X-ray Fluorescence Analyses

X-ray fluorescence (XRF) is a non-destructive analytical technique used to determine the elemental composition of materials. The XRF analysis was conducted using a Thermo ARL990 wavelength dispersive unit to evaluate the elemental composition of samples. Samples are analyzed directly by crushing the materials to a fine powder before being pressed into pellets for analysis. The direct analysis of the pressed pellet minimizes sampling error. The standard analysis includes the quantitative analysis of 31 elements.

2.2.2.4 X-ray Diffraction Analysis

X-ray diffraction (XRD) identifies mineral phases and quantities from peaks created by the scattering of radiation into three dimensional arrays of atoms unique to each mineral. Mineral phases are identified by comparing locations and intensities of diffraction peaks with those of mineral reference standards. Results were summarized as approximate mineral weight percent. Estimates of mineral percentages were based on relative peak heights/areas on the XRD scans. The detection limit for an average mineral in a sample is approximately 1 to 3 percent of the sample mass, and the analytical reproducibility is approximately equal to the square root of the mass of mineral present. Samples from the Phase I and II geochemical characterizations were analyzed using XRD. The results from the Phase I and II analyses were compared to the mineralogy of the Phase III geochemical analysis to evaluate the mineralogical changes spatially within the target unit.

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Section 3

Geochemical Analysis Results

Data collected from the field and laboratory analyses were combined to evaluate the potential water quality effects of the purified water interacting with the injection units and adjacent aquifer materials. Results from the Phase I and II investigations were combined with the results of the Phase III geochemical analysis to examine the geochemical conditions for PWS and the regional geologic units.

3.1.1 Purified Water Chemistry

Water was collected from four AWPFs for the soil leaching analysis for the Phase III geochemical analysis (Table 3-1). Water from AWPF1 was also used in Phase II; however, the post-treatment process had been slightly modified and therefore AWPF1 was used again in Phase III to determine if the change in post-treatment had an effect on constituent mobilization. Water collected from AWPF2 was used in Phase II and also used again for the Phase III geochemical to compare results between the TLC and Willowbrook wells. AWPF4 and AWPF5 water samples were from facilities that had not been used during the Phase II analysis and represent different post-treatment designs to be evaluated and compared with other AWPF soil leaching results.

Table 3-1. Water Quality of Purified Waters for Soil Leaching Analysis for Phase III Analysis

Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF4 (mg/L)	AWPF5 (mg/L)	MCL (mg/L)	SMCL (mg/L)
Aluminum	< 0.05	< 0.05	< 0.05	< 0.05	1	-
Antimony	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.006	-
Arsenic	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.01	-
Barium	< 0.007	< 0.007	< 0.007	< 0.007	1	-
Beryllium	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.004	-
Boron	0.274	0.217	0.241	0.511	-	-
Cadmium	< 0.00025	< 0.00005	< 0.00005	< 0.00005	0.005	-
Calcium	17.3	14.3	26.2	45.1	-	-
Chloride	41.1	3.19	58.8	115	-	250
Chromium	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.05	-
Copper	< 0.01	< 0.01	< 0.01	< 0.01	-	1
Fluoride	< 0.15	< 0.15	< 0.15	< 0.15	-	2
Iron	< 0.06	0.068	< 0.06	< 0.06	-	0.3
Lead	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.015	-
Magnesium	0.48	< 0.2	0.7	0.41	-	-
Manganese	< 0.01	< 0.01	< 0.01	< 0.01	-	0.05
Mercury	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.002	-
Molybdenum	< 0.02	< 0.02	< 0.02	< 0.02	-	-

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Table 3-1. Water Quality of Purified Waters for Soil Leaching Analysis for Phase III Analysis

Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF4 (mg/L)	AWPF5 (mg/L)	MCL (mg/L)	SMCL (mg/L)
Nickel	< 0.008	< 0.008	< 0.008	< 0.008	0.1	-
Potassium	17	<1	2.47	4.09	-	-
Selenium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.05	-
Silica	0.7	0.3	0.5	0.5	-	-
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	0.1
Sodium	19.5	4.29	29.5	52.6	-	-
Sulfate	< 1	< 1	6	2.9	-	250
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.002	-
Uranium†	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.03	-
Strontium	0.303	< 0.009	0.443	0.862	-	-
Zinc	< 0.02	< 0.02	< 0.02	< 0.02	-	5

MCL = maximum contaminant level
SMCL = secondary maximum contaminant level
mg/L = milligrams per liter
- = no MCL or SMCL is established
† = constituent has a regulated radionuclide drinking water MCL measured in pCi/L

3.1.2 Purified Water Soil Leaching

Laboratory data from the Phase III analysis provides an indication of constituents that could be mobilized when Purisima aquifer materials are rinsed with AWPF; however, the concentrations measured in the laboratory tests likely will not reflect those measured in groundwater monitoring wells during PWS operations. Comparisons of the laboratory data to regulatory MCLs and SMCLs is to provide an indication of the presence or absence of a regulated constituent. Phase III modified SPLP soil leaching analysis concentrations were all below their respective MCLs or SMCLs, with the exception of manganese and sulfate. Several regulated constituents were below the analytical detection limit (Table 3-2). Regulated drinking water constituents measured above the detection limit in the modified SPLP analyses included antimony, arsenic, barium, cadmium, fluoride, manganese, nickel, selenium, sulfate, and uranium. Direct comparisons between the soil leaching laboratory results, reported as dissolved concentrations, and regulatory water quality MCLs or SMCLs is not appropriate for constituents such as aluminum, antimony, arsenic, cadmium, iron, lead, manganese, and zinc. These metals can be adsorbed onto particles measured during the digestion of total recoverable water quality analyses. Dissolved concentrations of these metals may be much lower than the total metals concentrations in the same sample.

The laboratory modified SPLP soil leaching analyses conducted over a 24-hour period and are not designed to simulate long-term weathering or oxidation of mineral phases, such as sulfides. The modified SPLP soil leaching analyses provide information on the constituents that may become mobilized as a result of desorption of constituents from iron and manganese oxides or dissolution of fine-grained, readily dissolvable mineral phases. The metals and other constituents mobilized through desorption or dissolution can be identified when the concentrations from the modified SPLP soil leaching results are above the concentration of the AWPF water concentrations (Figures 3-1 and 3-2).

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Boron, chloride, and strontium modified SPLP concentrations are similar to the concentrations of the AWPF water, indicating these constituents are not highly mobilized during the laboratory analysis. Metals such as antimony, arsenic, barium, fluoride, manganese, and uranium concentrations are higher in the modified SPLP soil leaching results than the AWPF water concentrations, indicating these elements were mobilized to a degree during the laboratory analysis.

Phase III antimony, arsenic and nickel concentrations vary between the higher-transmissivity zone and the entire Willowbrook Purisima A unit (Figure 3-2), indicating potential spatial differences in the mineralogy within the A unit. Antimony concentrations for samples from the high-transmissivity zone within the Willowbrook well are the same order of magnitude as the AWPF water used for the analysis.

Lower arsenic concentrations appear to correlate with higher calcium and/or magnesium concentrations in the leachate solution (Figure 3-3). The Willowbrook modified SPLP sample results with the lowest concentration of arsenic and highest concentration of calcium and magnesium were tested using the AWPF5 water (Table 3-2). Similar results of lower arsenic concentrations coinciding with higher calcium and magnesium concentrations in the leachate solution were observed in the Phase II analysis (BC, 2020). However, the TLC high-transmissivity samples have higher calcium and magnesium concentrations in the leachate solution but similar orders of magnitude concentrations as the Willowbrook samples for arsenic. The TLC samples were in storage for a longer period of time than the Willowbrook samples, and therefore the calcium and magnesium in the TLC samples may also be affected by readily dissolvable sulfate minerals.

Results of the Phase III modified SPLP analysis indicate each of the four AWPF waters show the potential to mobilize constituents from the Purisima A unit materials; however, the modified SPLP soil leaching metals concentrations are the same order of magnitude for all four AWPF waters tested, indicating the range of post-treatment stabilization strategies tested (Table 2-4) all have the potential to minimize mobilization. All four AWPF water tested in the Phase III analysis resulted in lower concentrations of arsenic than the AWPF and de-ionized waters tested in the Phase II analysis (Figure 3-3).

3.1.3 Soil Leaching Phase I, II, and III

Data from Phases I, II, and III Purisima A unit modified SPLP soil leaching analysis show significant variations in mobilization of constituents (Figures 3-4 and 3-5). The differences in the nature of the samples, recently drilled vs archived samples, as well as the types of water used during the soil leaching tests, de-ionized vs. AWPF water, are the likely cause for the variation in the soil leaching water quality. Phase I soil leaching analyses were conducted using laboratory grade de-ionized water on archived aquifer materials from monitoring wells CB4, SC-22 and SC-9A that had been stored in chip trays for several years. Phase II soil leaching tests were conducted using three different AWPF waters and laboratory grade de-ionized water, labeled as modified SPLP in the sample ID, on aquifer materials collected during the drilling of the TLC pilot injection well and submitted for laboratory analysis soon after the drilling process was completed. Phase III soil leaching analyses were conducted using four different AWPF waters on materials collected from archived samples of the TLC well approximately 2 years after the drilling process had been completed and the materials representing the higher-transmissivity zone within the Purisima A unit.

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Phase I modified SPLP results were higher in calcium, fluoride, magnesium, magnesium, and sulfate and lower in metals such as antimony, arsenic, barium, and boron (Figure 3-4). Phase I samples were rinsed with laboratory grade de-ionized water and had non-detect concentrations of constituents such as aluminum, beryllium, cadmium, chromium, copper, fluoride, lead, mercury, silver and thallium. Boron concentrations measured in the Phases III modified SPLP soil leaching analysis reflect the boron concentration in the AWPF water used in the analysis (Figure 3-1). Higher concentrations of calcium and sulfate in the Phase I modified SPLP soil leaching results could indicate the effects of alteration of the sample materials during storage. Oxidation of sulfides during storage could convert sulfide to sulfate and the formation of readily dissolvable sulfate minerals within the samples during storage. Oxidation of sulfide could also have released metals such as iron contained within the sulfide mineral phases, leading to the formation of iron-hydroxide mineral formation and adsorption of metals to the iron-hydroxides. Lower concentrations of antimony and arsenic in the Phase I samples could be the result of metals adsorption on iron-hydroxides (Figure 3-5).

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Table 3-2. Phase III Soil Leaching Results from Modified SPLP Analysis

Analyte (mg/L)	MCL (mg/L)	TLCHT-670-720-AWPF1	TLCHT-670-720-AWPF2	TLCHT-670-720-AWPF4	TLCHT-670-720-AWPF5	WBA-480-720-AWPF1	WBA-480-720-AWPF2	WBA-480-720-AWPF4	WBA-480-720-AWPF5	WBHT-640-710-AWPF1	WBHT-640-710-AWPF2	WBHT-640-710-AWPF4	WBHT-640-710-AWPF5
Aluminum[a]	1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Antimony	0.006	0.00106	0.00118	0.00097	0.00089	0.00081	0.0007	0.00075	0.00063	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Arsenic	0.01	0.00178	0.00241	0.00199	0.00197	0.00235	0.00208	0.00158	0.00144	0.00149	0.00166	0.00113	0.00093
Barium	1	0.0467	0.0442	0.0438	0.0501	0.0195	0.0179	0.028	0.0299	0.0241	0.022	0.0315	0.0354
Beryllium	0.004	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Boron	-	0.307	0.258	0.271	0.517	0.291	0.234	0.249	0.514	0.283	0.222	0.242	0.501
Cadmium	0.005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.000063	< 0.00005	< 0.00005	< 0.00005
Calcium	-	182	141	180	187	59.3	60.7	88.6	91.9	58.2	53.9	79.4	94.5
Chloride[a]	250	48	9.55	63.9	119	45.5	6.86	60.9	115	45.4	6.85	65.5	120
Chromium	0.05	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00079
Copper[a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride[a]	2	0.27	0.28	0.21	0.26	0.2	0.23	0.17	0.21	0.2	0.21	0.17	0.19
Iron[a]	0.3	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Lead	0.015	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Magnesium	-	17.1	14.5	16.5	16.5	8.58	8.28	11.3	11.6	8.41	7.82	11	11.5
Manganese[a]	0.05	0.153	0.103	0.122	0.125	0.053	0.055	0.086	0.08	0.058	0.061	0.082	0.09
Mercury	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	-	0.026	0.028	< 0.02	0.026	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nickel	0.1	0.0138	0.0183	< 0.008	0.0096	0.0102	0.0093	< 0.008	< 0.008	< 0.008	0.0123	0.0093	< 0.008
Potassium	-	10.4	8.57	10.3	11.4	5.82	4.74	6.33	7.54	6.48	5.07	6.68	8.22
Selenium	0.05	0.0007	0.0007	0.00065	0.00072	0.00042	0.0004	0.0004	0.00047	0.00022	0.00023	0.00022	0.00032
Silica	-	18	19.4	15.2	17.2	14.4	15.8	14.8	14.2	14.7	16.7	16.4	14.9
Silver[a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	-	47.4	33.4	55.5	72.2	76.7	61.2	82.7	107	59.9	48.1	66.2	91.6
Strontium†	-	0.864	0.629	0.906	1.08	0.436	0.38	0.622	0.754	0.38	0.294	0.493	0.697
Sulfate[a]	250	487	400	486	456	224	248	327	263	252	201	271	246
Thallium	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium†	0.03	0.00332	0.00321	0.00317	0.00301	0.00188	0.0018	0.00252	0.00223	0.0014	0.00144	0.00165	0.00163
Zinc[a]	5	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

a. secondary drinking water MCL

< = concentration was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in picocuries per liter (pCi/L); - = no MCL is established; mg/L = milligrams per liter. Refer to Table 2-1 for the well and depths composited to generate each sample.

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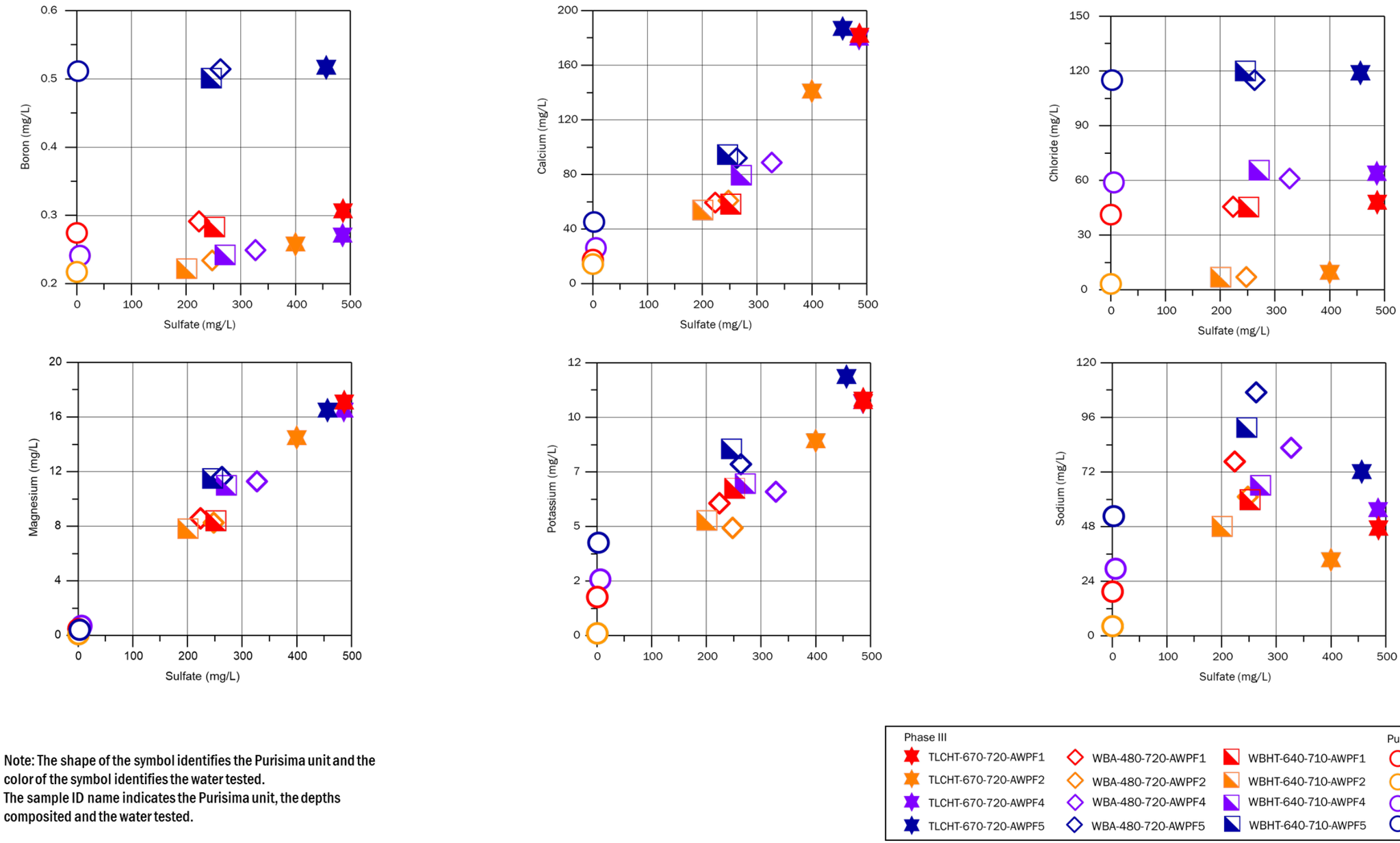

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited and the water tested.

Figure 3-1. Phase III modified SPLP leaching for purified waters and AWPF water chemistry

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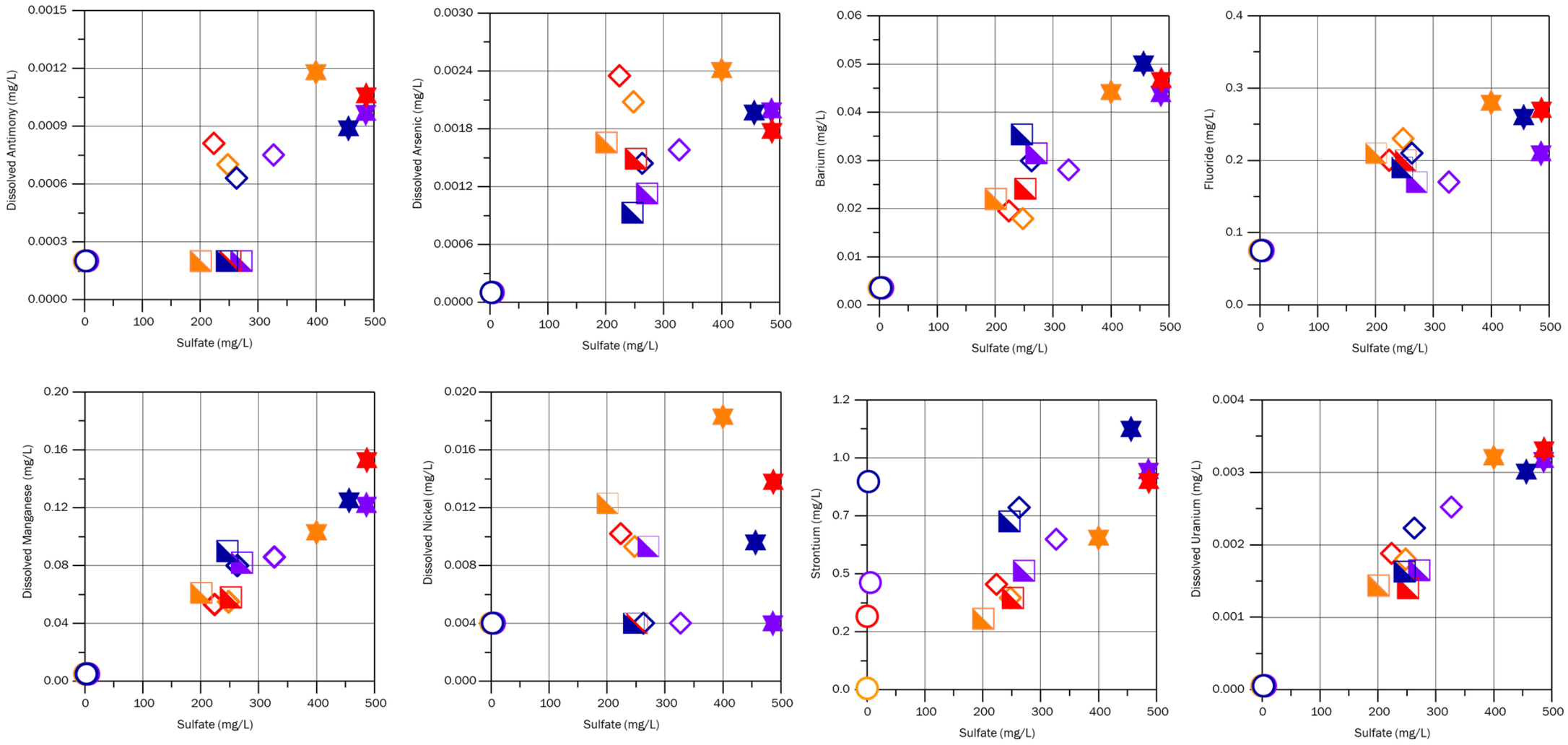

Note: The shape of the symbol identifies the Purisima unit and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited and the water tested.

Figure 3-2. Phase III metals concentrations of the modified SPLP soil leaching for purified waters and AWPF water chemistry

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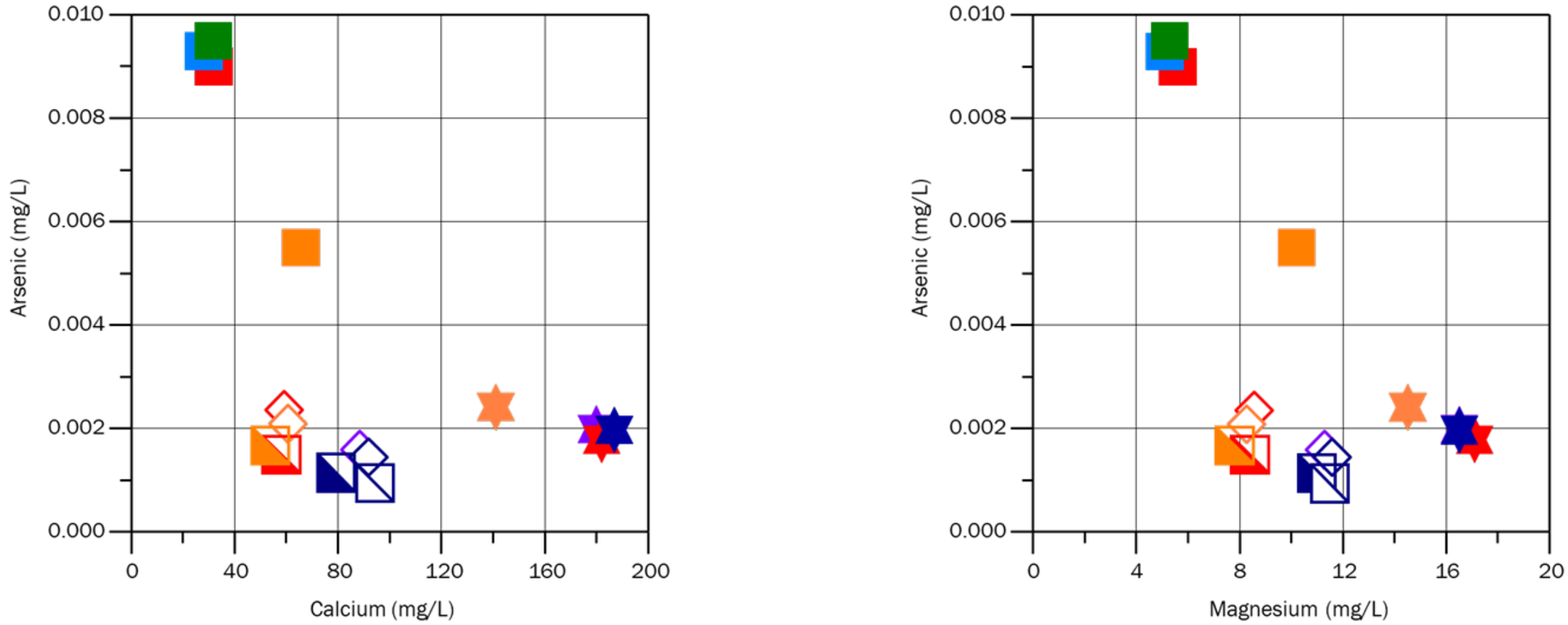

Note: The shape of the symbol identifies the Phase of testing, and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited, and the water tested.

Phase III			Phase II
TLCHT-670-720-AWPF1	WBA-480-720-AWPF1	WBHT-640-710-AWPF1	A-555-875-AWPF1
TLCHT-670-720-AWPF2	WBA-480-720-AWPF2	WBHT-640-710-AWPF2	A-555-875-AWFP2
TLCHT-670-720-AWPF4	WBA-480-720-AWPF4	WBHT-640-710-AWPF4	A-555-875-AWPF3
TLCHT-670-720-AWPF5	WBA-480-720-AWPF5	WBHT-640-710-AWPF5	A-555-875-SPLP

Figure 3-3. Phase II and III modified SPLP soil leaching arsenic with calcium and magnesium concentrations

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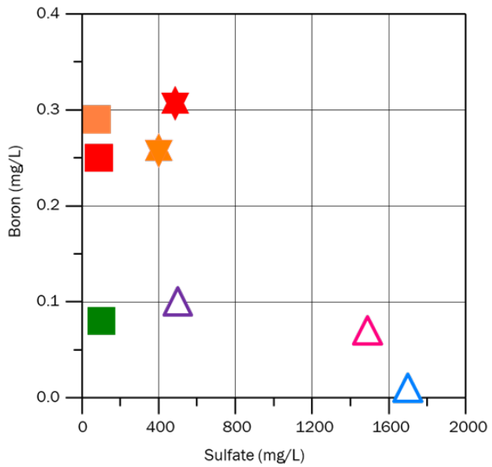

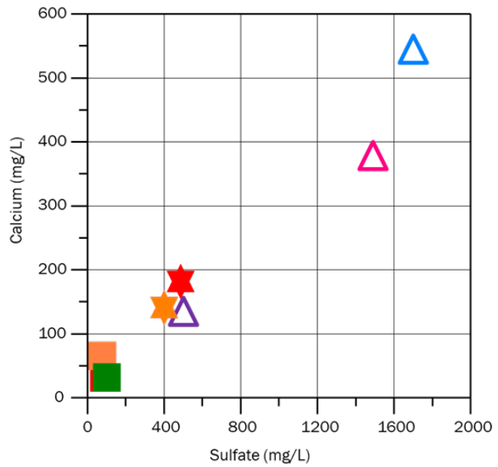

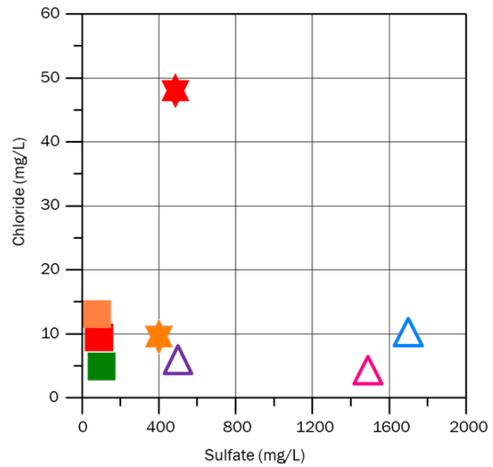

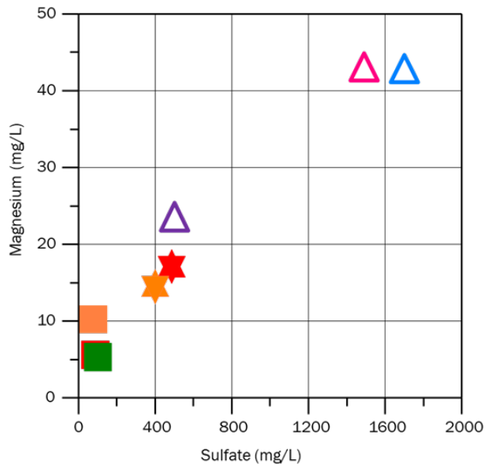

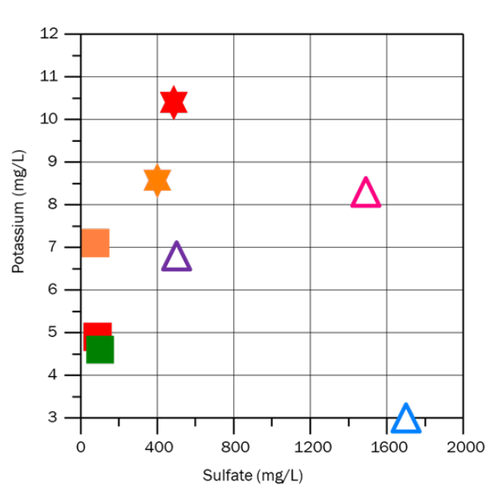

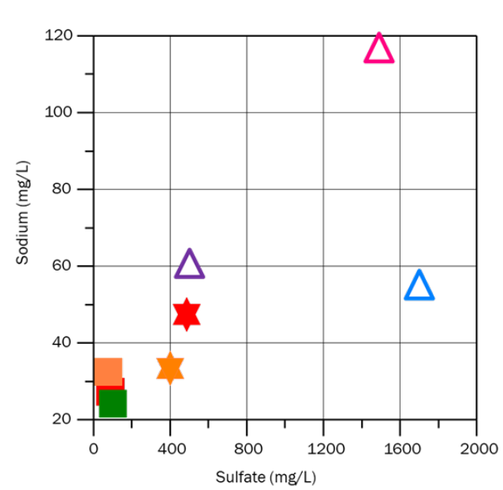

Note: The shape of the symbol identifies the Phase of testing, and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited, and the water tested.
Phase I samples were leached with de-ionized water only

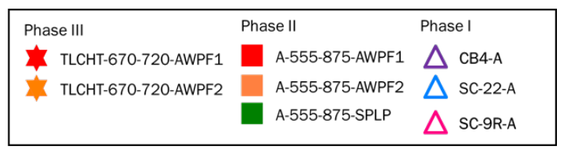

Figure 3-4. Phase I, II, and III modified SPLP leaching results

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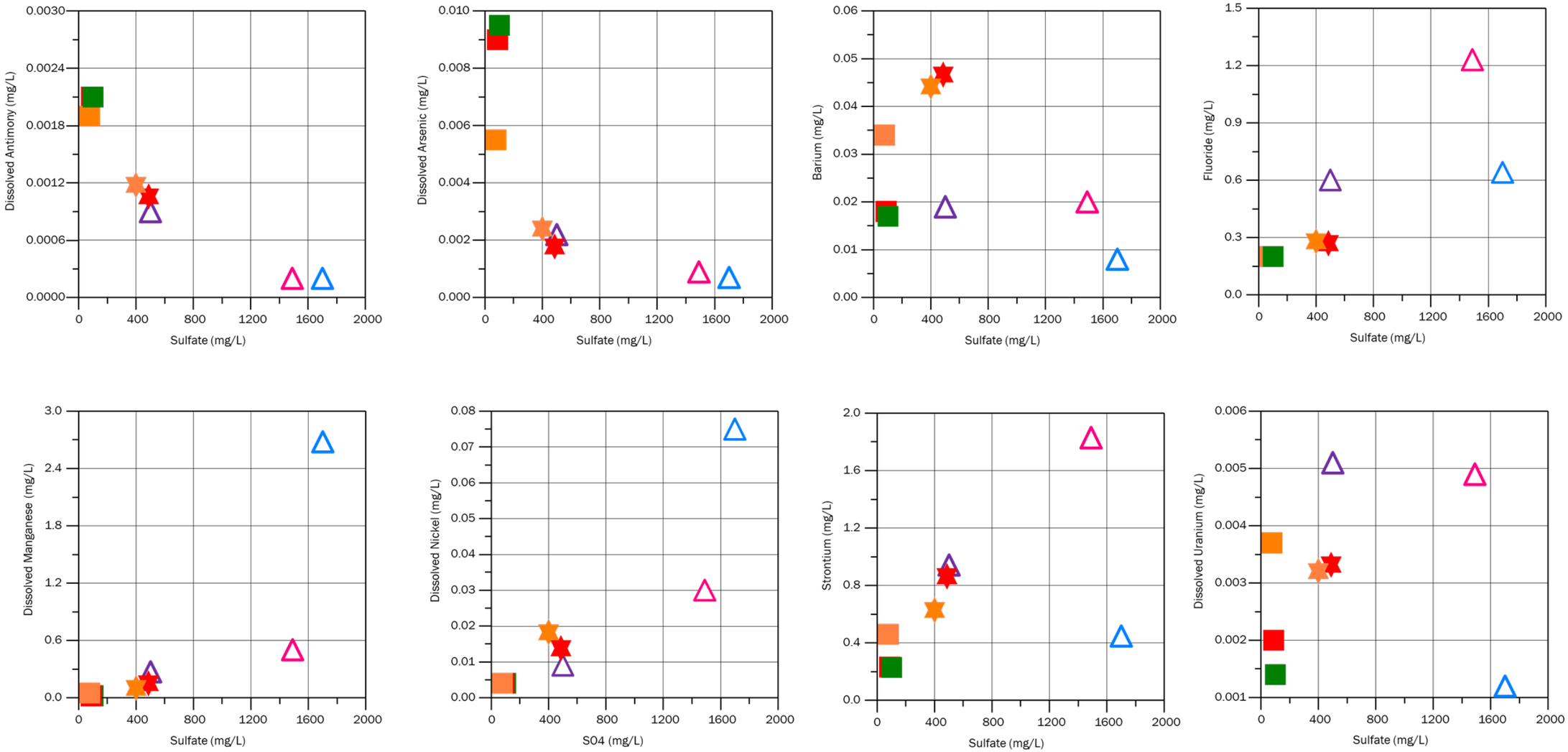

Note: The shape of the symbol identifies the Phase of testing, and the color of the symbol identifies the water tested.
The sample ID name indicates the Purisima unit, the depths composited, and the water tested.
Phase I samples were leached with de-ionized water only

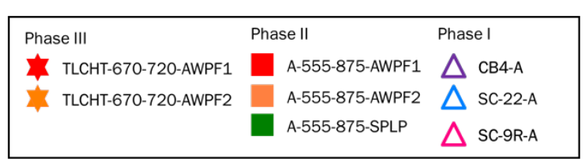

Figure 3-5. Phase I, II, and III modified SPLP leaching metals concentrations

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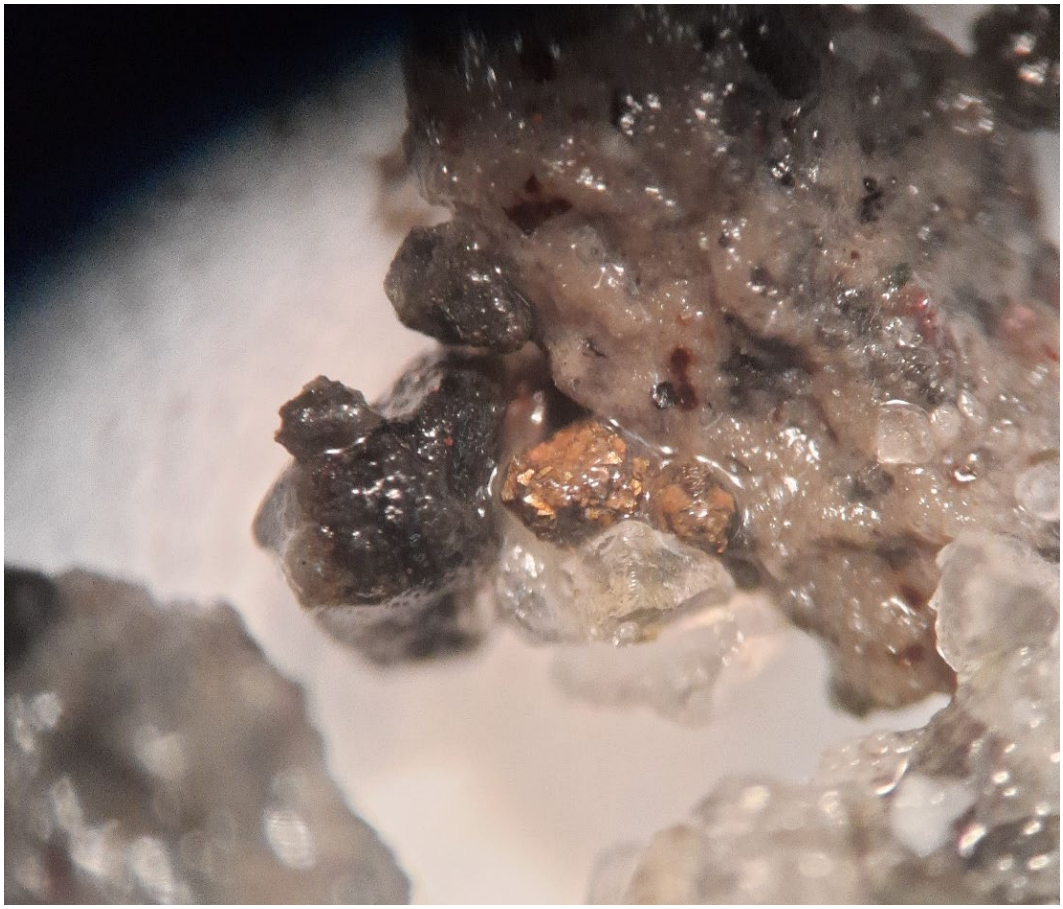
The modified SPLP calcium and sulfate concentrations of the TLC high-transmissivity samples that had been in storage and showed evidence of oxidation (Photograph 2-1) are higher than the Willowbrook high-transmissivity zone samples (Figure 3-1). Evidence of oxidized sulfide minerals can be seen when comparing sulfide minerals from the archived samples to similar materials photographed as samples were being collected during the drilling of the TLC Well (Photographs 3-1 and 3-2). Sulfide minerals from the archived TLC sample bags appear to have an orangish, opaque tarnish on the sulfide mineral surfaces and the sulfide minerals observed during the TLC Well drilling have a bright, metallic luster.



Photograph 3-1. Example of sulfide mineral phases oxidation in TLC sample bag 710 feet (photo taken 3/23/2021)

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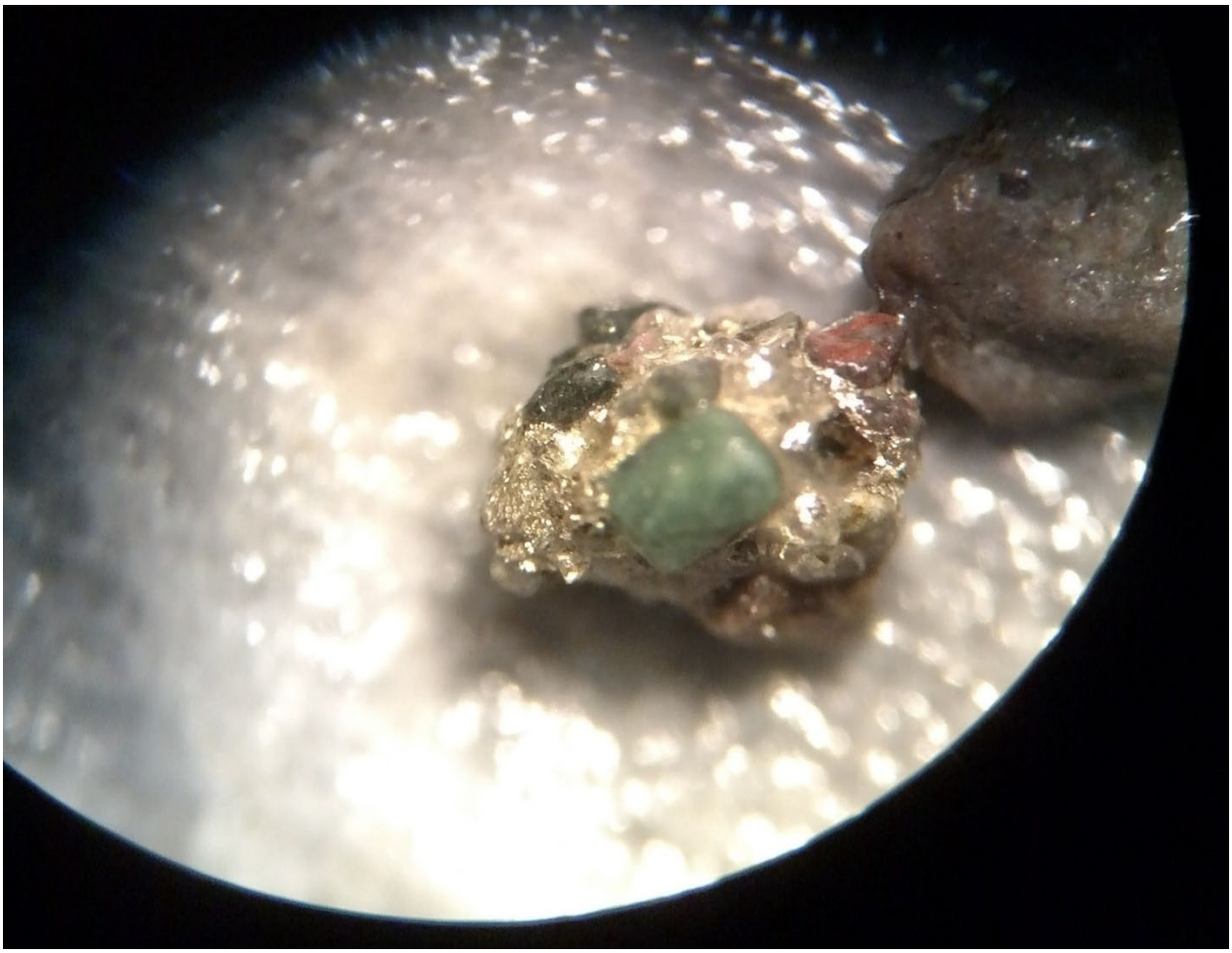

Photograph 3-2. Sulfide minerals in TLC sample bag 735 feet. Photograph taken at the time of well drilling (photo taken 02/14/2019)

Evidence of sulfate minerals forming in the archived TLC sample bags (Photograph 3-3) support the observations of elevated sulfate concentrations in the archived soil leaching test results. Clear, delicate, opaque minerals were noted in the archived TLC samples. The minerals appear in proximity to orange-ish, oxidized sample materials. The modified SPLP Phase III TLC well results show lower concentrations of antimony and arsenic than the Phase II modified SPLP data. Metals may have adsorbed onto iron-hydroxide minerals formed as a result of sulfide mineral oxidation within the archived sample bags. Metal adsorption onto iron-hydroxide minerals may occur during the SWIP operations when advanced treated purified water interacts with the in-situ aquifer minerals.

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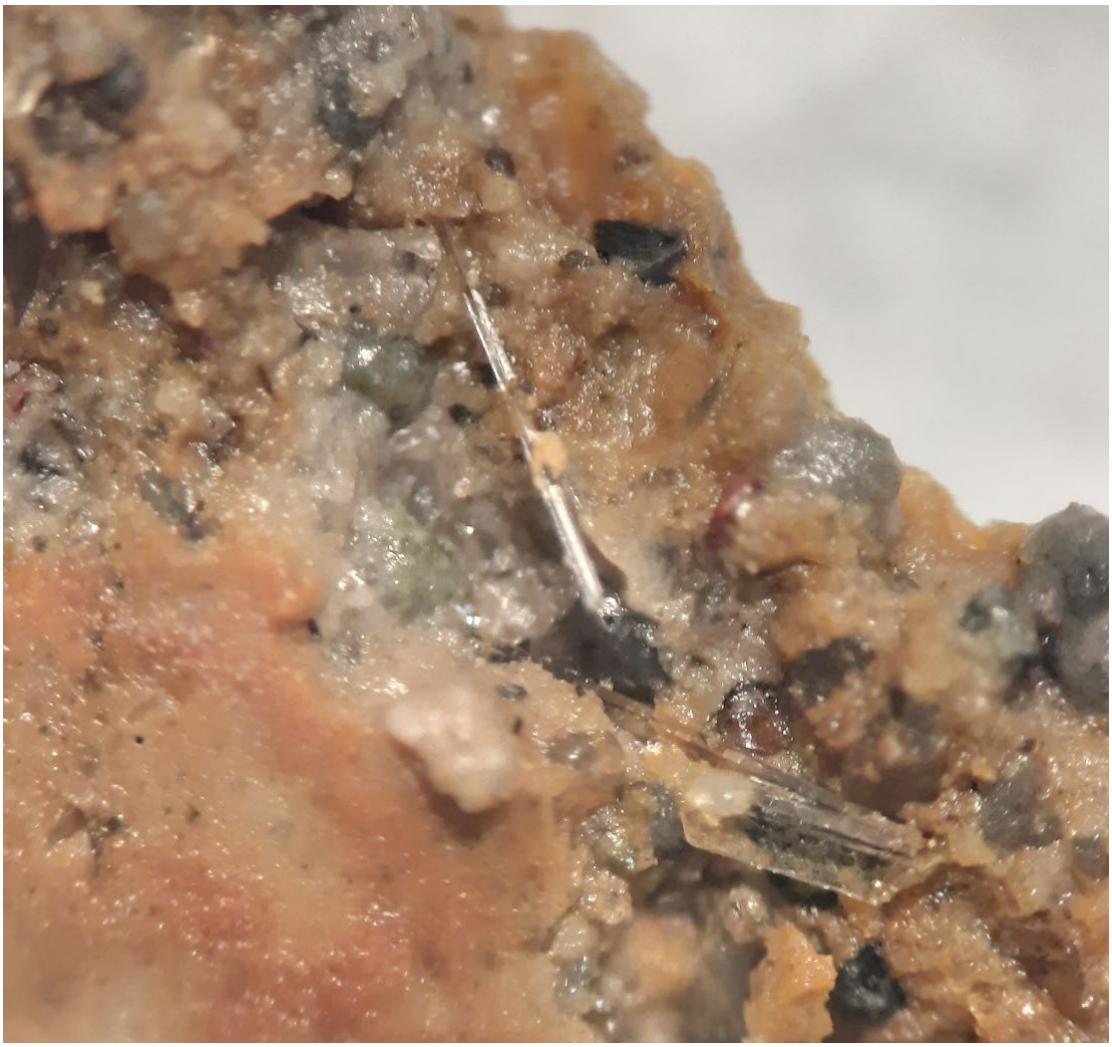

Photograph 3-3. Example of possible sulfate mineral phases in TLC sample bag 715 feet (photo taken 3/23/2021)

3.1.4 Modified Meteoric Water Mobility Procedure – Column Testing

Sequential rinsing of materials from the Purisima A unit high-transmissivity zones from the TLC and Willowbrook wells was conducted using the modified MWMP column test method for the Phase III analysis, similar to the tests conducted for the Phase II analysis. Phase III modified MWMP column testing was conducted with two types of water—advanced treated purified water (AWPF1) for five rinses followed by groundwater collected from the Tannery II well for two rinses.

The modified MWMP column test can provide insights to the potential reactions occurring between the A unit materials and test waters; however, the tests are not meant to represent the entire range of potential geochemical reactions that could occur during the SWIP operations. Differences in the ambient temperature, length of exposure, mixing ratios, oxygen content, and other factors make it difficult to replicate the geochemical conditions of an in situ aquifer injection in a laboratory environment; therefore, the concentrations observed in the laboratory are more likely to identify relationships and trends rather than represent the potential groundwater concentrations during operations.

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The objective of the modified MWMP column test analysis is to determine if changes in concentrations of constituents could be observed after repeated exposure to the advance treated purified water. For example, increases in sulfate or iron concentrations observed through successive rinses may be the result of oxygenated water reacting with sulfide mineral phases. Decreasing concentrations with successive rinses can indicate the dissolution of a finite quantity of mineral phases or the desorption of a finite initial concentration from mineral surfaces.

3.1.4.1 Advanced Purified Water Results

Several metals, including aluminum, antimony, beryllium, chromium, copper, iron, mercury, nickel, silver, and thallium, were below the analytical detection limit for both the TLC and Willowbrook samples (Table 3-3). Plots of the modified MWMP column data show decreasing metals concentrations with successive rinses for barium, strontium and uranium (Figures 3-6 and 3-7). Major ions calcium, magnesium, potassium, and sodium also show decreasing trends with successive rinses (Figures 3-6 and 3-7). Decreasing sulfate, barium and calcium concentrations with successive rinsing is likely an indication to the dissolution of sulfate minerals, such as gypsum and barite, occurring in the columns. Gypsum was identified through XRD analysis in samples of Purisima formation which had been in storage for several years (BC 2016). Translucent, needle-like crystals were observed in the archived TLC sample bags (Photographs 3-3) and could be sulfate minerals that formed within the sample bags during storage. Decreasing trends in magnesium, potassium and sodium are indications of other potential readily dissolvable mineral phases, such as soluble salts, that are likely present in the A unit. Uranium concentrations also show a decreasing trend with successive rinses. Uranium could be associated with sulfate, phosphate, or carbonate mineral phases. Decreasing uranium concentrations indicate that the mineral phases are likely a finite source being depleted with each interaction of the AWPF1 water.

Arsenic, fluoride, and nitrate showed increasing trends with successive rinses for both columns (Figures 3-6 and 3-7). Increases in these constitutes could be the result of the dissolution of mineral phases or desorption from mineral surfaces. The oxidation and subsequent release of metals associated with the sulfide mineral phases should result in increased concentrations of sulfate and associated metals; however, the concentrations noted with successive rinses show the opposite trend for sulfate.

Decreasing sulfate with increasing arsenic concentrations indicates the arsenic released during the column testing is not directly released from sulfide oxidation and that more complicated geochemical reactions are affecting arsenic mobilization. Arsenic has a positive correlation with the pre-filtered pH of the column leachate (Figure 3-8) with increasing arsenic concentrations and increasing pH values with successive rinses using the AWPF1 water; however, the arsenic concentrations of the leachate samples using the Tannery II groundwater continue to be the same order of magnitude as the AWPF1 samples despite a lower pH from the Tannery groundwater. Arsenic is likely mobilized as a result of dissolution or desorption from mineral phases that are not entirely dependent upon the pH of the leachate water.

Fluoride concentrations increase with decreasing sulfate concentrations and are independent of pH of the leachate water (Figures 3-6 and 3-8). Increases in fluoride concentration is likely the result of fluorite (formula as CaF) or apatite (formula as $Ca_5(OH,F)(PO_4)_3$) mineral dissolution. Neither fluorite nor apatite were mineral phases identified in the XRD analysis, indicating it is likely these mineral phases are a low proportion of the analyzed units.

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Nitrate concentrations show a positive correlation with leachate pH (Figure 3-8) and a general increase with successive rinses (Figure 3-7). Nitrate concentrations in the leachate solution could be the result of desorption or the oxidation of other nitrogen phases (nitrite or ammonia). Nitrite and ammonia concentrations dropped to below the detection limit after successive rinses (Table 3-3), which would be consistent with oxidation.

Boron concentrations did not exhibit consistent trends between the Willowbrook and TLC wells (Figure 3-5). Boron concentrations slightly increased with successive rinses for the TLC well sample and slightly decreased for the Willowbrook sample. There was also no clear trend of boron concentration with leachate pH (Figure 3-8). Boron concentrations measured in the modified SPLP soil leaching analysis were similar to the concentrations of the purified water used in the analysis (Section 3.1.2). Boron concentrations in the modified column test are several times higher indicating the potential for a mineral phase releasing boron with longer interaction time between the A unit samples and the purified water (24 hours for the modified SPLP vs. 6 days for the modified MWMP analysis). Similar differences in the boron concentrations between modified SPLP and modified MWMP analysis were observed in the Phase II analysis (BC 2020). Borate mineral phases were not identified in the XRD analysis, and the source of the boron is not known. Boron maybe adsorbed onto mineral surfaces in the aquifer materials or may be within a slowly dissolvable mineral phase requiring several days to release the boron concentration.

Results of the modified MWMP column tests indicate the concentrations of constituents change with successive rinses with AWPF water. Decreasing concentrations with successive rinses, such as calcium, magnesium and sulfate likely indicate the dissolution of a finite mineral phase within the aquifer unit and the dissolution is likely due to the AWPF water being dilute compared to the groundwater the aquifer materials are in equilibrium with in-situ environment. Increasing concentrations with successive rinses, such as arsenic and fluoride, could be due to the release of constituents from mineral dissolution or desorption from mineral surfaces. The mechanism for mobilization for some constituents, such as barium and uranium, is likely the change in the pH of the leachate solution with multiple rinses. For other constituents, the mechanism for mobilization could be the lower concentrations of other constituents such as calcium and magnesium in the leachate. The oxidation of materials in the aquifer with successive rinses may also mobilize constitutes, such as nitrate.

3.1.4.2 Groundwater Results

In addition to performing the column test with purified water, an additional analysis was conducted using the same column test materials and groundwater collected from the Tannery II well. The purpose of rinsing the columns with Tannery II groundwater was to evaluate the potential mobilization of constituents with the reintroduction of groundwater to aquifer materials that had been exposed to purified water.

The pH of the leachate and concentrations of several metals and major ions, such as barium, chloride, magnesium, potassium, sodium, strontium, and sulfate, most likely reflect the groundwater used in the analysis (Table 3-4). Arsenic, fluoride, and uranium increased in concentration above the groundwater used for the analysis. Arsenic and fluoride concentrations fall within the trend of the purified water increasing concentrations (Figure 3-6). The concentrations of these constituents remaining near the values measured with the AWPF1 water suggest these constituents are not greatly affected by the geochemistry of the water used in the column test and are mobilized by the presence of water with lower concentrations of these constituents.

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Uranium concentrations showed an increase above the values from the AWPF1 rinses suggesting the change in the water geochemistry does affect the mobilization of uranium (Figure 3-7). There is a strong correlation between the uranium concentration and leachate pH (Figure 3-8), suggesting pH values below approximately 8 results in higher concentrations of uranium mobilization.

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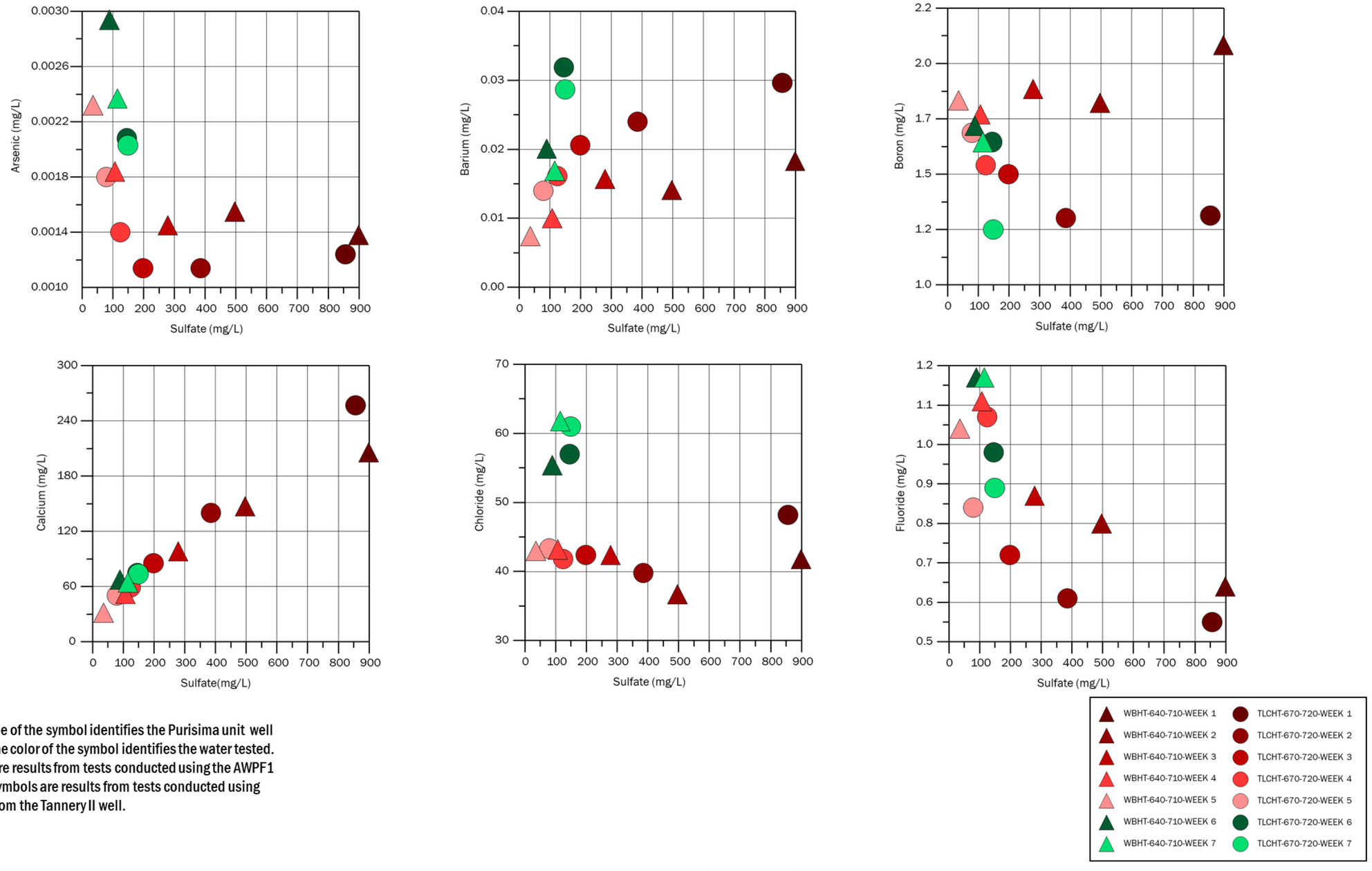

Note: The shape of the symbol identifies the Purisima unit well location and the color of the symbol identifies the water tested. Red symbols are results from tests conducted using the AWPF1 water. Green symbols are results from tests conducted using groundwater from the Tannery II well.

Figure 3-6. Phase III Modified MWMP column test results with sulfate

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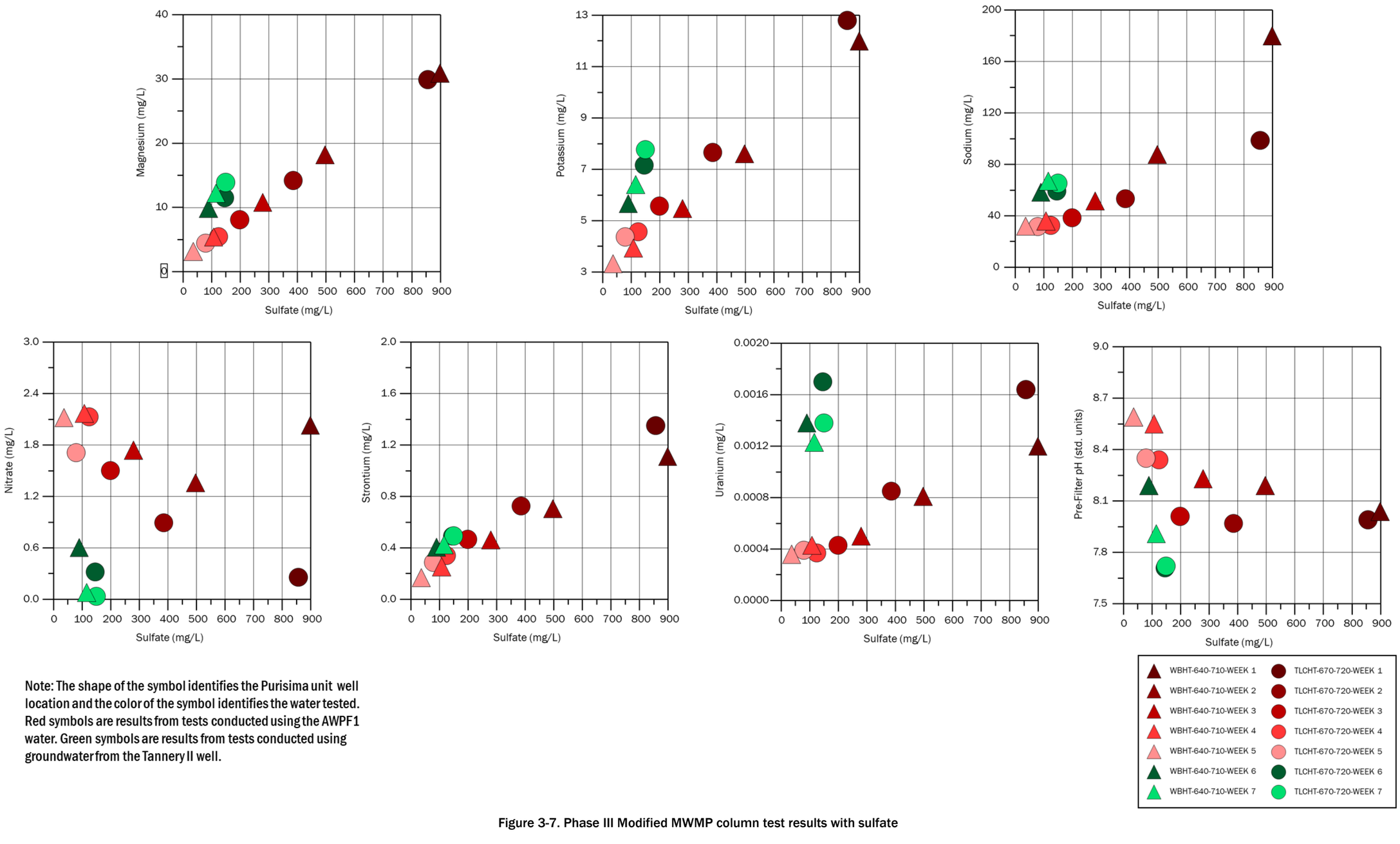

Note: The shape of the symbol identifies the Purisima unit well location and the color of the symbol identifies the water tested. Red symbols are results from tests conducted using the AWPF1 water. Green symbols are results from tests conducted using groundwater from the Tannery II well.

Figure 3-7. Phase III Modified MWMP column test results with sulfate

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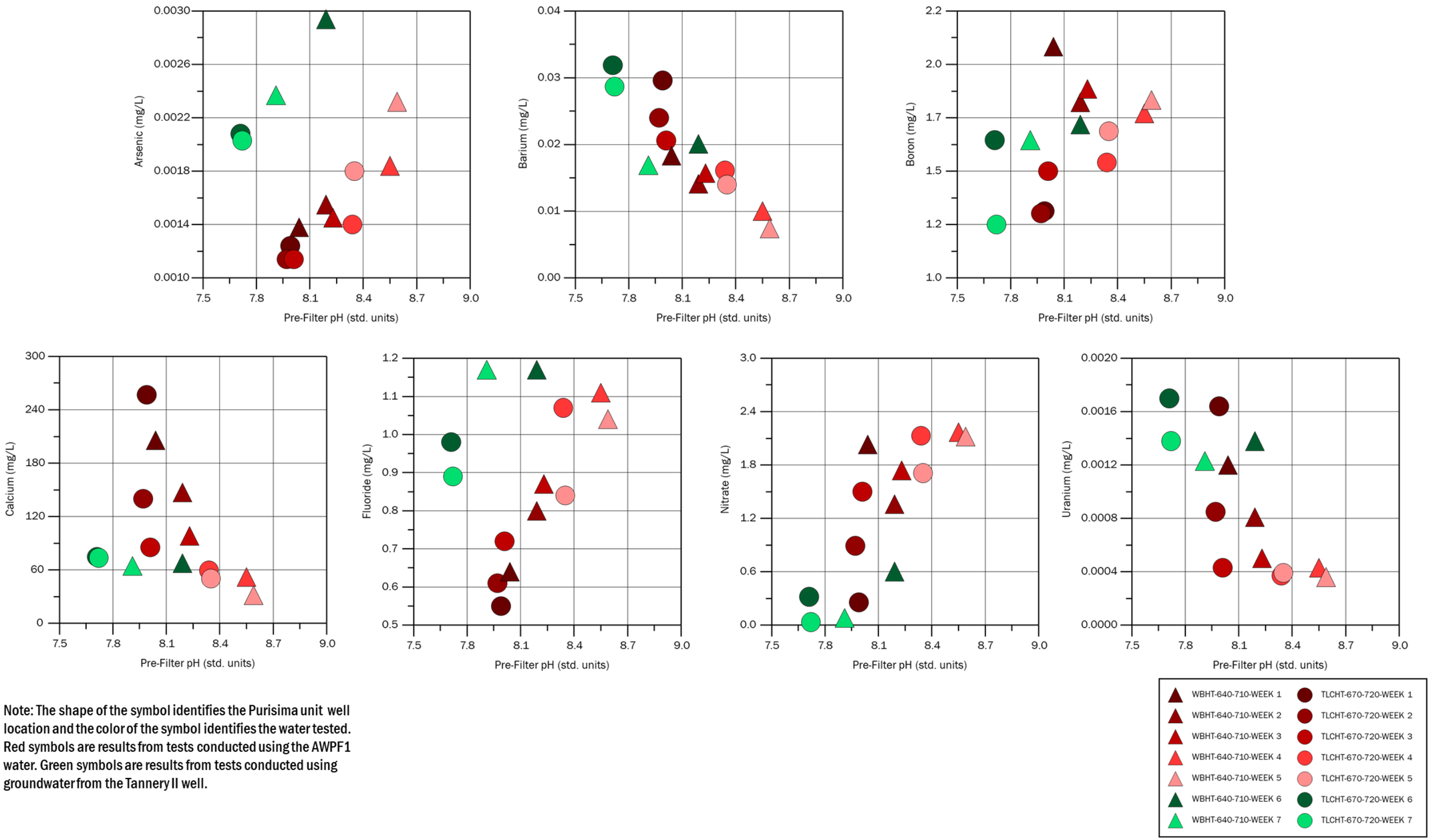

Note: The shape of the symbol identifies the Purisima unit well location and the color of the symbol identifies the water tested. Red symbols are results from tests conducted using the AWPF1 water. Green symbols are results from tests conducted using groundwater from the Tannery II well.

Figure 3-8. Phase III Modified MWMP column test results with leachate pH

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Table 3-3. Soil Leaching Results from Modified MWMP Column Analysis

Analyte (mg/L)	MCL (mg/L)	TLCHT-670-720 WEEK 1	TLCHT-670-720 WEEK 2	TLCHT-670-720 WEEK 3	TLCHT-670-720 WEEK 4	TLCHT-670-720 WEEK 5	TLCHT-670-720 WEEK 6	TLCHT-670-720 WEEK 7	WBHT-640-710 WEEK 1	WBHT-640-710 WEEK 2	WBHT-640-710 WEEK 3	WBHT-640-710 WEEK 4	WBHT-640-710 WEEK 5	WBHT-640-710 WEEK 6	WBHT-640-710 WEEK 7
Extraction pH (standard units)	-	7.56	7.56	7.56	7.56	7.56	7.5	7.5	7.56	7.56	7.56	7.56	7.56	7.5	7.5
Pre Filter pH (standard units)	-	7.99	7.97	8.01	8.34	8.35	7.71	7.72	8.04	8.19	8.23	8.55	8.59	8.19	7.91
Post Filter pH (standard units)	-	8.01	7.99	7.97	8.32	8.39	7.73	7.7	8.07	8.26	8.22	8.85	8.67	8.21	7.95
Total Alkalinity	-	54.4	48	46.8	47.5	58.3	119	133	52.1	43.7	44.2	46.6	23.2	162	146
Bicarbonate as $CaCO_3$	-	54.4	48	46.5	44.8	58.3	110	130	52.1	43.7	38.5	46.6	23.2	134	136
Carbonate as $CaCO_3$	-	< 2	< 2	< 2	2.8	< 2	9	2.9	< 2	< 2	5.7	< 2	< 2	28.6	9.9
Hydroxide as $CaCO_3$	-	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Aluminum[a]	1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Antimony	0.006	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.00044	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Arsenic	0.01	0.00124	0.00114	0.00114	0.0014	0.0018	0.00208	0.00203	0.00138	0.00155	0.00145	0.00184	0.00232	0.00294	0.00237
Barium	1	0.0296	0.024	0.0206	0.0161	0.014	0.0319	0.0287	0.0183	0.0141	0.0157	0.01	0.0074	0.0201	0.0169
Beryllium	0.004	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Boron	-	1.30	1.29	1.48	1.52	1.66	1.62	1.24	2.04	1.79	1.85	1.74	1.80	1.69	1.62
Cadmium	0.005	0.000295	0.000067	< 0.00005	< 0.0001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Calcium	-	257	140	85.5	59.4	50.3	74.8	73.6	206	147	98.3	52.1	31.7	67.5	64.4
Chloride[a]	250	48.2	39.8	42.4	41.8	43.3	57	61	41.8	36.7	42.4	43.2	43	55.4	61.8
Chromium	0.05	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper[a]	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.014	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride[a]	2	0.55	0.61	0.72	1.07	0.84	0.98	0.89	0.64	0.8	0.87	1.11	1.04	1.17	1.17
Iron[a]	0.3	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Lead	0.015	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	0.00101	0.00043	0.00028	0.00017	0.00012	0.00042	0.00039
Magnesium	-	29.9	14.2	8.11	5.45	4.43	11.5	13.9	30.9	18.2	10.8	5.41	3.15	9.88	12.2
Manganese[a]	0.05	0.168	0.045	0.012	< 0.01	< 0.01	< 0.01	< 0.01	0.011	< 0.01	< 0.01	< 0.01	0.033	< 0.01	< 0.01
Mercury	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	-	0.031	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nickel	0.1	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008
Nitrate as N	10	0.256	0.892	1.5	2.13	1.71	0.319	0.034	2.03	1.36	1.74	2.17	2.12	0.604	0.081
Nitrite as N	1	0.067	0.438	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.547	0.355	0.097	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate/Nitrite as N	-	0.323	1.33	1.50	2.13	1.71	0.319	0.034	2.58	1.71	1.84	2.17	2.12	0.604	0.081
Nitrogen, ammonia	-	0.353	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.107	0.076	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Total Kjeldah	-	0.53	< 0.4	< 0.2	< 0.2	< 0.2	0.2	< 0.2	0.53	0.56	0.38	< 0.2	< 0.2	0.37	< 0.2
Phosphorus	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phosphorus, ortho	-	0.013	< 0.01	0.01	< 0.01	< 0.01	0.029	0.06	0.015	< 0.01	0.011	< 0.01	< 0.01	0.084	0.022

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Table 3-3. Soil Leaching Results from Modified MWMP Column Analysis

Analyte (mg/L)	MCL (mg/L)	TLCHT-670-720 WEEK 1	TLCHT-670-720 WEEK 2	TLCHT-670-720 WEEK 3	TLCHT-670-720 WEEK 4	TLCHT-670-720 WEEK 5	TLCHT-670-720 WEEK 6	TLCHT-670-720 WEEK 7	WBHT-640-710 WEEK 1	WBHT-640-710 WEEK 2	WBHT-640-710 WEEK 3	WBHT-640-710 WEEK 4	WBHT-640-710 WEEK 5	WBHT-640-710 WEEK 6	WBHT-640-710 WEEK 7
Potassium	-	12.8	7.66	5.57	4.57	4.37	7.16	7.77	12.0	7.61	5.47	3.93	3.32	5.66	6.41
Selenium	0.05	0.00019	0.00018	0.00014	< 0.0002	0.00015	0.0002	0.00021	0.00013	0.00011	0.00014	0.00012	< 0.0001	< 0.0001	< 0.0001
Silica	-	25	20.8	22.6	21.7	23.9	51.5	59.3	24	22	24.7	22.2	22.3	54.9	59.9
Silver[a]	0.1	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	-	98.5	53.2	38.6	32.6	31.7	59.2	65.3	180	87.6	51.5	36.0	31.9	58.3	66.8
Strontium†	-	1.35	0.726	0.466	0.341	0.288	0.492	0.493	1.11	0.706	0.463	0.253	0.169	0.406	0.423
Sulfate	250	856	385	198	124	78.7	145	149	898	496	279	107	35.6	88.6	115
Thallium	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium†	0.03	0.00164	0.00085	0.00043	0.00037	0.00039	0.0017	0.00138	0.0012	0.00081	0.0005	0.00043	0.00036	0.00138	0.00123
Zinc[a]	5	0.029	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

a. secondary drinking water MCL
< = concentrations was not measured above the method detection limit
† = constituent has a regulated radionuclide drinking water MCL measured in pCi/
- = no MCL is established
mg/L = milligrams per liter
Refer to Table 2-1 for the well and depths composited to generate each sample
Data listed are from the lab reports included in Appendix B.

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Boron concentrations did not exhibit consistent trends between the Willowbrook and TLC wells (Figure 3-5). Boron concentrations slightly increased with successive rinses for the TLC well sample and slightly decreased for the Willowbrook sample. There was also no clear trend of boron concentration with leachate pH (Figure 3-8). Boron concentrations measured in the modified SPLP soil leaching analysis were similar to the concentrations of the purified water used in the analysis as described in Section 3.1.2). Boron concentrations in the modified column test are several times higher indicating the potential for a mineral phase releasing boron with longer interaction time between the A unit samples and the purified water (24 hours for the SPLP vs. 6 days for the MWMP analysis). Similar differences in the boron concentrations between SPLP and MWMP analysis were observed in the Phase II analysis (BC, 2020). Borate mineral phases were not identified in the XRD analysis, and the source of the boron is not known. Boron may be adsorbed onto mineral surfaces in the aquifer materials or may be within a slowly dissolvable mineral phase requiring several days to release the boron concentration.

Results of the modified MWMP column tests indicate the concentrations of constituents change with successive rinses with AWPF water. Decreasing concentrations with successive rinses, such as calcium, magnesium, and sulfate, likely indicate the dissolution of a finite mineral phase within the aquifer unit, and that the dissolution is likely due to the AWPF water being dilute compared to the groundwater the aquifer materials are in equilibrium with the aquifer in situ environment. Increasing concentrations with successive rinses, such as with arsenic and fluoride, could be due to the release of constituents from mineral dissolution or desorption from mineral surfaces. The mechanism for mobilization for some constituents, such as barium and uranium, is likely the change in the pH of the leachate solution with multiple rinses. For other constituents, the mechanism for mobilization could be the lower concentrations of other constituents, such as calcium and magnesium in the leachate. The oxidation of materials in the aquifer with successive rinses may also mobilize constitutes, such as nitrate.

3.1.4.3 Groundwater Results

In addition to performing the modified MWMP column test with purified water, an additional subsequent analysis was conducted using the same column test materials and groundwater collected from the Tannery II well. The purpose of rinsing the columns with Tannery II groundwater was to evaluate the potential mobilization of constituents with the reintroduction of groundwater to aquifer materials that had been exposed to purified water.

The pH of the leachate and concentrations of several metals and major ions, such as barium, chloride, magnesium, potassium, sodium, strontium, and sulfate, most likely reflect the groundwater used in the analysis (Table 3-4). Metals such as arsenic, fluoride, and uranium increased in concentration above the groundwater used for the analysis. Arsenic and fluoride concentrations fall within the trend of the purified water increasing concentrations (Figure 3-6). The concentrations of these metals remaining near the values measured with the AWPF1 water suggest these constituents are not greatly affected by the geochemistry of the water used in the column test and are mobilized by the presence of water with lower metal concentrations.

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Table 3-4. Water Quality of Tannery II Groundwater for Column Tests			
Analyte (mg/L)	Tannery II (mg/L)	Analyte (mg/L)	Tannery II (mg/L)
Aluminum	< 0.05	Manganese	0.154
Antimony	< 0.0004	Mercury	< 0.0002
Arsenic	< 0.0002	Molybdenum	< 0.02
Barium	0.0425	Nickel	< 0.008
Beryllium	< 0.00008	Potassium	8.23
Boron	0.184	Selenium	< 0.0001
Cadmium	< 0.00005	Silica	66.7
Calcium	93.5	Silver	< 0.0001
Chloride	60.1	Sodium	66.2
Chromium	< 0.0005	Strontium	0.552
Copper	0.04	Sulfate	104
Fluoride	0.3	Thallium	< 0.0001
Iron	< 0.06	Uranium	< 0.0001
Lead	< 0.0001	Zinc	< 0.02
Magnesium	21.5		

< = concentration was not measured above the method detection limit, mg/L = milligrams per liter.

Uranium concentrations showed an increase above the values from the AWPF1 rinses suggesting the change in the water geochemistry does affect the mobilization of uranium (Figure 3-7). There is a strong correlation between the uranium concentration and leachate pH (Figure 3-8), suggesting pH values below approximately 8 results in higher concentrations of uranium mobilization.

3.1.4.4 Phase II and III Column Concentration Trends

Trends in concentration observed in the Phase III column test were similar to the observed trends in Phase II. Concentrations of calcium, magnesium, potassium, sodium, strontium, and sulfate decrease with successive rinses (Figure 3-10). Concentrations of fluoride increased with successive rinses (Figure 3-10). Barium, nitrate, and uranium mobilization appear to be related to the pH of the leachate solution (Figure 3-10). As the aquifer unit was repeatedly rinsed with purified water, the capacity of the aquifer mineralogy to buffer the pH diminished and the pH began to rise above 8, resulting in an increasing nitrate trend and decreasing trends for barium and uranium. The correlation of pH and nitrate may not be causational. The increase in pH may coincide with the increase in oxidation, and nitrate increases are likely related to the oxidation of nitrogen sources in the A unit. Arsenic and fluoride did not exhibit clear trends with pH in either set of column test data.

Arsenic and boron concentrations are lower in the Phase III column tests of the A unit materials from the high-transmissivity zone than the Phase II column tests of the entire A unit (Figure 3-9). The difference in concentrations for these constituents may be related to a difference in mineralogy of the high-transmissivity zone than the entire A unit. It is not possible to determine if a difference in mineralogy is the reason for the concentration differences since no arsenic or boron mineral phases were identified in the XRD analysis. The advanced treated purified water is more likely to travel through the high-transmissivity zone than the entire A unit during SWIP operations. The concentrations observed for the Phase III column tests may be a better representation of the geochemical conditions to occur during SWIP operations.

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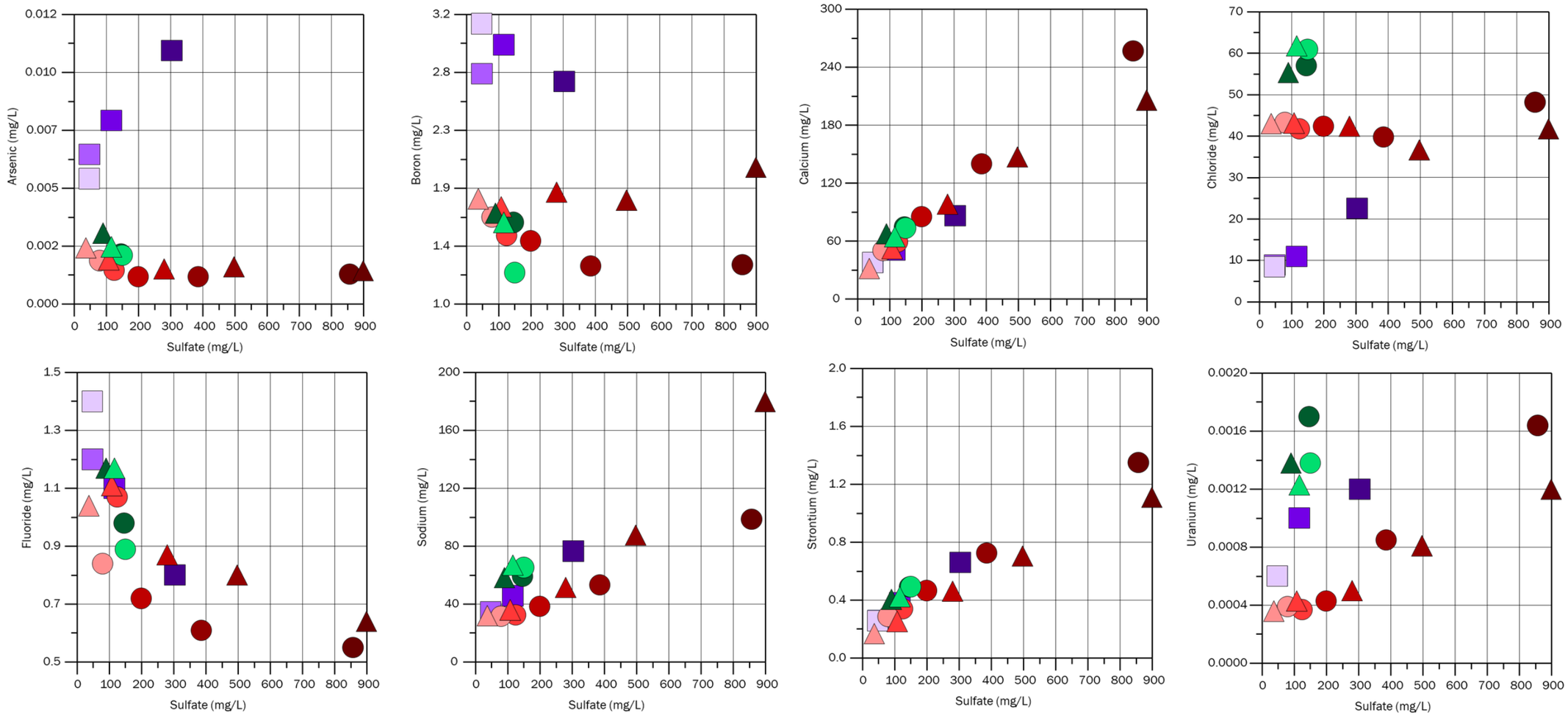

Note: The shape of the symbol identifies the Purisima unit well and the color of the symbol identifies the water tested. Red symbols are results from tests conducted using the AWPF1 water. Green symbols are results from tests conducted using groundwater from the Tannery II well. Purple symbols are results from the Phase II analysis conducted using the AWPF1 water.

Figure 3-9. Modified MWMP column concentrations with sulfate

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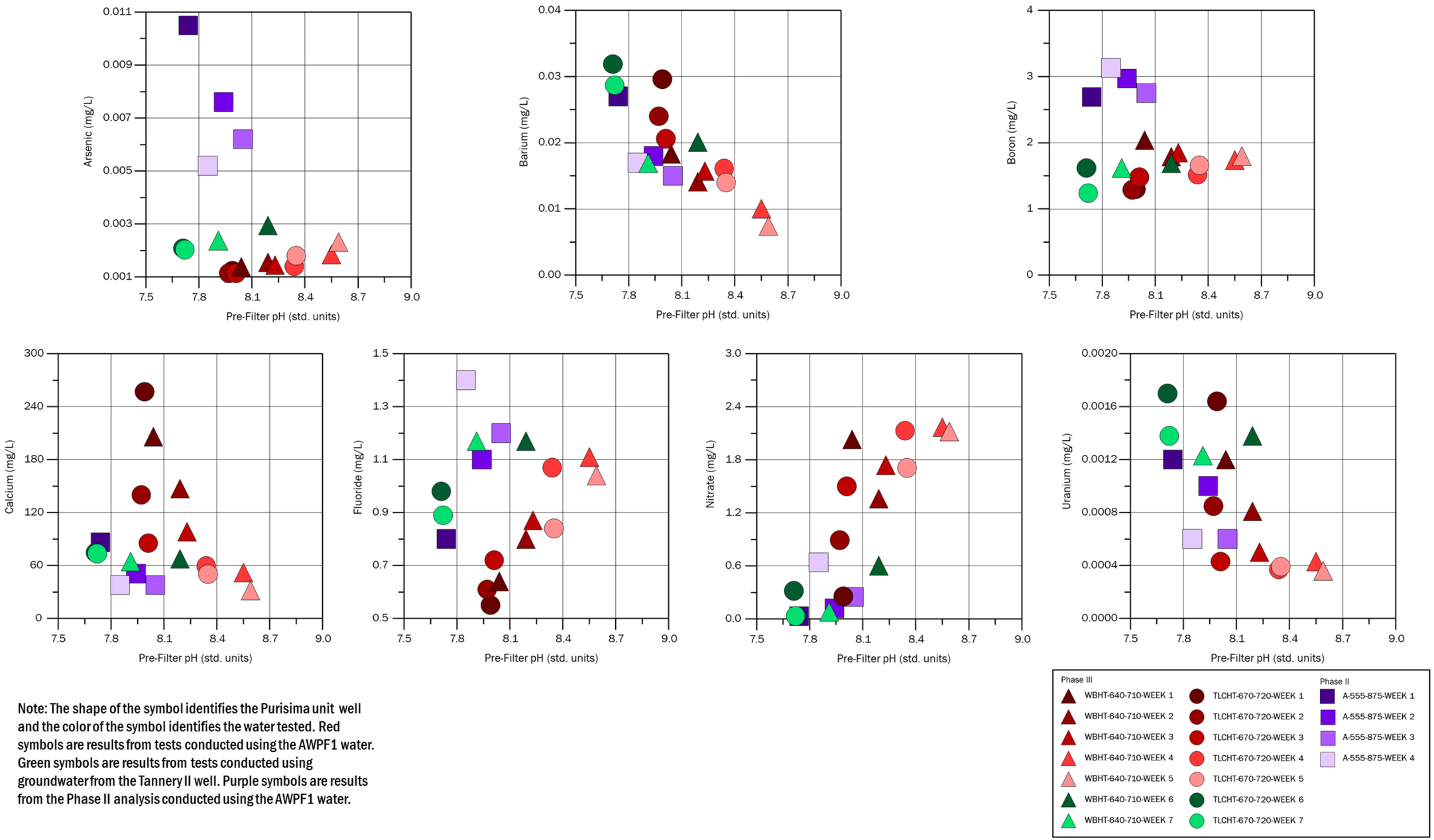

Note: The shape of the symbol identifies the Purisima unit well and the color of the symbol identifies the water tested. Red symbols are results from tests conducted using the AWPF1 water. Green symbols are results from tests conducted using groundwater from the Tannery II well. Purple symbols are results from the Phase II analysis conducted using the AWPF1 water.

Figure 3-10. Modified MWMP column concentration with leachate pH

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3.1.5 Hydroxylamine-Hydrochloride Extraction Leaching

The HA-HCl analyses are part of a technique called sequential extraction intended to progressively release constituents from solid soil samples using the following multi-step process. The HA-HCl step used in Phases II and III represent metals bound in iron and manganese oxides. The constituents adsorbed or bound in the iron and manganese oxide mineral phases, as estimated using HA-HCl extraction, are of greatest interest for the Phase III geochemical characterization.

Antimony, boron, chromium, copper, fluoride, lead, mercury, molybdenum, silver, and thallium were non-detect in the HA-HCl extractions (Table 3-5). Cadmium, chromium, copper, lead, mercury, silver, and thallium were also non-detect in the modified SPLP results. These metals would likely not be released during the purified water injection process.

Table 3-5. Soil Leaching HA-HCl Extraction Results

Analyte (mg/L)	TLCHT-670-720-STEP 1	WBA-480-720-STEP 1	WBHT-640-710-STEP 1
Aluminum[a]	3.76	0.409	4.05
Antimony	< 0.004	< 0.004	< 0.004
Arsenic	0.0336	< 0.002	0.0305
Barium	0.432	0.788	0.528
Beryllium	0.00164	< 0.0008	0.00155
Boron	< 0.15	< 0.15	< 0.15
Cadmium	0.00258	0.00184	0.00172
Calcium	291	1040	277
Chromium	< 0.1	< 0.1	< 0.1
Copper[a]	< 0.05	< 0.05	< 0.05
Fluoride[a]	< 0.05	< 0.05	< 0.05
Iron[a]	101	28.4	109
Lead	< 0.15	< 0.15	< 0.15
Magnesium	29.6	21.4	23.9
Manganese[a]	3.75	9.51	3.92
Mercury	< 0.002	< 0.001	< 0.002
Molybdenum	< 0.1	< 0.1	< 0.1
Nickel	0.323	0.112	0.256
Phosphorus	4.4	< 0.5	4.18
Potassium	13.8	18.8	12
Selenium	< 0.001	0.00108	< 0.001
Silver[a]	< 0.001	< 0.001	< 0.001
Sodium	28.4	19	21.9
Strontium†	1.36	1.68	1.08
Sulfate[a]	301	294	348

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Table 3-5. Soil Leaching HA-HCl Extraction Results			
Analyte (mg/L)	TLCHT-670-720-STEP 1	WBA-480-720-STEP 1	WBHT-640-710-STEP 1
Thallium	< 0.001	< 0.001	< 0.001
Uranium†	0.00233	< 0.001	0.00235
Zinc[a]	0.242	0.102	0.184

a. secondary drinking water MCL
< = concentration was not measured above the method detection limit; † = constituent has a regulated radionuclide drinking water MCL measured in pCi/L; mg/L = milligrams per liter
Refer to Table 2-1 for the well and depths composited to generate each sample.

Trends in the HA-HCl analysis indicate a difference in the mineralogy between the samples collected from the entire Purisima A unit in the TLC and Willowbrook wells compared to the samples collected from the high-transmissivity zone of the Purisima A unit (Figures 3-11 and 3-12). Samples from the high-transmissivity zone have higher concentrations of iron and other constituents; however, the HA-HCl results do not necessarily indicate these zones will release more metals during SWIP operations.

Materials from the high-transmissivity zone are represented in the samples of the entire A unit but are a much lower proportion of the total sample volume analyzed; therefore, less material from the same zone was mixed with the HA-HCl extraction liquid. The composite sample collected of the entire A unit (from 555 to 875 feet [ft]in depth) has a smaller proportion of the materials collected from the higher-transmissivity zone (670 to 720 ft in depth). The composite samples for the entire A unit and high-transmissivity zone were roughly the same mass of material, approximately 15 kilograms, and were generated by collecting the same mass of material from each individual depth sample bag, as described in Section 2.1. The mass of material from the Phase II analysis represents all 320 ft of material collected from the entire A unit collected as equal portions from each of the individual depth sample bags. A higher mass of material was collected from each of the individual depth sample bags, from 670 to 720 ft, to generate enough sample mass for the high-transmissivity composite sample. The mass of sample collected from the high-transmissivity zone, 670 to 720 ft in depth, represents only 50 ft of material from the overall 320 ft of the A unit. This means the higher-transmissivity zone (670 to 720 ft in depth) represents only 15 percent of the entire A unit concentration.

The concentrations of iron are higher in the TLC higher-transmissivity zone sample than the Phase II sample representing the entire A unit (Figures 3-11 and 3-12); however, the higher transmissivity zone material represents a very small portion of the iron concentration for the entire A unit.

Differences between the samples collected from the TLC and Willowbrook wells indicate there is some spatial variability, as noted in the visual observation of the drill cuttings both with depth and spatial location is reflected in differences in the geochemical behavior of the samples. The variability in the HA-HCl concentrations between the well locations does confirm the site-specific geochemical data provides the most accurate geochemical information for each well. However, the concentrations in the two wells are within the same order of magnitude for most metals, indicating the variations noted on the microscopic scale are muted when evaluating the overall geochemical characterization of the A unit.

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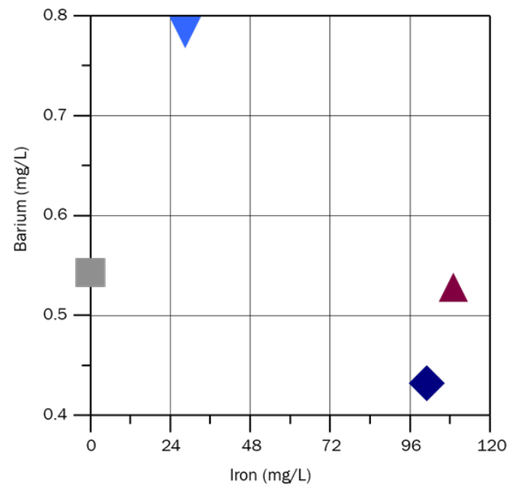

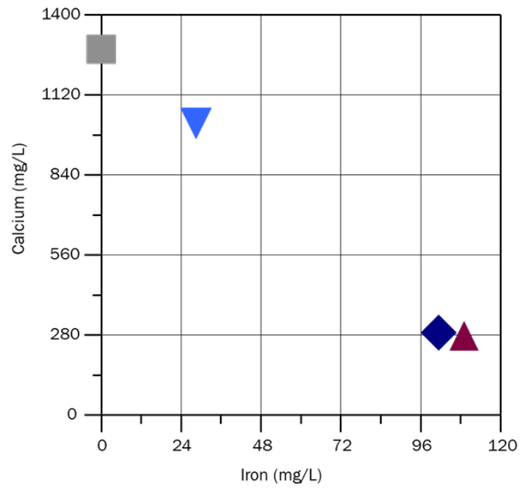

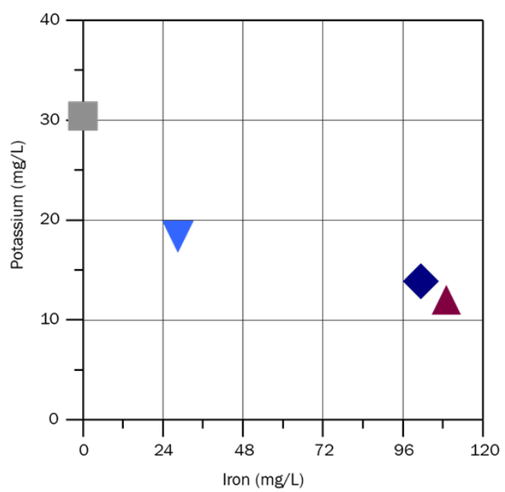

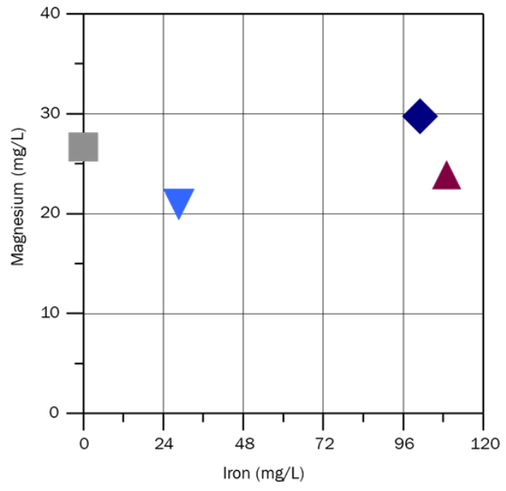

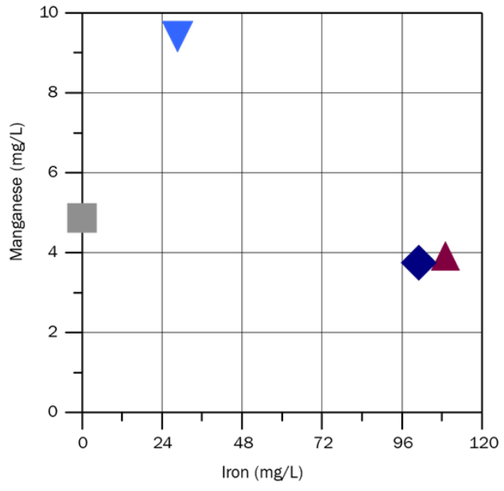

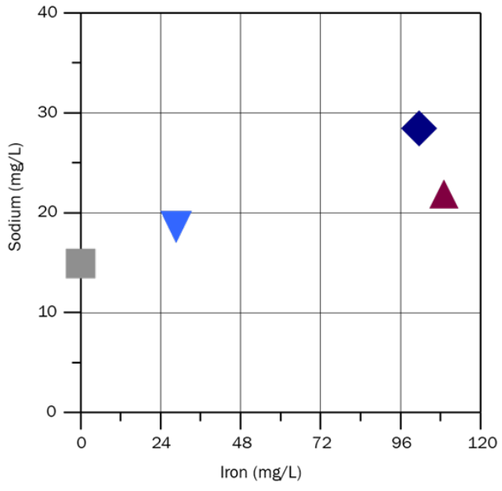

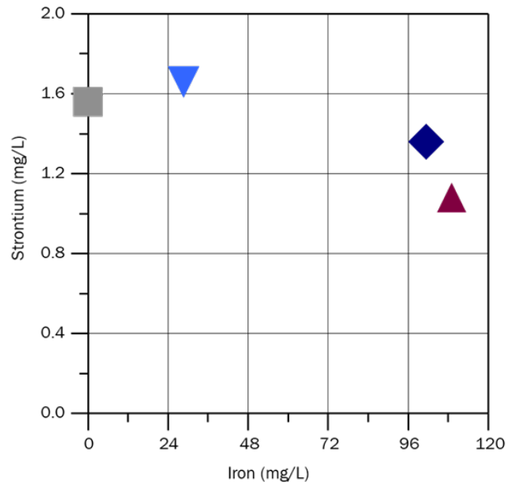



Note: The sample ID name indicates the Purisima well location and the depths composited. Sample A-555-875 is the entire A unit from the TLC well collected as part of the Phase II geochemical program.

Figure 3-11. HA-HCL Phase II and Phase III test results

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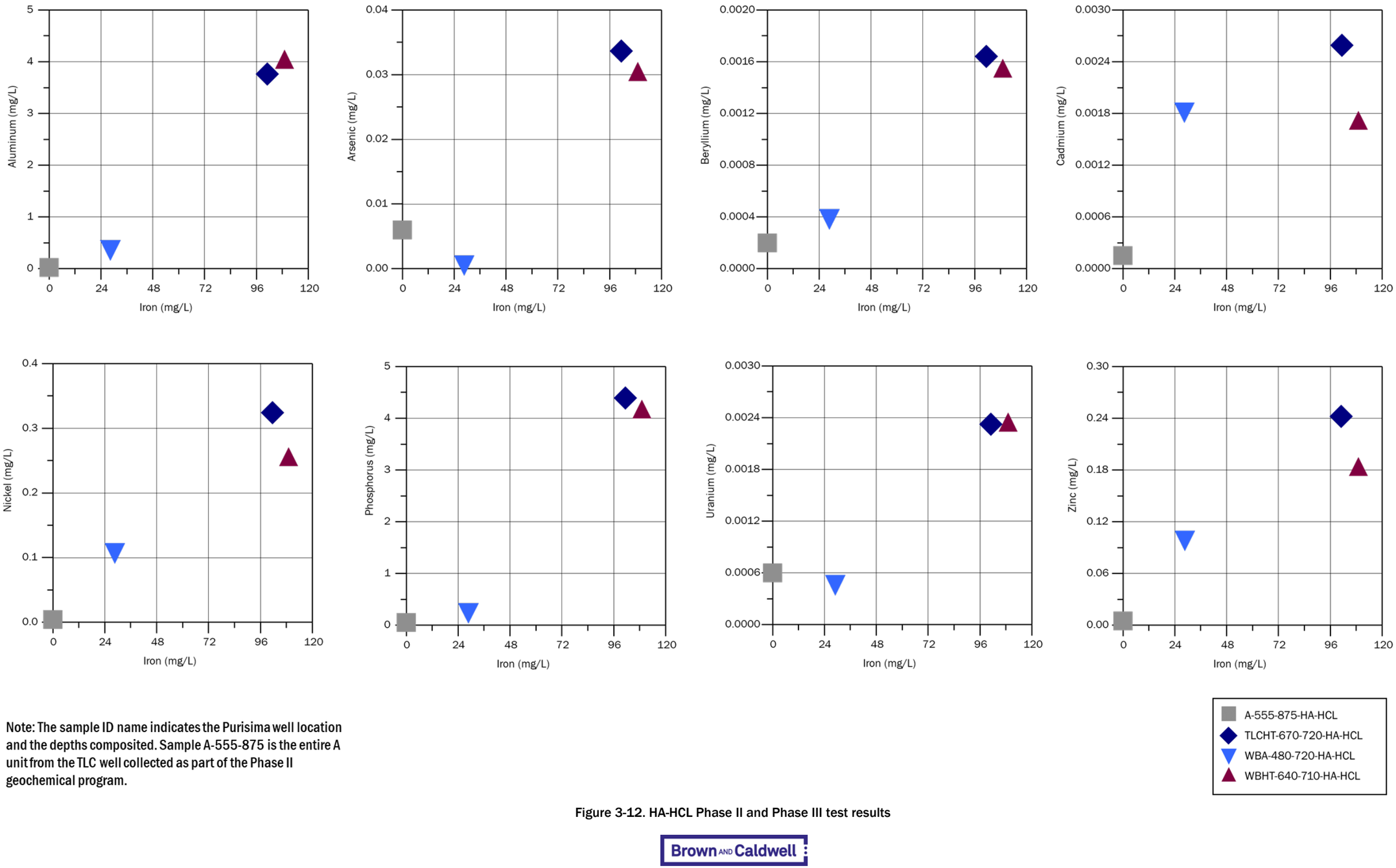

Note: The sample ID name indicates the Purisima well location and the depths composited. Sample A-555-875 is the entire A unit from the TLC well collected as part of the Phase II geochemical program.

Figure 3-12. HA-HCL Phase II and Phase III test results

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3.2 Mineralogical Analysis

Site-specific mineralogy of the target injection units and adjacent units can provide information on potential for reactions to occur between the target injection unit and the purified water. Mineralogy data were collected from a variety of sources, including visual examination of the sample cuttings during the drilling of the pilot TLC Pilot SWIP well; XRD of sample splits for each unit; and evaluation of whole-rock data to provide a total chemical analysis of the samples.

3.2.1 Visual Examination

Visual examination of the drill cuttings was performed to identify mineral phases during sample collection (Appendix A). Lithological logs were developed during the drilling activities of the TLC Well (BC 2020). Individual minerals or rock types were observed and photographed prior to sample compositing with emphasis on identifying sulfide minerals. Sulfide mineral phases are of importance due to the potential for long-term metals leaching resulting from mineral oxidation by purified water.

Samples from the TLC Well had been archived and in storage for approximately 2 years; Willowbrook samples were in storage for approximately 7 months prior to the Phase III sample collection efforts. The objective of the visual examination was to document the state of the sulfide minerals in the archived sample bags. Particular effort was made to document the state of sulfide minerals within the Willowbrook and TLC materials.

Some TLC samples showed potential results of alteration during storage based on observed color changes of the materials, possible iron-hydroxide and sulfate mineral formation within the bag, and signs of sulfide mineral reactions (Photographs 2-1, 2-2, 3-1, and 3-2); however, most of the sulfide minerals observed in the TLC samples showed little to no signs of alteration during storage. Sulfide mineral grains found within lithological fragments appeared unaffected by the length of sample storage for both the TLC and Willowbrook samples (Photographs 3-4 and 3-5).

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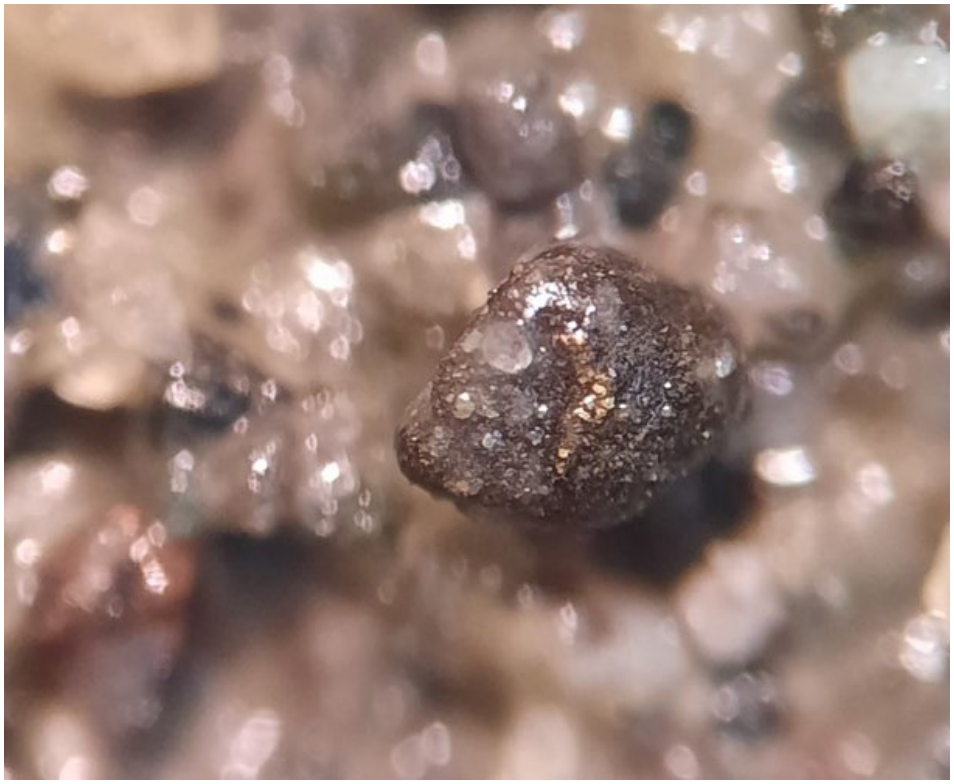
Photograph 3-4. Sulfide minerals within a sand-grain rock fragment from TLC 720 ft



Photograph 3-5. Sulfide minerals within a sand-grain rock fragment from Willowbrook 650 ft

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Due to the fine-grained nature of the samples, not all mineral phases or rock types were identifiable using only a visual evaluation, even with the 30X magnification binocular scope. Mineral identification requires a combination of various characteristics, including the mineral color, luster, hardness, streak, and habit. Color and luster can be evaluated through visual observation. The other identifiable traits of mineral phases typically require specimens larger than sand-size particles.

3.2.2 XRD Analysis

XRD analysis provided mineral quantity estimations based on the relative peak height of the X-ray diffraction pattern. The mineral phase quantities are semi-quantitative, with estimated percentages of greater than 2 percent of the bulk sample mineralogy. Amorphous mineral phases cannot be identified with XRD. The X-ray pattern of mineral phases in such low quantities (less than 5 percent of the bulk sample) can be difficult to distinguish and are classified as "Unidentified." Results of the XRD analysis identified the major and minor percentages of mineral phases present within the samples (Table 3-6).

Table 3-6. Drill Cutting XRD Mineral Analysis

Mineral	Mineral Formula	WBA-480-720 wt %	WBHT-640-710 wt %	TLCHT-670-720 wt %
Quartz	SiO_2	36%	37%	30%
Plagioclase	(Na,Ca)Al(Si,Al)3O8	39%	39%	28%
K-feldspar	$KAlSi_3O_8$	12%	13%	9%
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_{8022}(OH,F)_2$	<3	<3	<3
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_{4010}(OH,F)_2$	<3	<3?	<3
Chlorite	$(Mg,Fe,Al)6(Si,Al)_{4010}(OH)_8$	<2?	<2?	–
Calcite	$CaCO_3$	<2	<2	23
Magnetite	$(Fe,Mg,Zn,Cu,Ni)(Fe,Al,Cr)2O_4$	<5	<5	<3
Pyrite	FeS_2	<2	<1	<2
Apatite	$Ca_5(PO_4,CO_3)_3(OH,F,Cl)$	–	<1?	–
"Unidentified"	?	<5	<5	<5

wt% = weight percent
Refer to Table 2-1 for the well and depths composited to generate each sample.

XRD mineralogy results from the Phase III analysis agree with the Phase II (BC, 2020) and Phase I (BC, 2016) results and literature descriptions of the Purisima Formation. The XRD minerals identified include volcanic silicate minerals, such as feldspars and quartz, along with clinoamphibole mineral phases, such as hornblende and glaucophane. Clinoptilolite is a zeolite mineral formed when volcanic glass is altered by water after deposition and was noted to be of sufficient quantities to be an economic deposit within the Santa Margarita Formation (stratigraphically below the Purisima Formation) near Branciforte Creek in Santa Cruz County (Sheppard, 1971; Gilbert and McAndrews, 1948). Clay mineral phases identified with XRD are consistent with the literature descriptions of the rocks. Variations in the mineral assemblages between the different drill holes and within the individual Purisima A units are likely due to changes in the depositional environment of the sedimentary Purisima Formation as it was deposited in the basin over geologic time.

Gypsum, a sulfate mineral, was identified in the Phase I samples from SC-9R archived materials at low concentrations of 5 percent or less (BC, 2016). Gypsum was not measured in the XRD for the Phase II or Phase III samples but was observed to have formed in the TLC sample bag during storage

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(Photograph 3-2); however, the formation of sulfate minerals in the sample bags was not observed in all archived sample bags and were not abundant.

3.2.3 Whole-rock Analysis

Samples were submitted for whole rock analysis to evaluate the total elemental constituents within each unit (Table 3-7). Silica, calcium, and aluminum being the most abundant elements correspond with the XRD mineralogy indicating quartz and plagioclase feldspar are the most abundant mineral phases in the Purisima unit (Table 3-6).

Table 3-7. Whole-rock Data

Analyte (mg/kg)	TLCHT-670-720	WBA-480-720	WBHT-640-710
Aluminum	57,100	72,800	66,200
Antimony	< 5.04	< 5	< 5
Arsenic	5.15	8.89	7.1
Barium	766	911	895
Beryllium	1.76	1.58	1.72
Boron	13.6	15.8	10.8
Cadmium	1.61	1.63	1.69
Calcium	88,200	35,400	31,600
Chromium	< 100	< 100	< 100
Copper	< 50.2	< 50.1	< 50.1
Fluoride	2.48	4.18	3.74
Iron	28,100	34,400	34,000
Lead	10.1	13.2	12.6
Magnesium	10,600	14,300	13,200
Manganese	1000	565	559
Mercury	10.3	12.2	9.75
Molybdenum	< 100	< 100	< 100
Nickel	< 40.2	< 40.1	< 40.1
Potassium	16,300	19500	18,300
Selenium	< 1.26	< 1.25	< 1.25
Silica	625,000	728,000	696,000
Silver	< 50.2	< 50.1	< 50.1
Sodium	18,800	23,500	22,000
Strontium	438	534	487
Sulfur	6,160	4,670	3,640
Thallium	< 1.26	< 1.25	< 1.25
Uranium	2.19	1.93	1.89
Zinc	< 100	< 100	< 100

< = concentrations were not measured above the method detection limit
mg/kg = milligrams per kilogram

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Iron abundances are two orders of magnitude higher than manganese for the whole-rock analysis; however, iron is not measured at detectable levels in the soil leaching data (Table 3-2). Iron-bearing minerals, such as smectite, mica/illite, and pyrite, contribute to the total iron concentration in the whole-rock and XRF analysis. Amorphous iron oxide minerals could also be present in the samples contributing to the whole-rock iron concentrations; however, these mineral phases are not readily dissolvable and would not release iron during the soil leaching modified SPLP analysis. Iron concentrations in the HA-HCl extraction results indicate the potential for iron oxide mineral phases to be present (Table 3-5).

Whole-rock analyses of the Purisima A unit from the Phase II and Phase II analysis were plotted together to evaluate the differences in the elemental concentrations of the entire A unit with the higher-transmissivity zone within the A unit (Figure 3-13). Similar to the HA-HCl results described above, the whole-rock results from the higher-transmissivity zone represent a small portion of the overall A unit. For example, the concentrations of iron are higher in the TLC higher-transmissivity zone sample than the Phase II sample representing the entire A unit. The same mass of sample is used in the analysis from the composite sample material. Other sections of the A unit may contain higher or lower concentrations of iron that were combined to provide an overall concentration of the entire unit. For example, the proportions of the A unit not within the high-transmissivity zone may contain higher proportions of non-iron-bearing silicate minerals, such as quartz and plagioclase.

The whole-rock results indicate the overall chemical composition of the A unit is not widely variable. Differences in the whole-rock chemical composition between the TLC and Willowbrook wells and the different sampled intervals within the A unit are likely the result of mineralogical variations resulting from the changes in the source of rock and mineral material being deposited during the formation of the Purisima formation. The wide variety of rock types and minerals noted within the Purisima formation was observed during the sample collection process (Appendix A).

Low concentrations of metals in the whole-rock analysis indicate the low abundance of mineral phases containing those elements. For example, antimony, chromium, copper, selenium, silver, thallium, and zine were all below the detection limit. The whole-rock results concur with the column test results indicating metals are likely not contained within reactive mineral phases in high abundances and are unlikely to become mobile.

Whole-rock data represent the composition of all materials within the sample, not only the materials that may become mobilized when in contact with AWPF water; therefore, concentrations of arsenic, boron, and fluoride noted in the whole-rock data are not an indication of the total amount of a particular constituent that will become mobilized or a direct indication of the potential water quality which could arise from the interactions of the materials with AWPF water.

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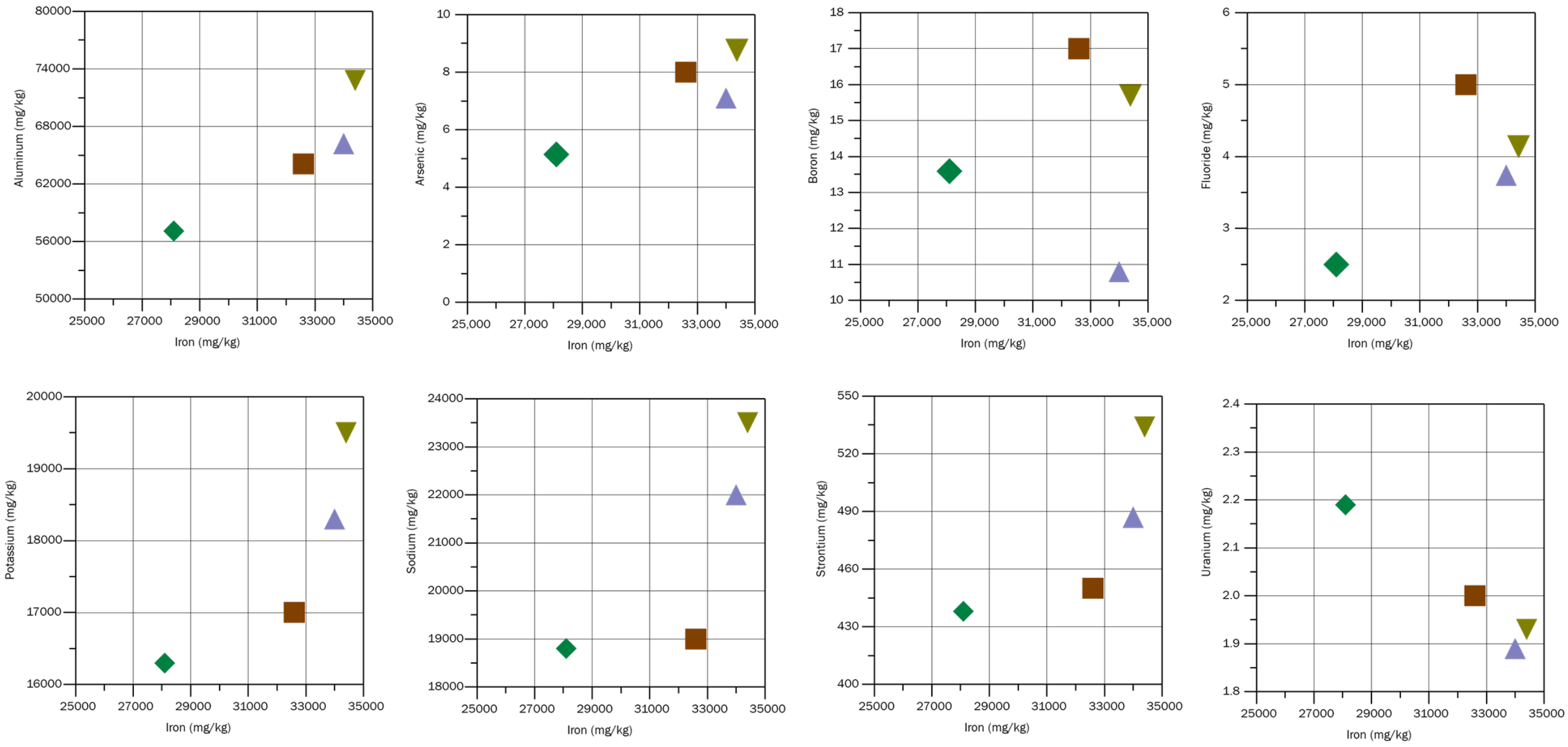

Note: The sample ID name indicates the Purisima well location and the depths composited. Sample A-555-875 is the entire A unit from the TLC well collected as part of the Phase II geochemical program.

Figure 3-13. Whole-rock Phase II and Phase III test results

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3.2.4 XRF Analysis

XRF analysis provided the elemental abundances of major ions and trace metals. Results for major ions, often listed as the oxide form of the element, are reported as weight percent of the total sample. Trace metals are reported as concentrations in parts per million (ppm).

XRF analyses were conducted as part of the geochemical characterization program conducted by other municipal water districts in central California for aquifer recharge projects. Phase I and Phase II for the SqCWD studies used the whole-rock analysis to evaluate the elemental concentrations in the samples collected. Similar to the whole-rock results, XRF can be used to evaluate the initial concentrations of a constituent in a sample prior to the leaching analyses to evaluate the mobility of individual elements.

Phase III XRF analysis indicate the majority of the sample material is composed of silica (SiO_2) and concur with the whole-rock and XRD analysis on the sample mineralogy (Table 3-8). The samples also contain calcium and aluminum, which agrees with the high percentages of plagioclase measured in the XRD analysis (Table 3-6).

The XRF results found trace concentrations of several metals, such as chromium, copper, nickel, and zinc, that were below the detection limit in the whole-rock analysis. These metals were below or near the detection limit in the column tests, indicating the mobility of these trace metals is low. Phosphate (P_2O_5) is noted as a minor component of all three samples and concurs with the trace amount of apatite identified in one sample XRD analysis result. Apatite is likely found within the seashell fragments observed within the Purisima unit.

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Table 3-8. X-ray Fluorescence Data			
Analyte	TLCHT-670-720	WBA-480-720	WBHT-640-710
wt%			
SiO_2	53.5	65.7	66.1
CaO	14.91	4.22	4.04
Al_2O_3	9.42	12.2	11.7
Fe_2O_3	3.88	4.19	4.64
Na_2O	2.16	2.82	2.85
K_2O	1.8	2.07	2.08
MgO	1.51	2.07	1.94
S	0.64	0.53	0.39
TiO_2	0.38	0.41	0.44
P_2O_5	0.26	0.23	0.23
Cl	<0.02	<0.02	<0.02
MnO	0.15	0.06	0.07
BaO	0.08	0.09	0.09
PPM			
As	<20	<20	23
Co	<10	<10	<10
Cr	107	125	142
Cu	16	22	61
Pb	<10	<10	23
Mo	<10	<10	<10
Nb	<10	<10	<10
Ni	20	26	24
Rb	54	55	59
Sn	<20	<20	<20
Sr	409	428	426
Th	<10	<10	<10
U	<10	<10	<10
V	76	71	79
W	<10	<10	<10
Y	21	16	16
Zn	48	53	73
Zr	103	101	116

wt% = weight percent, PPM - parts per million

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Section 4

Geochemical Observations

Results from the Phase II and III geochemical characterization of the TLC SWIP well aquifer units indicate the potential for some metals mobilization due to the interactions between the soil and advanced purified waters. The mechanism for metals mobilization is believed to be a combination of desorption and/or mineral dissolution. Mineral dissolution could also include the oxidation of sulfide minerals.

The Phase III geochemical analysis was developed to address data gaps identified after the Phase I and II geochemical characterization analyses were complete. Results of the Phase III geochemical analysis found:

- Storage of the samples prior to laboratory analysis could cause oxidation of the sulfide minerals. Drill cuttings for the TLC Well had been in storage for about 2 years prior to the sample collection for the Phase III analysis. Observations of the material color and mineralogy under a binocular microscope did show evidence of geochemical changes to the materials during storage; however, efforts were taken to collect splits of the drill cuttings that showed the least amount of alteration due to storage.
- Decreasing sulfate and calcium concentrations could be an indication of sulfate minerals that formed during sample storage were dissolving during the modified MWMP column tests. Minerals observed in the stored samples could be gypsum or other readily dissolvable sulfate minerals formed as a result of sulfide oxidation that occurred during storage.
- There is a potential for variability in the mineralogy of the Purisima A unit between the SWIP future injection wells. Variation within the A unit may also result in slight differences in the potential geochemical reactions. A sample was collected from a higher-transmissivity zone within the TLC A unit to evaluate the geochemical characterization within the portion of the A unit expected to allow for the most injection water to move into the formation. Additional samples were collected from the Willowbrook drill cuttings to evaluate the entire A unit and the high-transmissivity zone within the A unit.
- Phase III modified SPLP soil leaching analyses were conducted with two AWPF waters not used in the Phase II analysis to allow for flexibility in the post-treatment stabilization design. Analyzing soil leaching results using water chemistries for various treatment scenarios provided additional data points to evaluate the cost-effectiveness of a potential treatment design and assess the potential trade-offs of a particular treatment design and the potential for metals mobilization.
- The water quality of modified MWMP column tests was similar to the Tannery II groundwater quality indicating limited constituent mobilization occurred during the final two rinses of the modified MWMP column tests. The Tannery II groundwater water chemistry did not cause an increase in constituents desorbing from the aquifer materials.

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Results from the Phase II and III geochemical characterizations indicate the potential for some constituents to be mobilized from the Purisima A unit when in contact with AWPF water. The following were key observations from the laboratory data:

- Lower arsenic concentrations appear to correlate with higher calcium and/or magnesium concentrations in the modified SPLP leachate solution. Similar observations of arsenic mobilization and calcium concentrations were identified in the OCWD laboratory studies (Fakhreddine et al., 2020).
- Arsenic is likely mobilized as a result of dissolution or desorption from mineral phases that are not entirely dependent upon the pH of the modified MWMP column leachate water.
- Decreasing concentrations of calcium, magnesium and sulfate with successive rinses in the modified column tests likely indicates the dissolution of a finite mineral phase within the aquifer materials.
- Boron concentrations in the modified SPLP are similar to the concentration of the AWPF water used in the analysis. Boron concentrations in the modified column tests are higher than the AWPF water and higher than the results of the modified SPLP, indicating the length of exposure time to the AWPF water in the laboratory contributes to the mobilization. Boron may be adsorbed onto mineral surfaces in the aquifer materials or may be within a slowly dissolvable mineral phase requiring several days to release the boron concentration.
- Fluoride concentrations increase with successive rinses and decreasing sulfate concentrations, for the first week 4 of the MWMP tests Fluoride concentrations are likely the result of fluorite or apatite dissolution, although these mineral phases were not identified by XRD analysis.
- Although there are slight mineralogical variations within the Purisima A unit, the modified SPLP and modified MWMP soil leaching results indicate the overall potential to mobilize constituents is consistent between the TLC and Willowbrook results. The water quality of the advanced purified treated water has a larger impact on the potential to mobilize constituents than the slight variations in mineralogy within the Purisima A unit.

Results from the Phase III analysis indicate that differences in the AWPF water quality based on the types of materials used in post-processing do have some impact on the mobilization of constituents; however, some mobilization of metals and other ions, such as antimony, arsenic, barium, fluoride, nitrate, and uranium, occur with all of the AWPF waters tested. Metals such as arsenic and fluoride appear to become more mobilized with lower calcium, magnesium, and sulfate concentrations in the leachate solution. Barium, nitrate, and uranium appear to be either more or less mobile at leachate pH values below or above 8. Boron does not appear to have a clear trend with leachate pH or a consistent trend with sulfate across the different well locations. All AWPF waters tested for Phase III showed similar potential to mitigate mobilization of constituents as all of the modified SPLP soil leaching results were within the same order of magnitude in concentrations. The mitigation effectiveness was evident by a comparison with Phase I results.

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Section 5

Recommendations

Below are recommendations based on the results of the Phase I, II, and III geochemical analyses and the objectives of the PWS Project. Recommendations for additional work based on the geochemical characterization include:

- Compile and share geochemical information across the region. Data from the PWS geochemical analysis should be compared with the results of other geochemical and operational advanced purified treated water reuse studies and aquifer storage and recovery studies conducted within the central California area to synthesize the results and improve conceptual models of the geochemical mechanisms occurring during advanced treated purified water injection operations.
- Data from the geochemical analyses could be used to finalize the anti-degradation report. This could include comparisons with historical background concentrations and with water quality objectives for protection of beneficial uses. Based on the Phase II and III results, the constituents of greatest interest in regard to geochemical effects are arsenic, boron, and fluoride
- Data from the SWIP well geochemical characterization analyses, including the list of analytes to monitor, should be used when developing the groundwater sampling and monitoring program and operations protocols for the AWPF and SWIP wells. Constituents showing the potential for increasing trends due to geochemical effects could be monitored frequently at the monitoring wells closest to the SWIP wells. Details for this could be contained in the final anti-degradation report.
- Review data from the Phase III analysis and data compiled from other operating AWPF reuse systems, including start-up of the PWS system, to optimize post-water treatment operations.
- Data from the monitoring program can be compared to the results of the geochemical analysis to evaluate if trends observed in the laboratory are occurring during SWIP operations. Specifically, based only on the modified MWMP column test results, there could be a rolling front of water expanding from the SWIP wells with increased concentrations of some constituents, followed by a decrease or stabilizing of the concentrations. Analyzing the monitoring results for trends in constituents of interest and also for concentrations of constituents that were correlated to the main constituents of interest could enhance understanding of the aquifer geochemistry.

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Section 6

Limitations

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Section 7

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Appendix A: Sample Photos

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Figure A-1
Photograph of Willowbrook sample bags from storage

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Figure A-2
Photograph of Willowbrook sample bag 480 – 490 ft bgs

Target Aquifer Geochemical Characterization
Soquel Creek Water District

Brown AND Caldwell

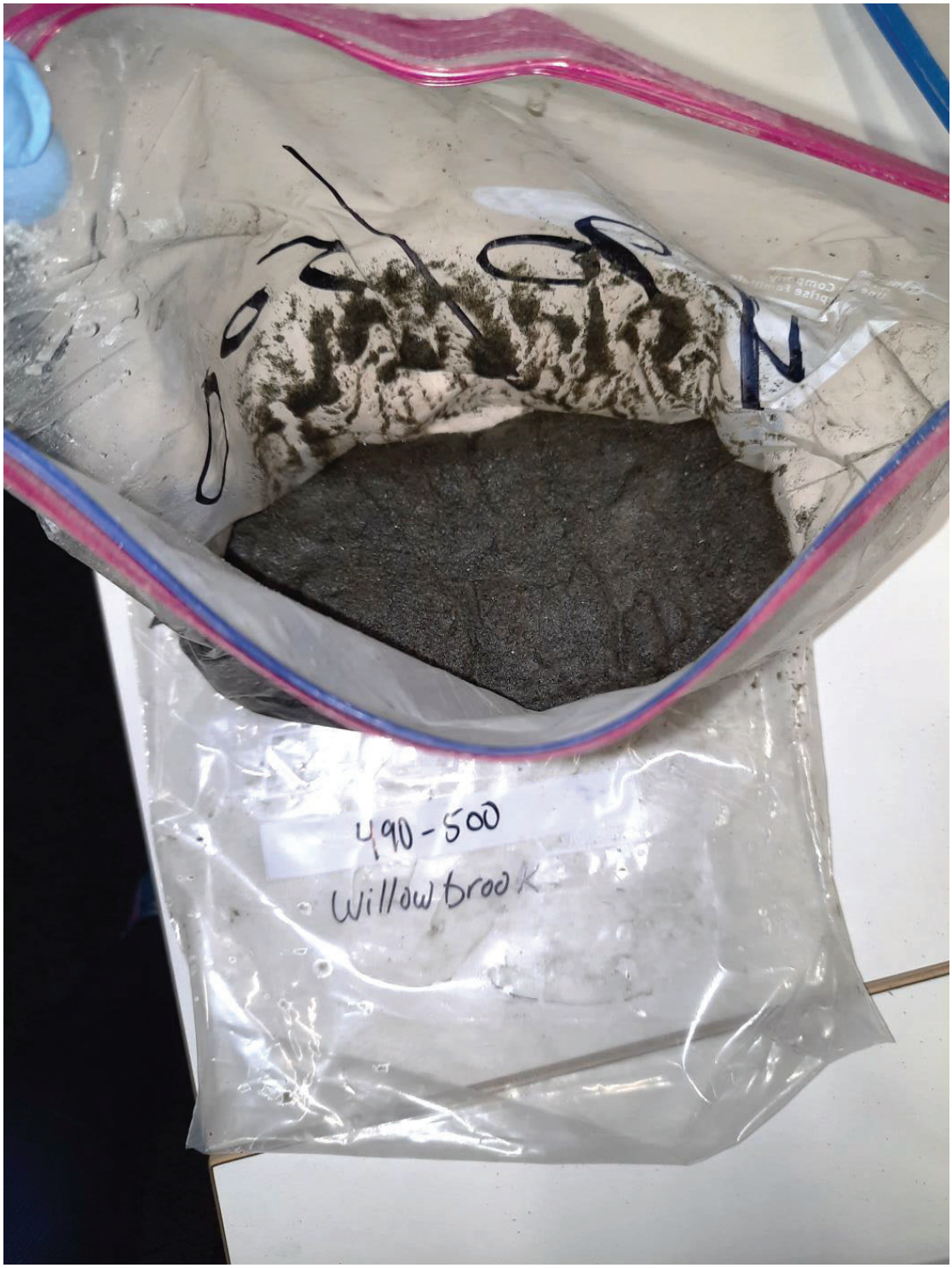
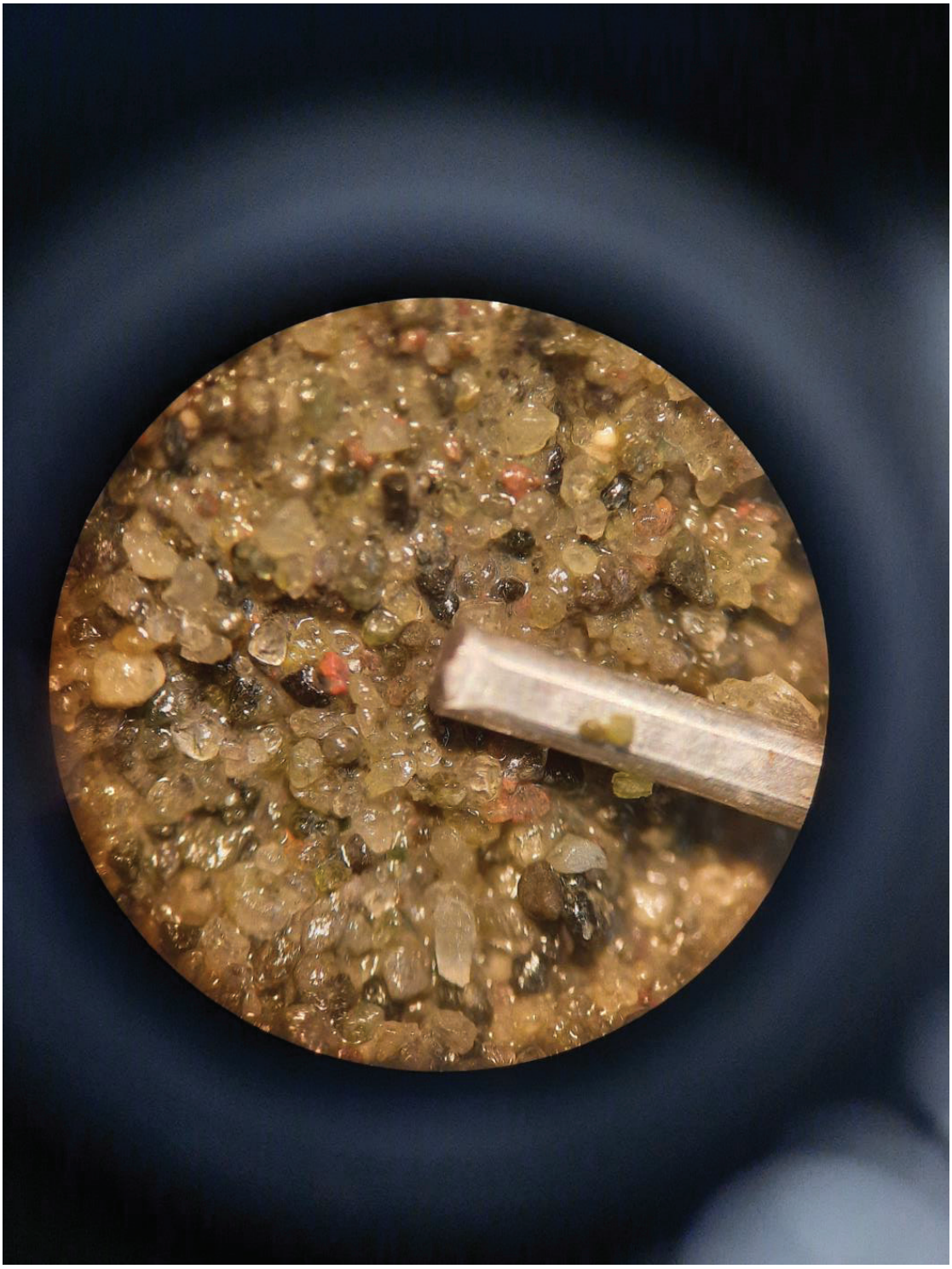


Figure A-3
Photograph of Willowbrook sample bag 490 – 500 ft bgs



30X magnification. Paperclip in photo for scale.

Figure A-4
Microphotograph from Willowbrook sample 490 – 500 ft.

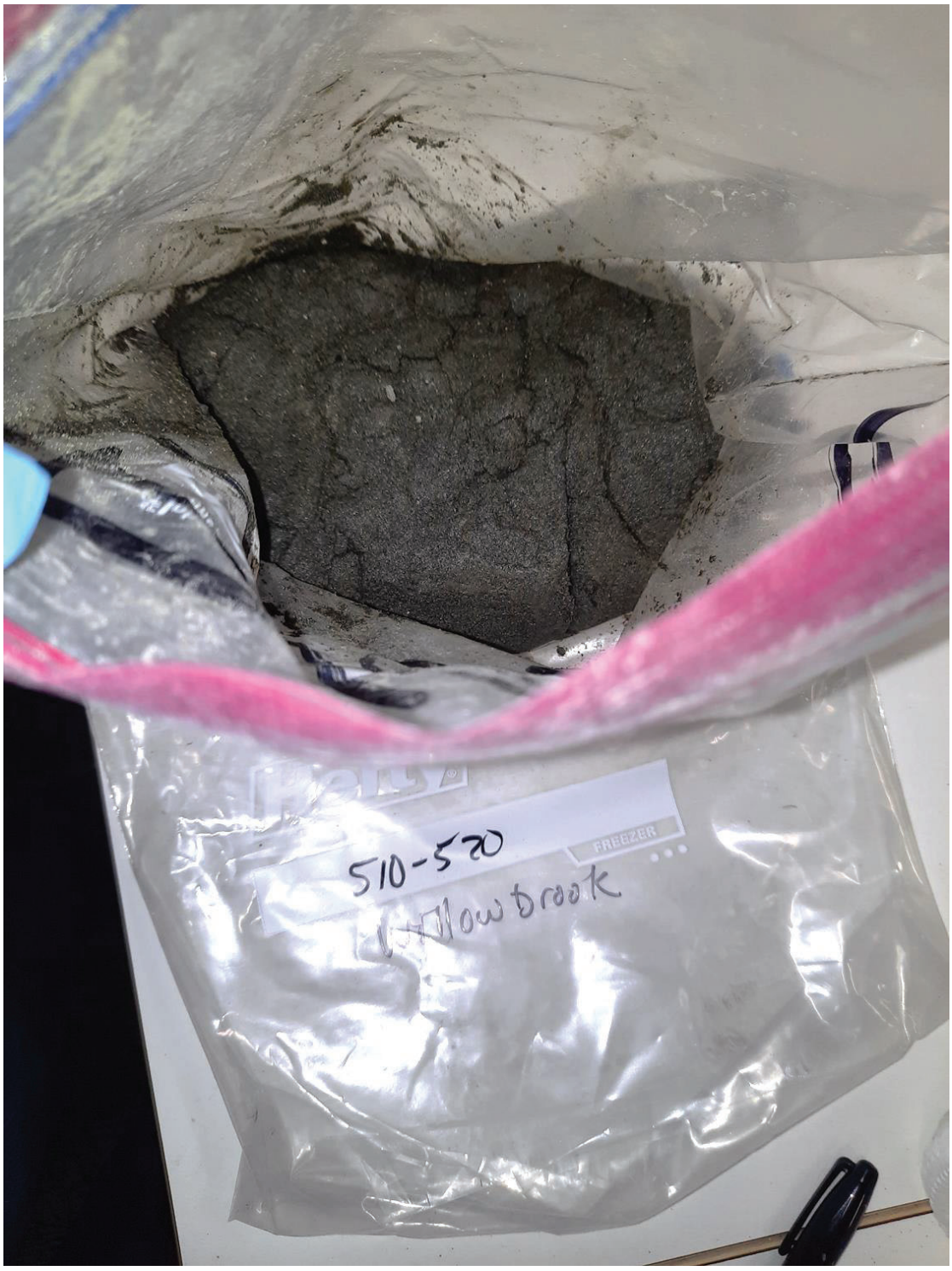


Figure A-5
Photograph of Willowbrook sample bag 510 – 520 ft bgs



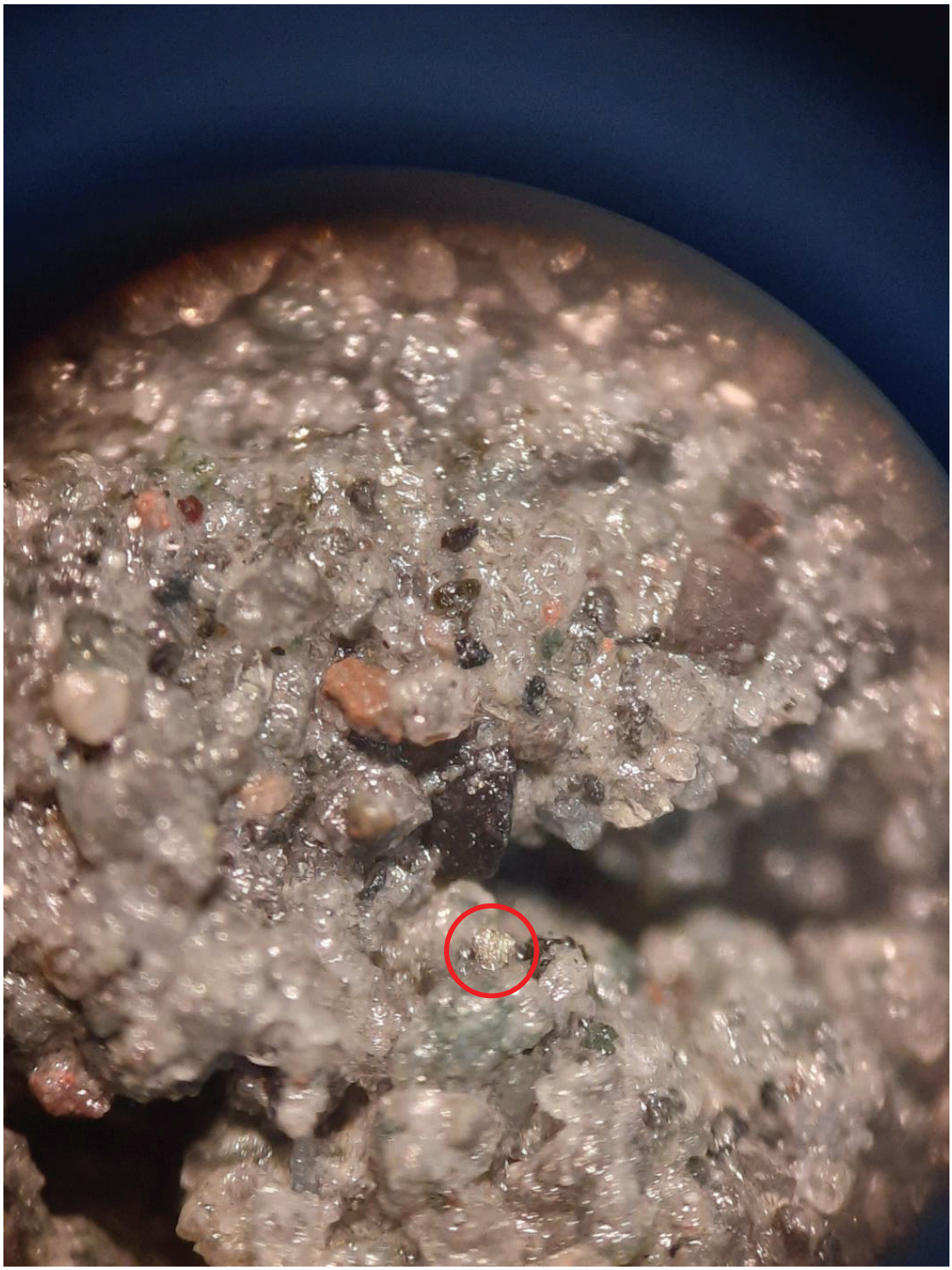
Figure A-6
Photograph of Willowbrook sample bag 520 – 530 ft bgs



30X magnification. Sulfide mineral circled.

Figure A-7
Microphotograph from Willowbrook sample 520 – 530 ft.

Brown AND Caldwell



30X magnification. Sulfide mineral circled.

Figure A-8
Microphotograph from Willowbrook sample 520 – 530 ft.

Brown AND Caldwell

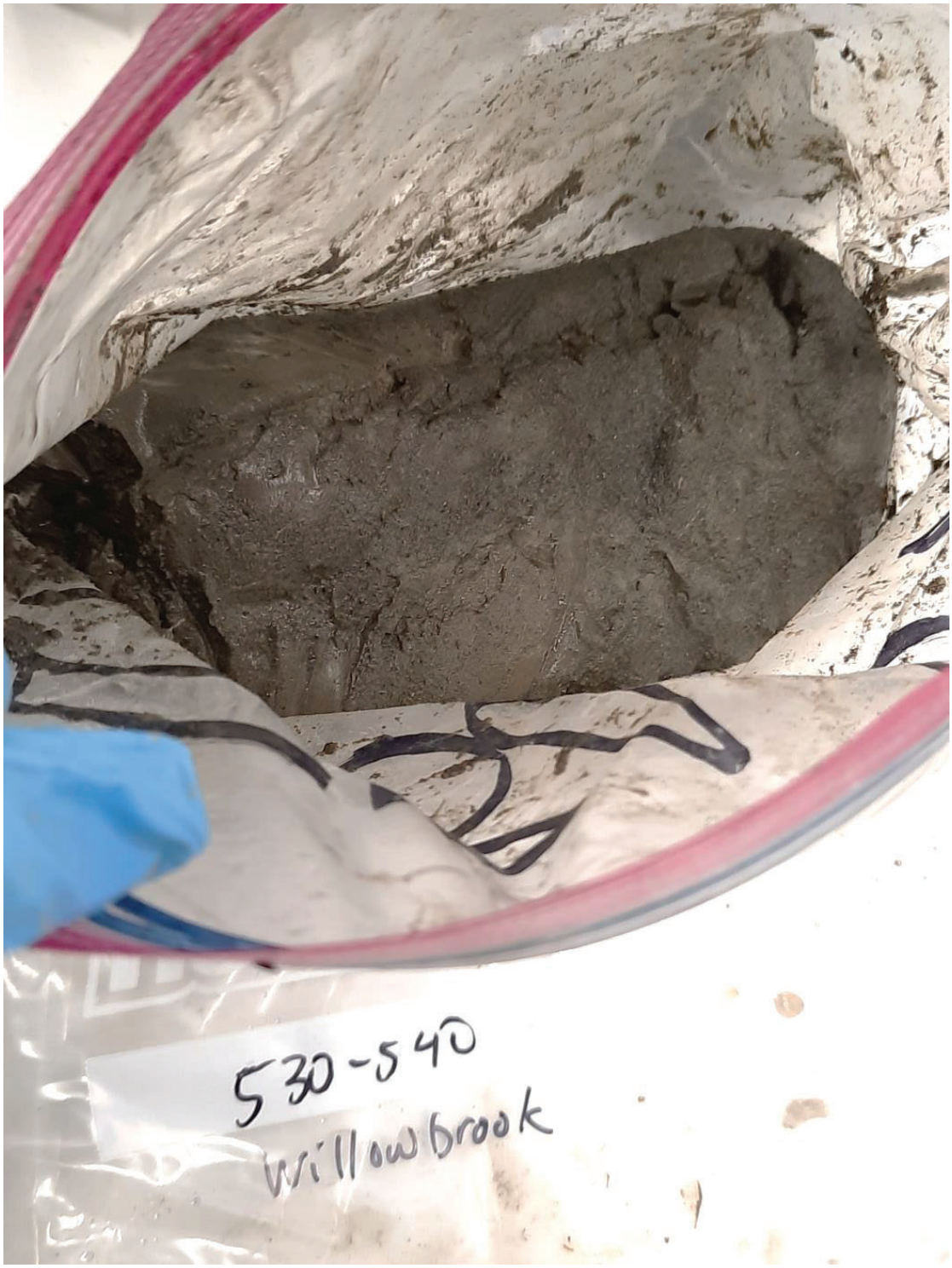


Figure A-9
Photograph of Willowbrook sample bag 530 – 540 ft bgs

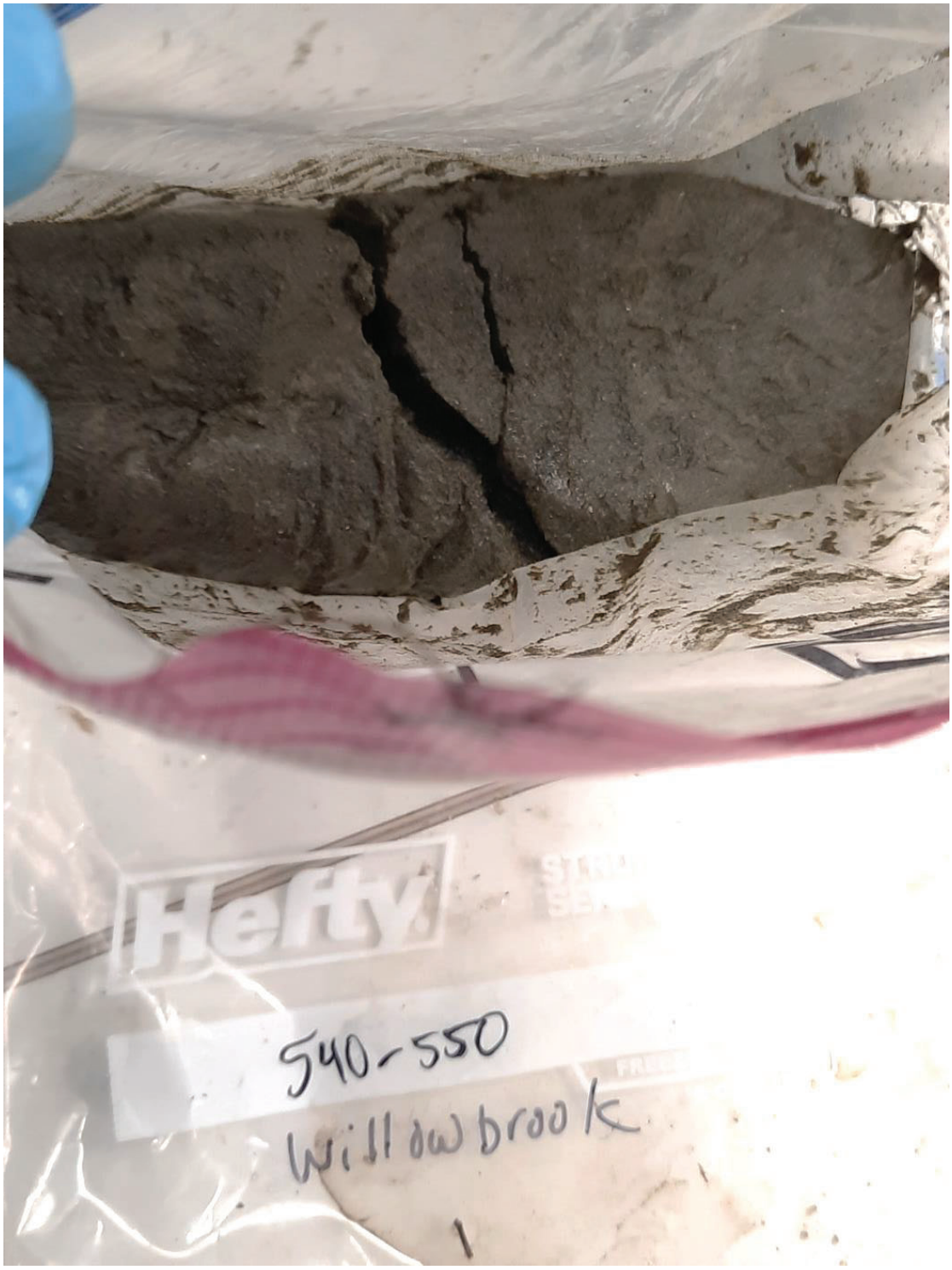


Figure A-10
Photograph of Willowbrook sample bag 540 – 550 ft bgs



30X magnification. Sulfide minerals within sand grain circled.

Figure A-11
Microphotograph from Willowbrook sample 540 – 550 ft.

Target Aquifer Geochemical Characterization
Soquel Creek Water District

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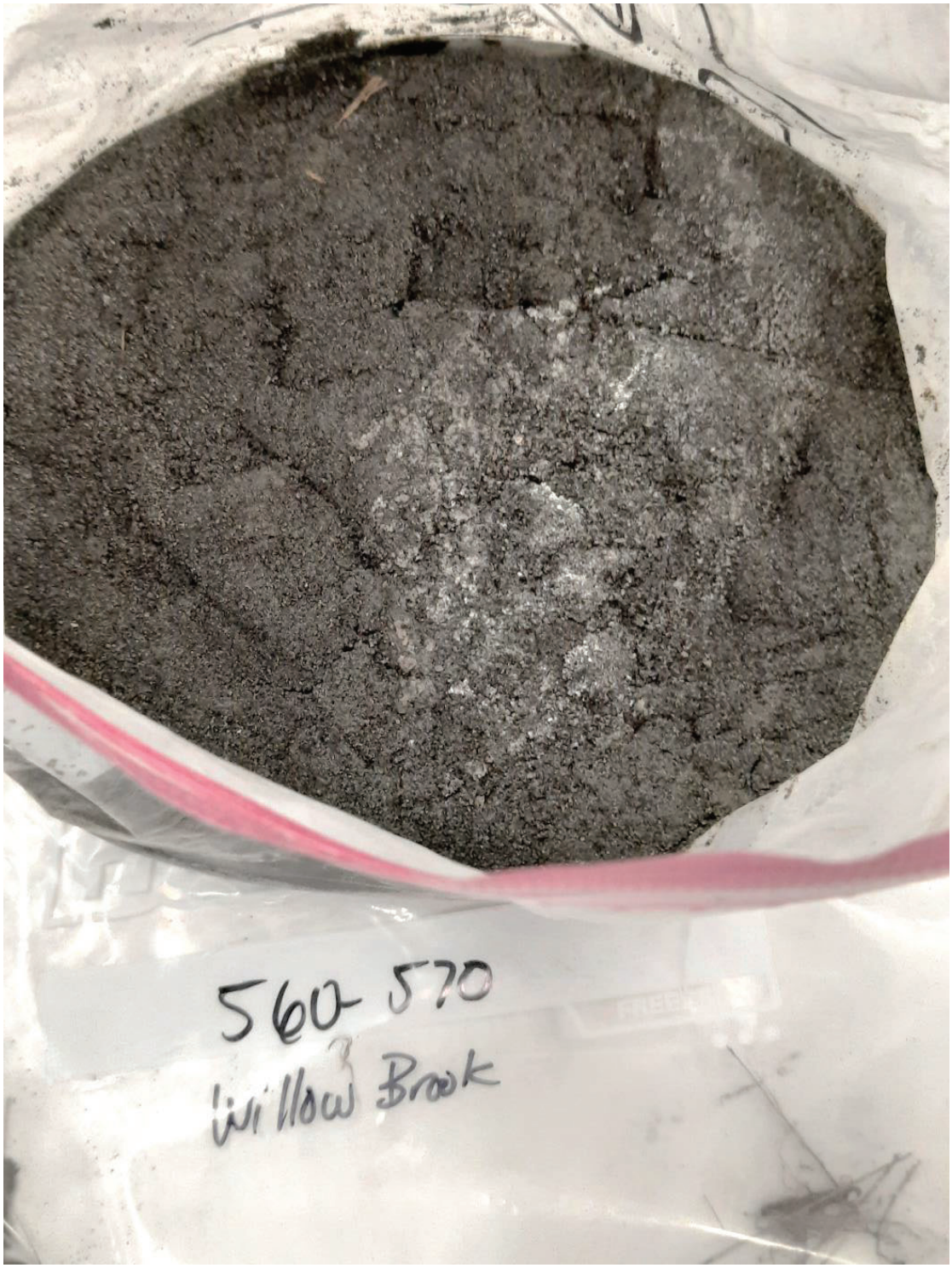

Figure A-12
Photograph of Willowbrook sample bag 560 – 570 ft bgs

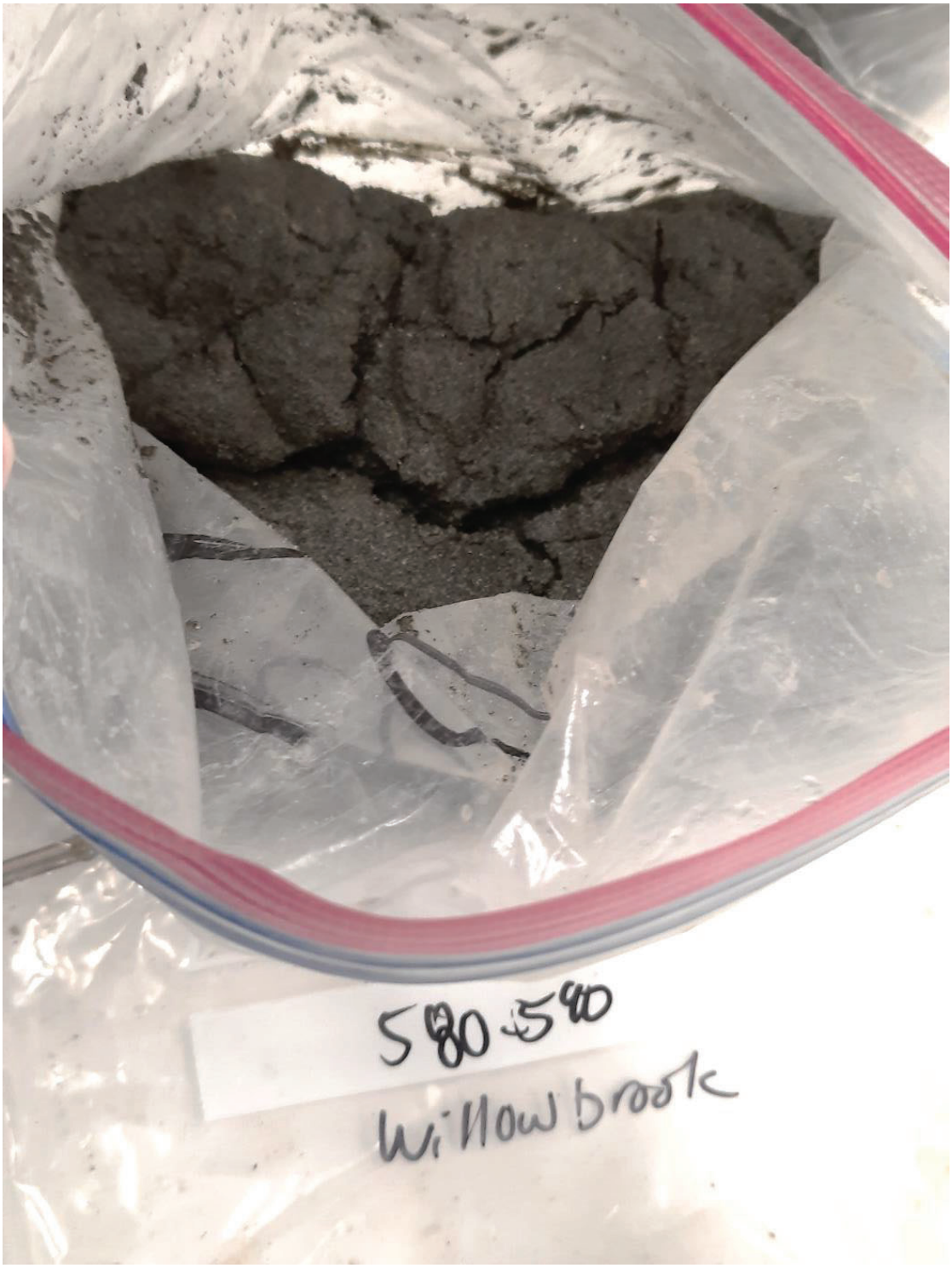

Figure A-13
Photograph of Willowbrook sample bag 580 – 590 ft bgs



30X magnification. Sulfide mineral cluster circled.

Figure A-14
Microphotograph from Willowbrook sample 580 – 590 ft.

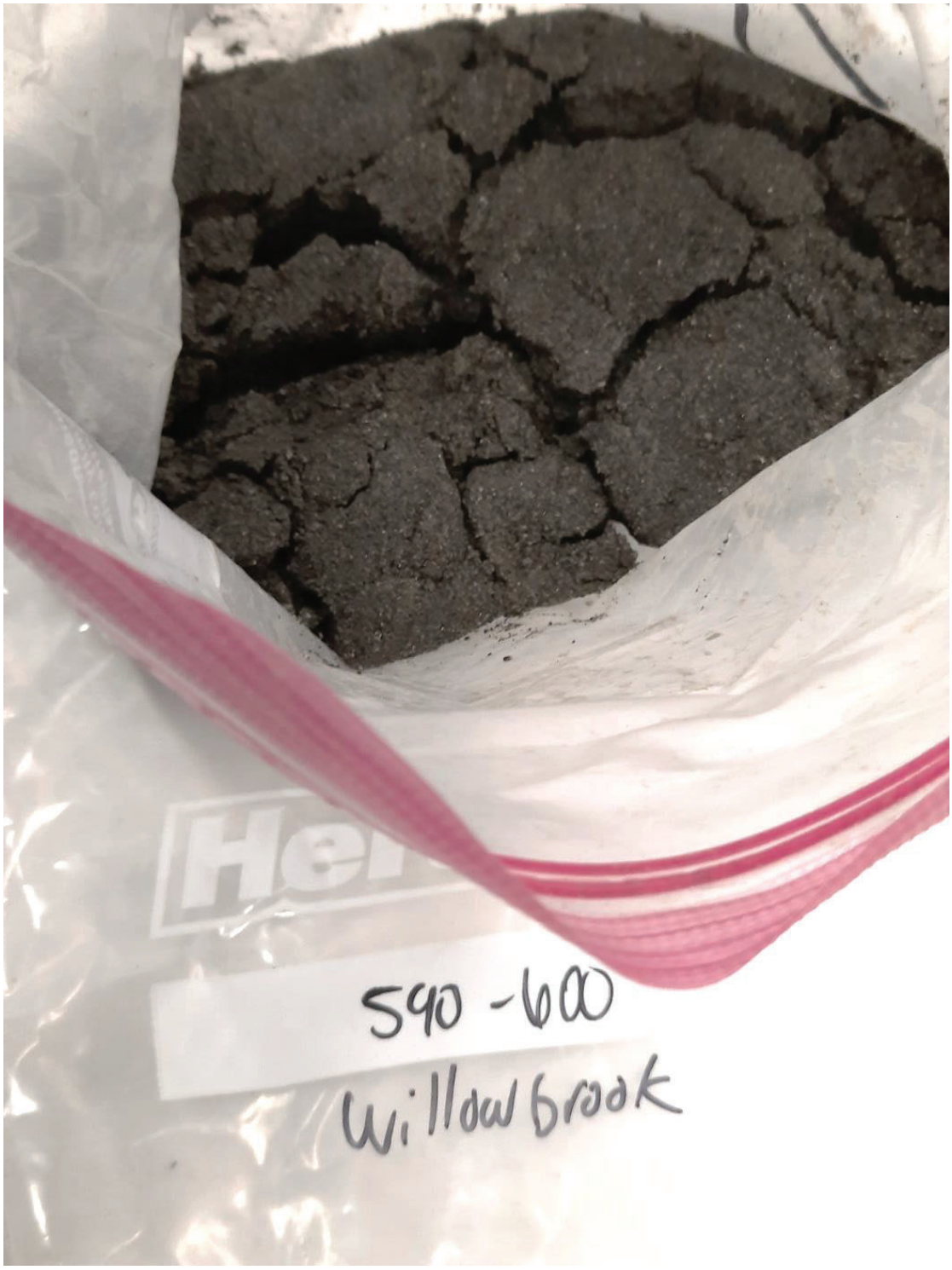

Figure A-15
Photograph of Willowbrook sample bag 590 – 600 ft bgs

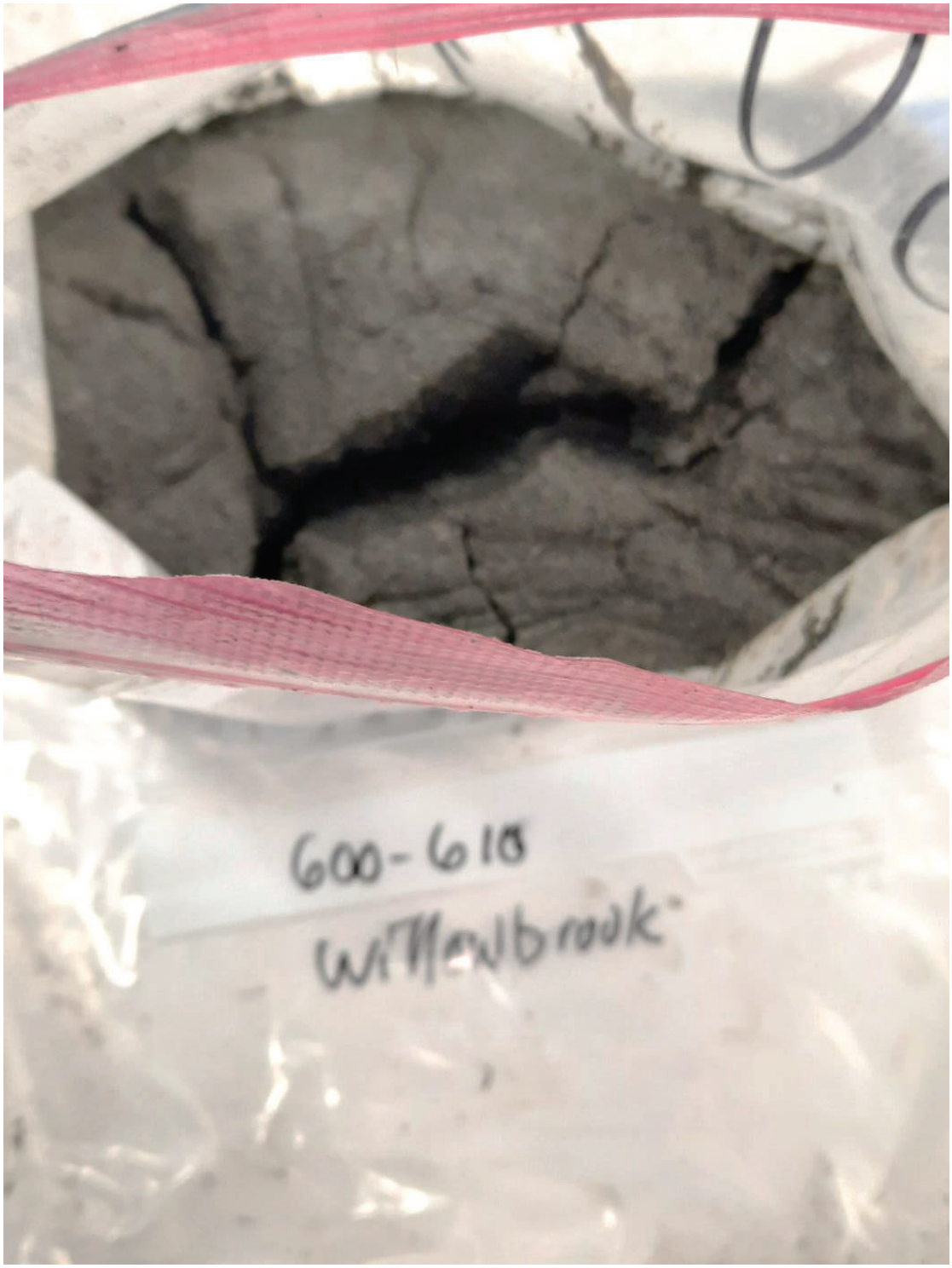

Figure A-16
Photograph of Willowbrook sample bag 600 – 610 ft bgs



30X magnification. Sulfide mineral circled.

Figure A-17
Microphotograph from Willowbrook sample 600 – 610 ft

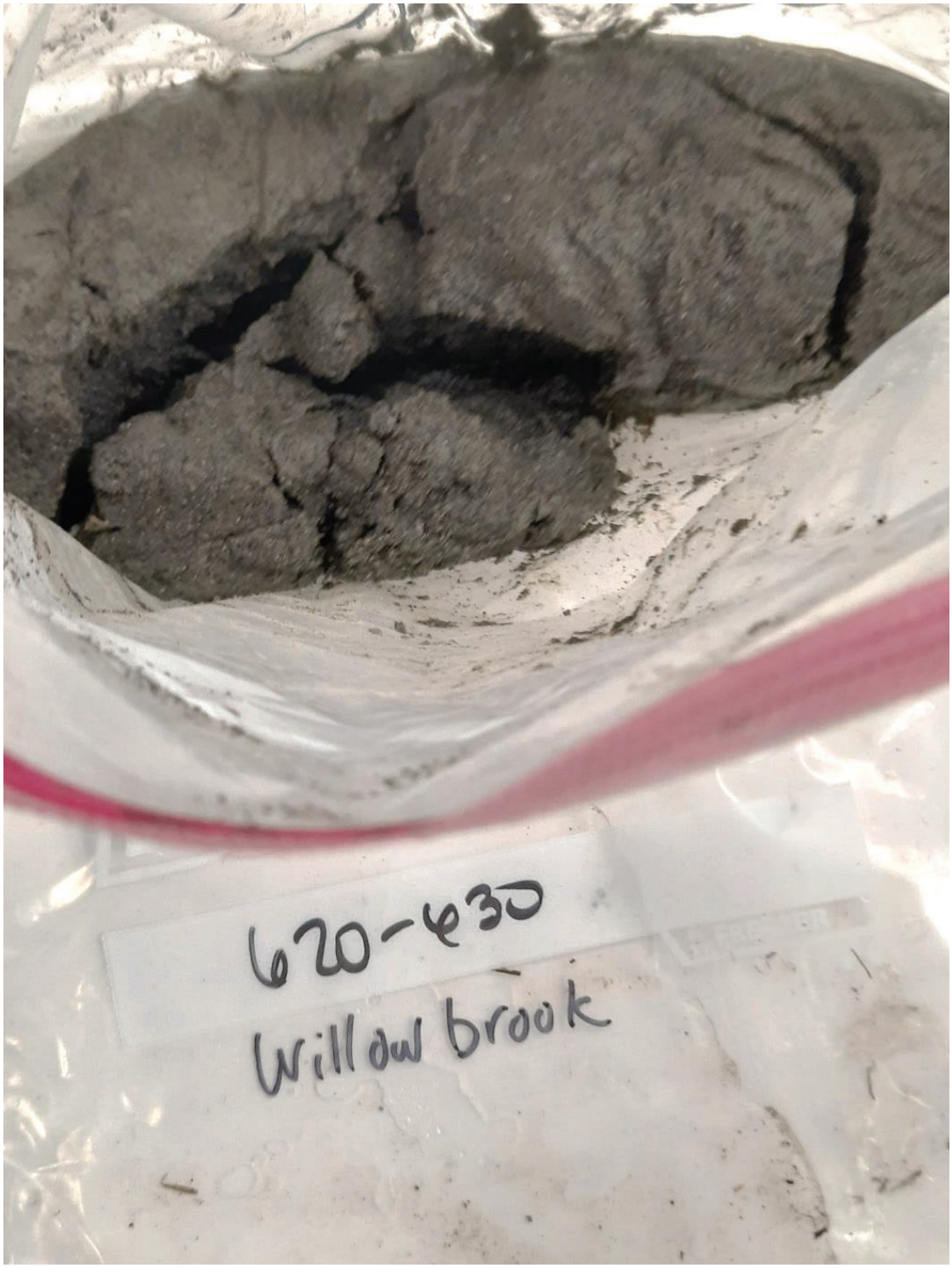

Figure A-18
Photograph of Willowbrook sample bag 620 – 630 ft bgs



30X magnification. Sulfide minerals within sand grain circled.

Figure A-19
Microphotograph from Willowbrook sample 620 – 630 ft

Target Aquifer Geochemical Characterization
Soquel Creek Water District

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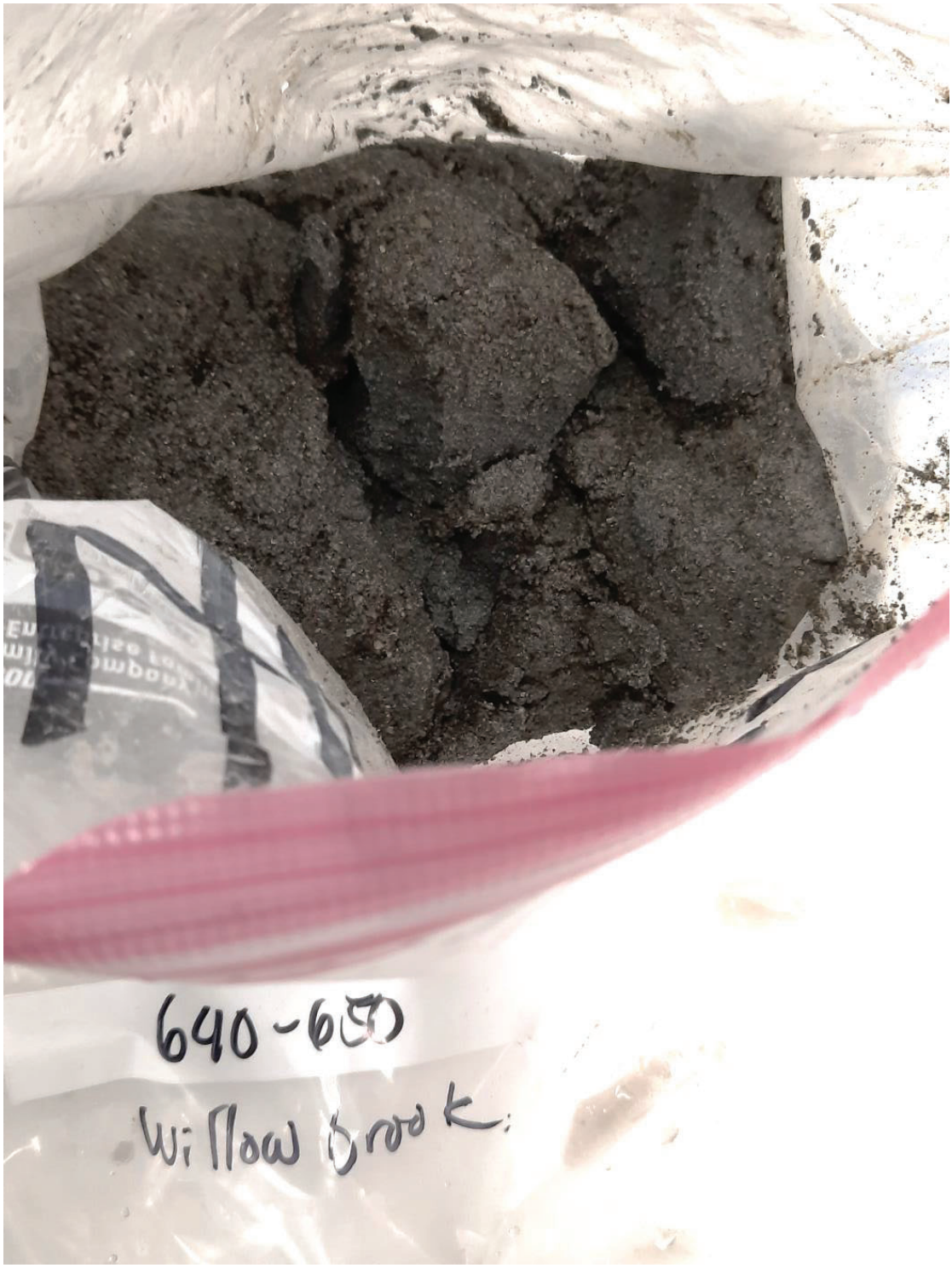

Figure A-20
Photograph of Willowbrook sample bag 640 – 650 ft bgs



30X magnification. Sulfide minerals within sand grain circled.
Paperclip for scale.

Figure A-21
Microphotograph from Willowbrook sample 640 – 650 ft

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Figure A-22
Photograph of Willowbrook sample bag 650 – 660 ft bgs



30X magnification. Sulfide minerals within sand grain circled.
Paperclip for scale.

Figure A-23
Microphotograph from Willowbrook sample 650 – 660 ft

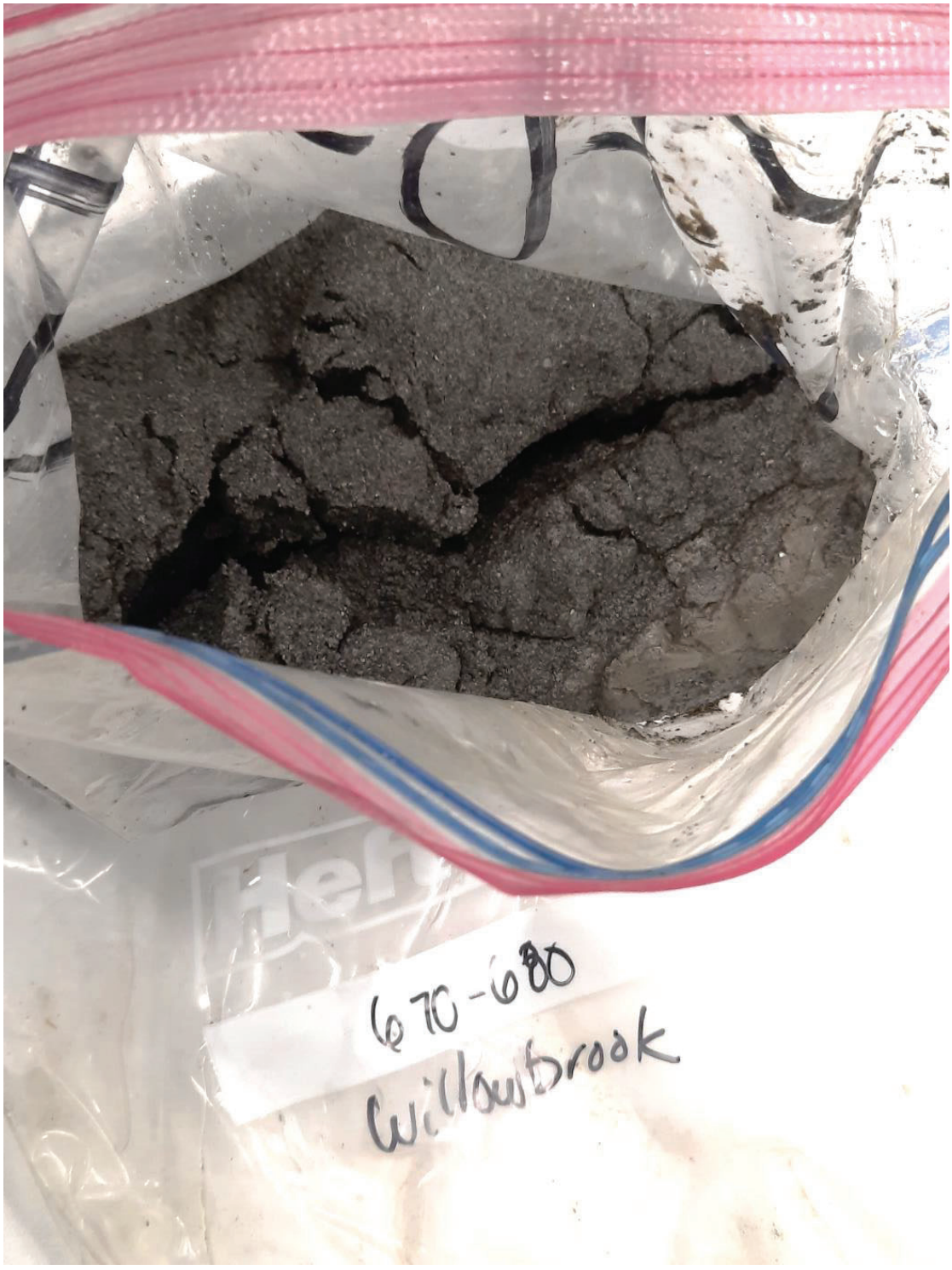

Figure A-24
Photograph of Willowbrook sample bag 670 – 680 ft bgs

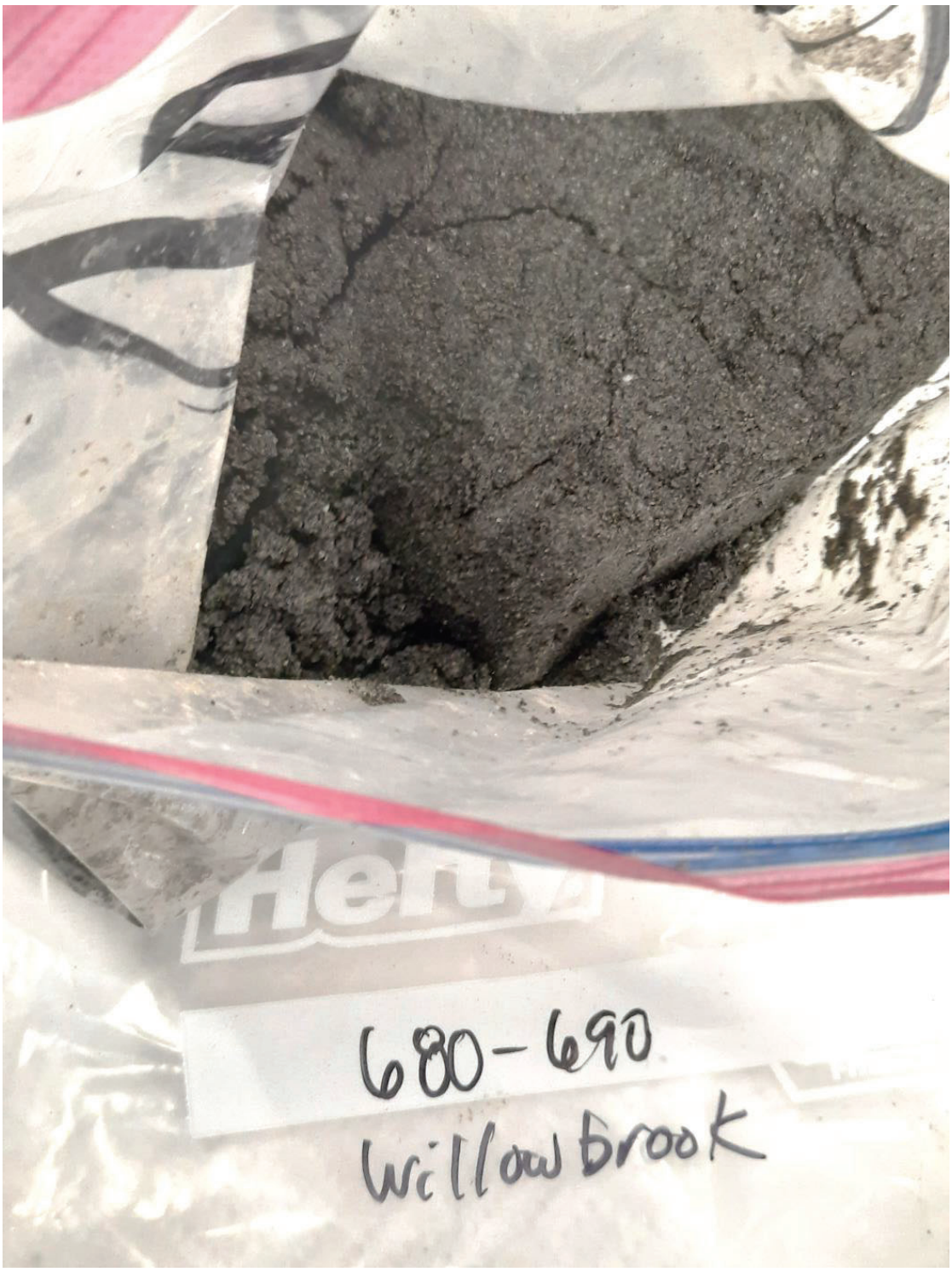

Figure A-25
Photograph of Willowbrook sample bag 680 – 690 ft bgs



30X magnification. Sulfide minerals within sand grain circled.
Paperclip for scale.

Figure A-26
Microphotograph from Willowbrook sample 680 – 690 ft

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Figure A-27
Photograph of Willowbrook sample bag 700 – 710 ft bgs

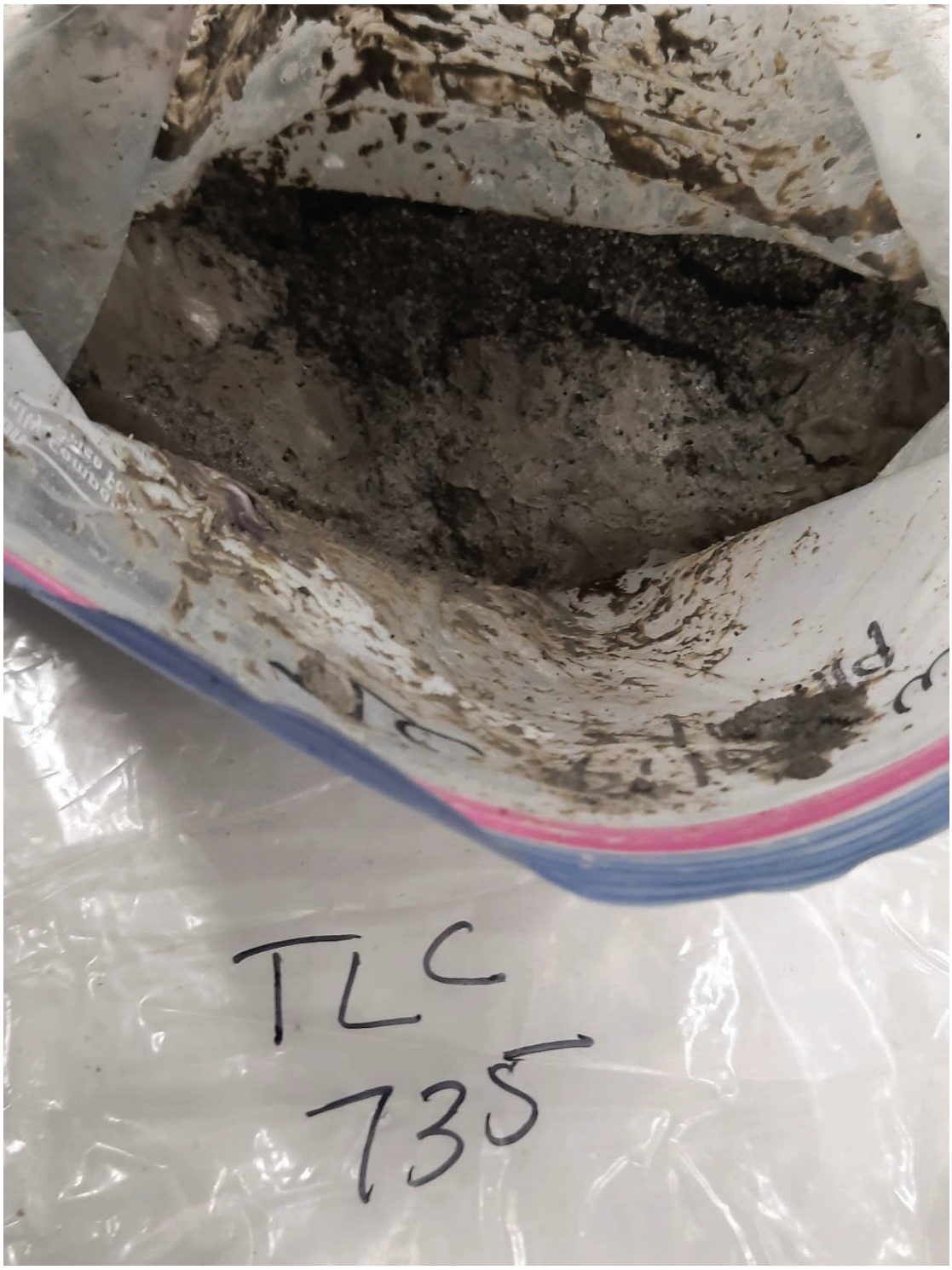


Figure A-28
Photograph of TLC sample bag 735 ft bgs



30X magnification. Sulfide mineral cement surrounding several minerals circled. Paperclip for scale.

Figure A-29
Microphotograph from TLC sample 735 ft



30X magnification. Sulfide mineral circled.

Figure A-30
Microphotograph from TLC sample 735 ft

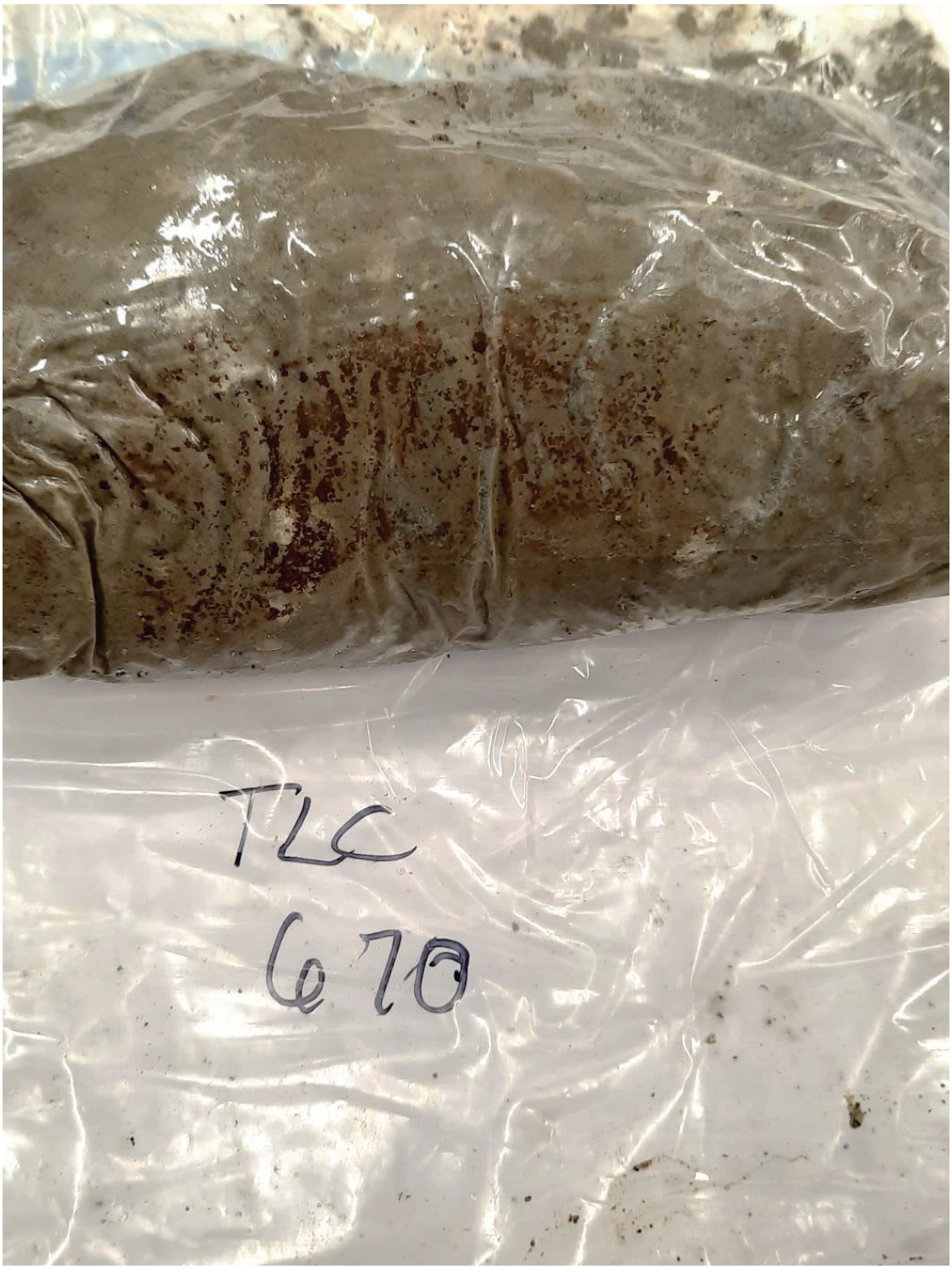


Figure A-31
Photograph of the outside of TLC sample bag 670 ft bgs

Target Aquifer Geochemical Characterization
Soquel Creek Water District

Brown AND Caldwell



Figure A-32
Photograph of TLC sample bag 670 ft bgs



30X magnification. Sulfide minerals within sand fragment circled.

Figure A-33
Microphotograph from TLC sample 670 ft



Figure A-34
Photograph of TLC sample bag 675 ft bgs



Figure A-35
Photograph of TLC sample bag 680 ft bgs



30X magnification. Sulfide mineral circled.

Figure A-36
Microphotograph from TLC sample 680 ft

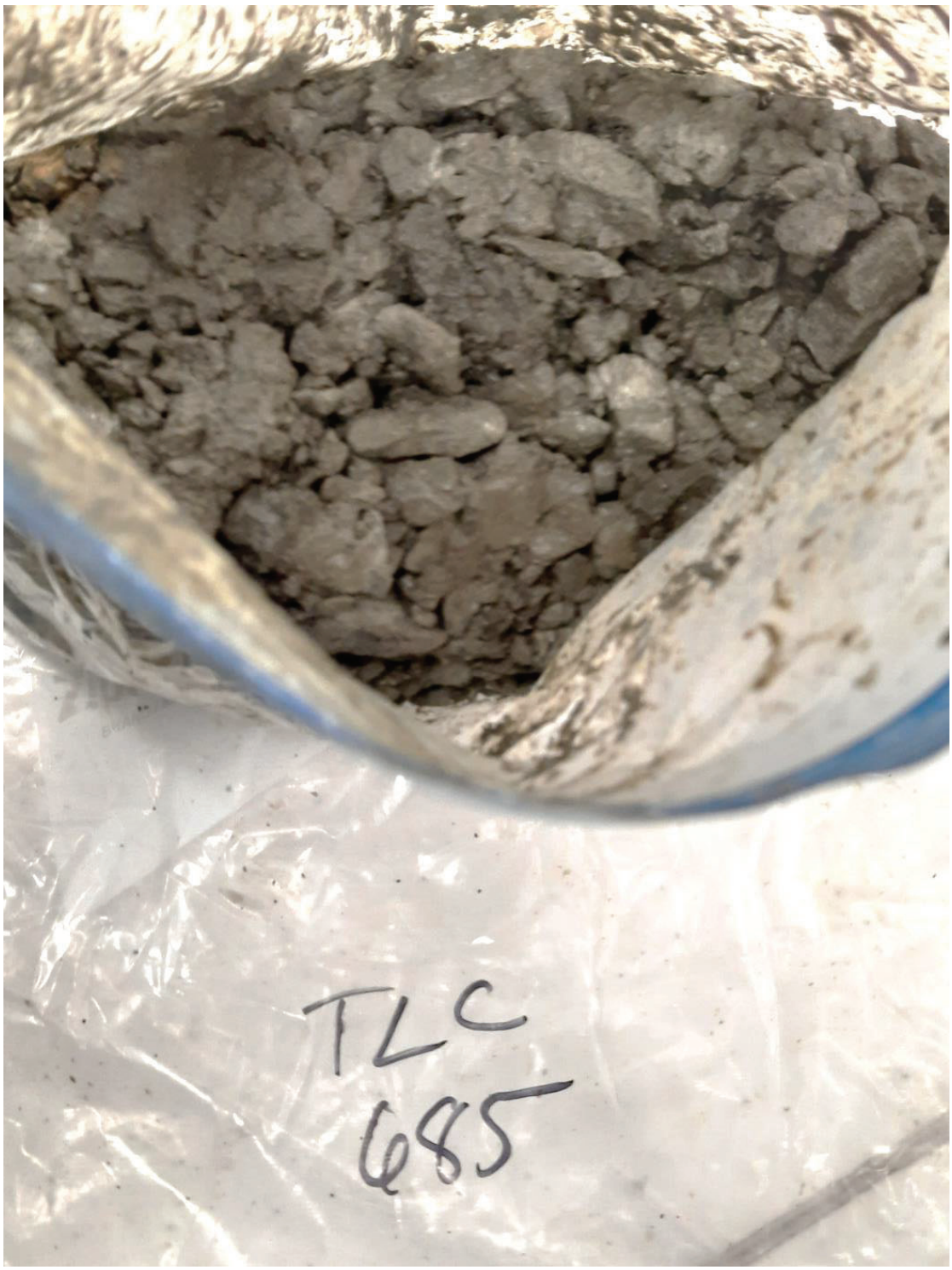


Figure A-37
Photograph of TLC sample bag 685 ft bgs

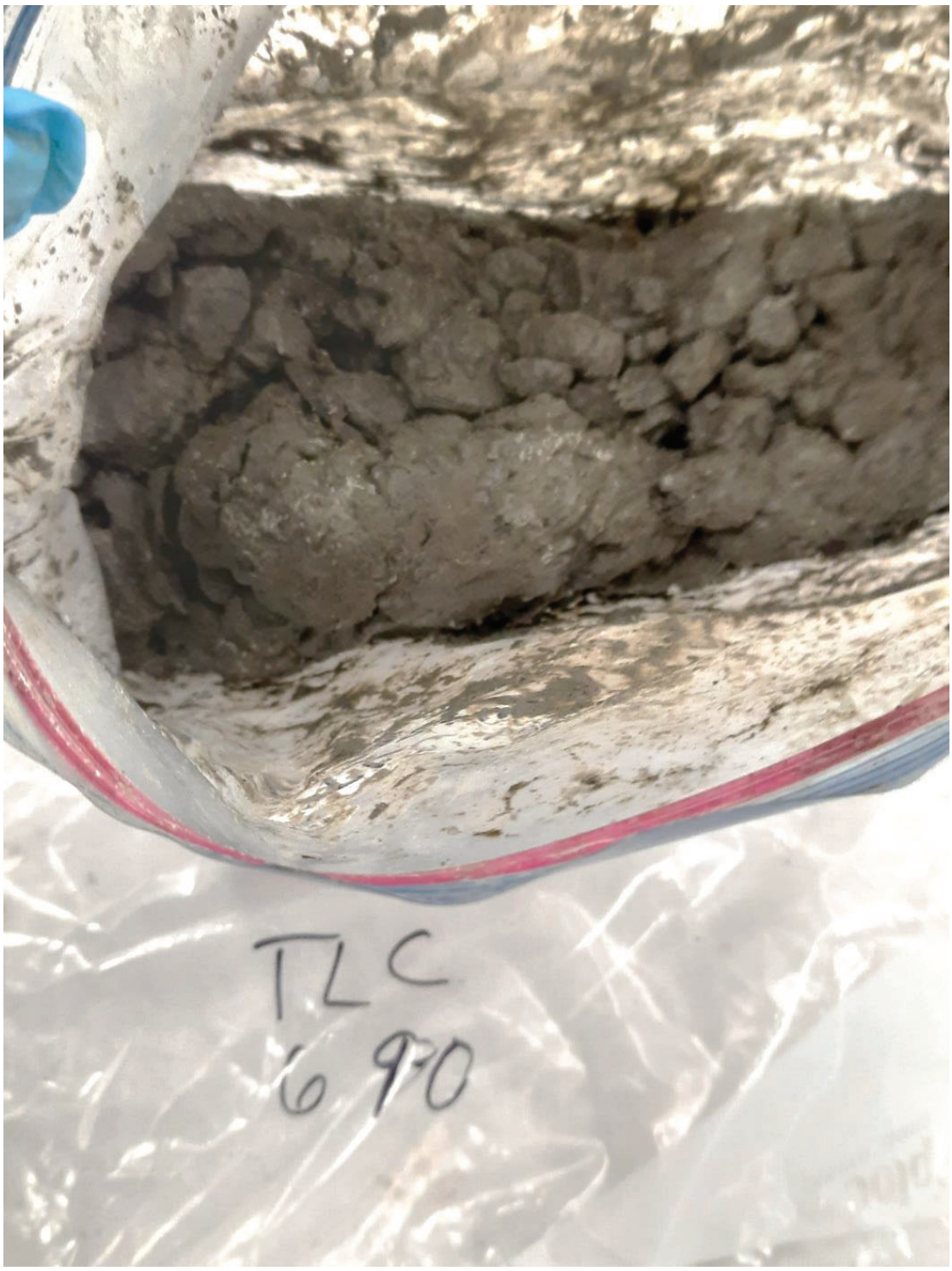


Figure A-38
Photograph of TLC sample bag 690 ft bgs



30X magnification. Sulfate minerals

Figure A-39
Microphotograph from TLC sample 690 ft

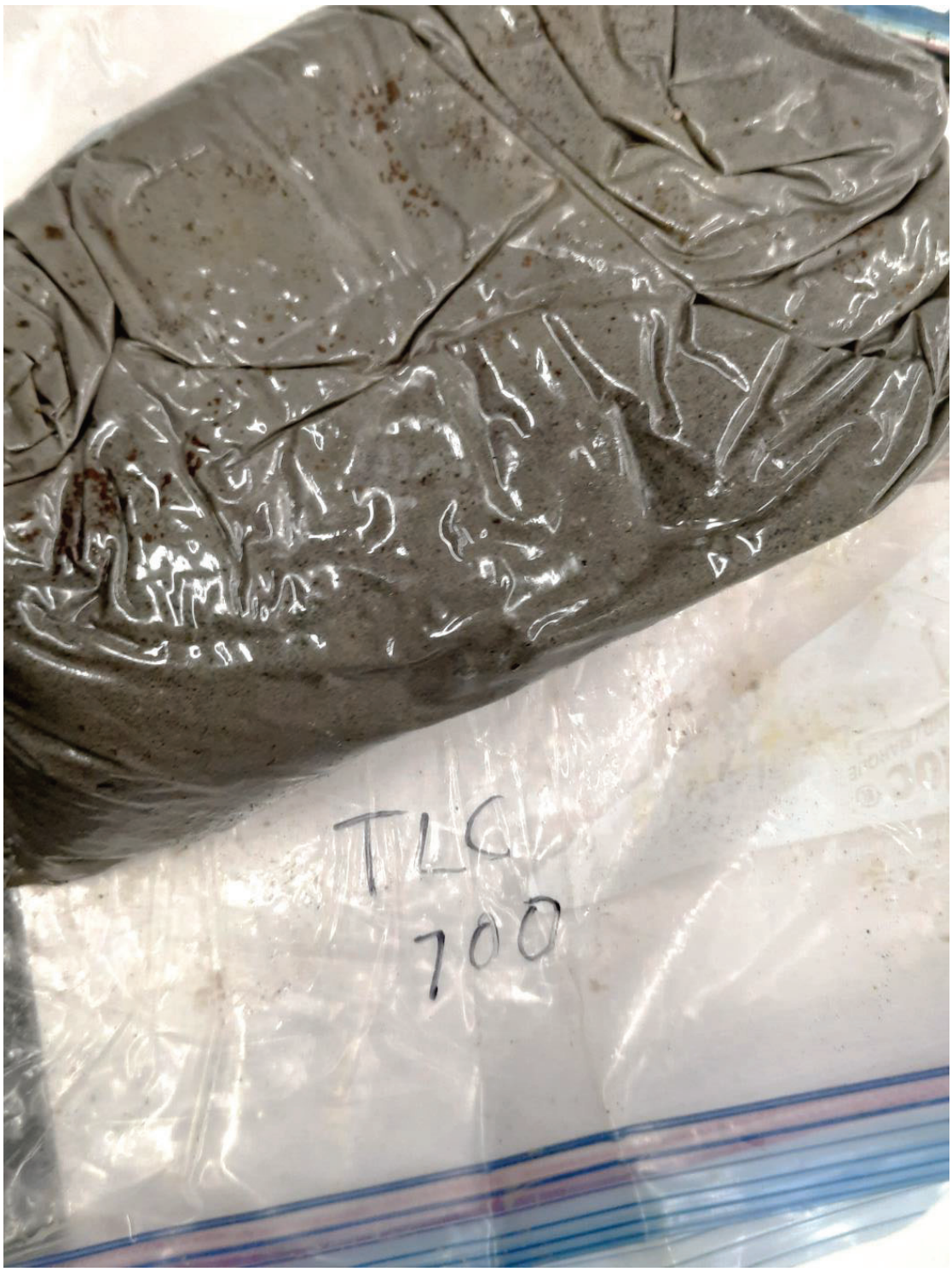


Figure A-40
Photograph of outside of TLC sample bag 700 ft bgs



30X magnification. Sulfide mineral circled.

Figure A-41
Microphotograph from TLC sample 700 ft



30X magnification. Sulfide minerals and sulfide minerals in sand grain circled.

Figure A-42
Microphotograph from TLC sample 700 ft

Brown AND Caldwell



Figure A-43
Photograph of TLC sample bag 705 ft bgs



30X magnification. Sulfide mineral circled.

Figure A-44
Microphotograph from TLC sample 705 ft

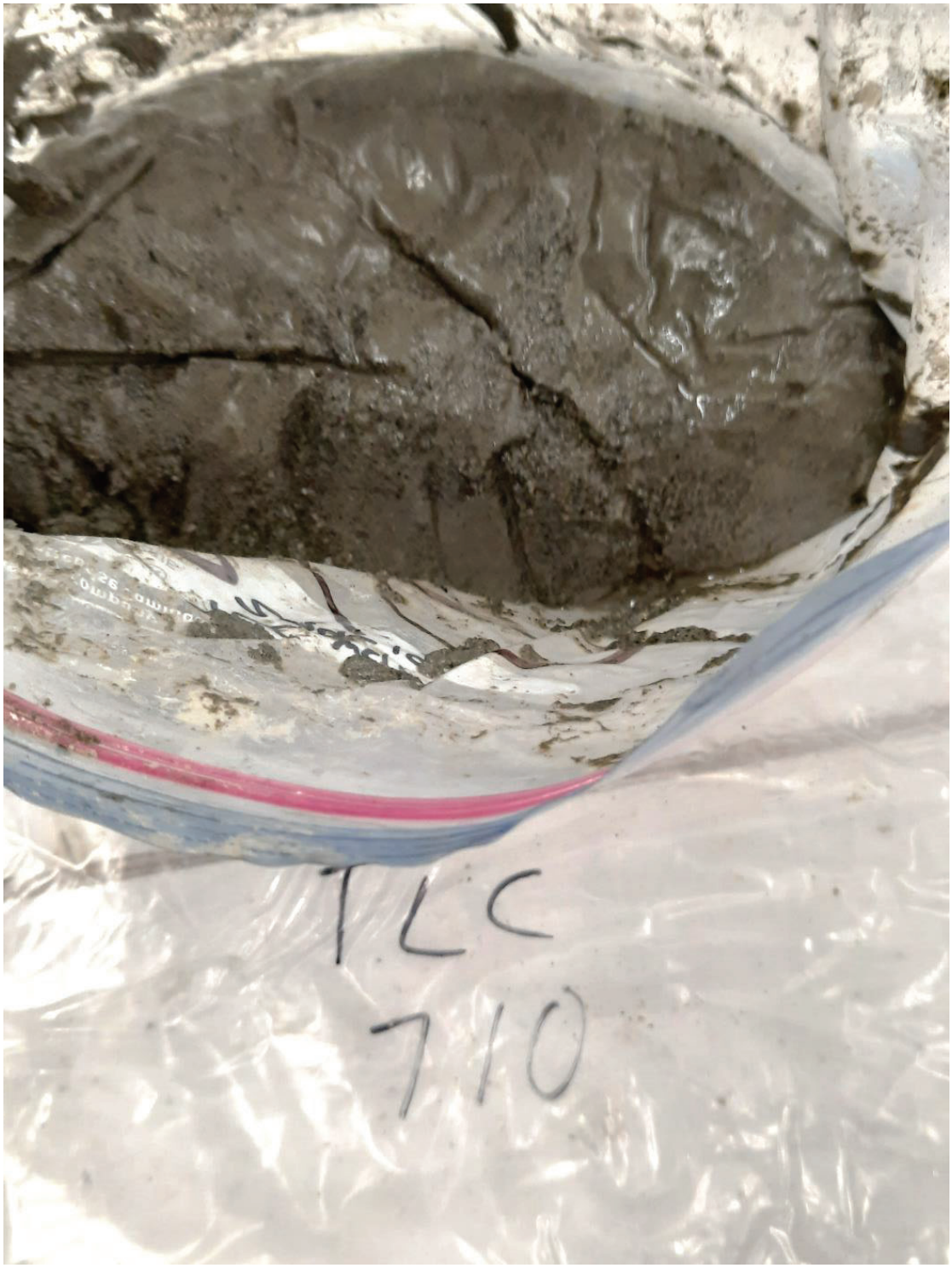
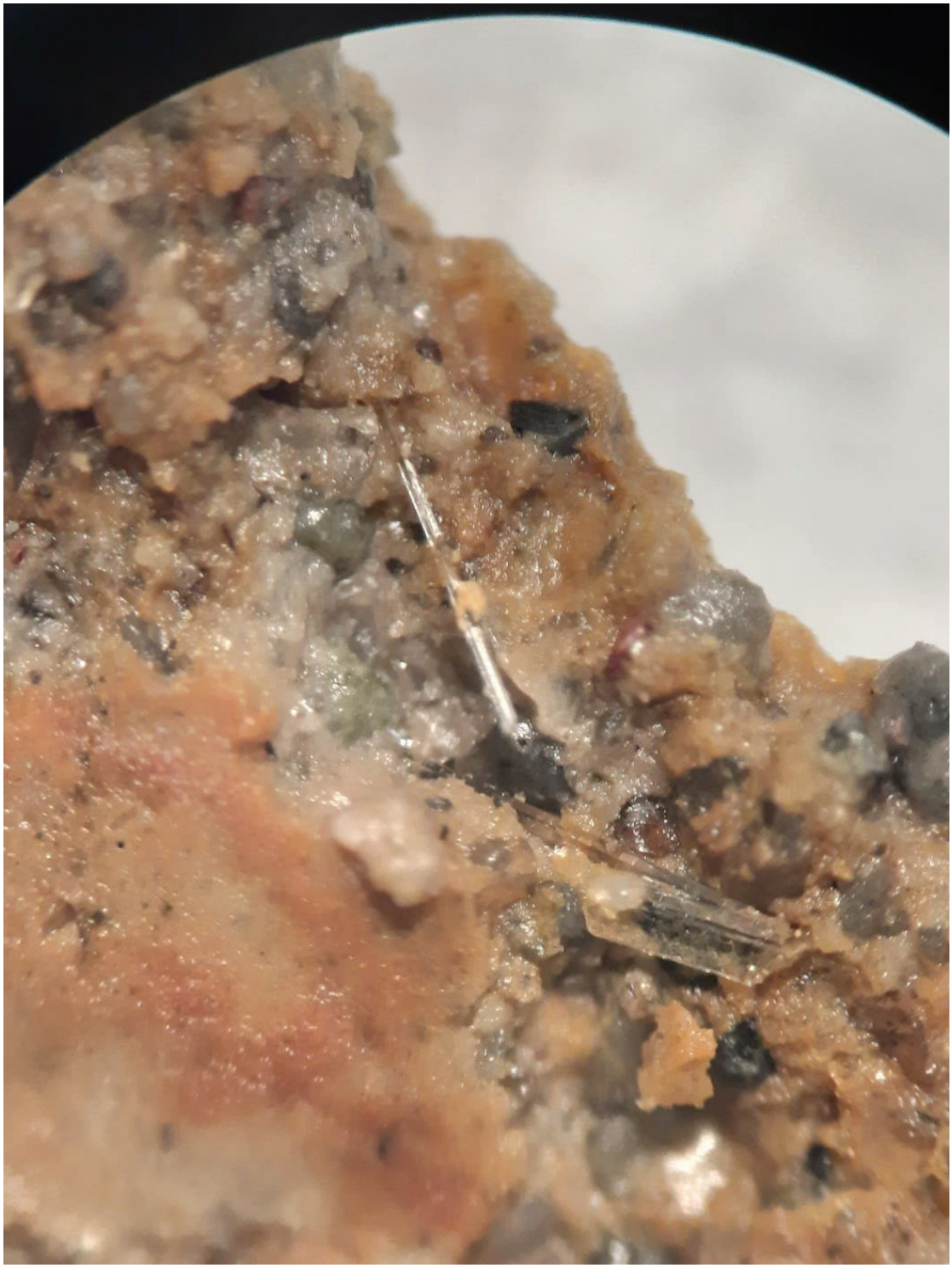


Figure A-45
Photograph of TLC sample bag 710 ft bgs



Figure A-46
Photograph of TLC sample bag 715 ft bgs



30X magnification. Sulfate minerals

Figure A-47
Microphotograph from TLC sample 710 ft



30X magnification. Sulfide mineral circled.

Figure A-48
Microphotograph from TLC sample 710 ft



Figure A-49
Photograph of TLC sample bag 720 ft bgs



30X magnification. Sulfide minerals circled.

Figure A-50
Microphotograph from TLC sample 720 ft



30X magnification. Sulfide mineral cement circled.

Figure A-51
Microphotograph from TLC sample 720 ft

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Appendix B: Lab Reports

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Final Phase_III_ Geochemical Testing_Final.docx

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Use of contents on this sheet is subject to the limitations specified at the end of this document.
Final Phase_III_ Geochemical Testing_Final.docx

Modified Synthetic Precipitation Leaching Producer

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

July 19, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L65898

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on May 18, 2021. This project has been assigned to ACZ's project number, L65898. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L65898. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 18, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

July 19, 2021

Project ID:
ACZ Project ID: L65898

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 15 miscellaneous samples from Brown and Caldwell on May 18, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L65898. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for the following -

1. Chloride (HD) - Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to analysis.

2. Mercury (H4) - Sample was extracted past required extraction holding time, but analyzed within analysis holding time.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. Various metals (B1) - Client requested extraction fluid used per special instructions: Use a 4:1 liquid to solid ratio. For sample IDs ending in SPLP, use standard solution. For IDs ending in SCVWD, use water labeled SCVWD. For MOW IDs, use MOW water. For OCWD IDs, use OCWD water. Analytes that are present in the prep blank (PBS) and biased high in the laboratory fortified blank (LFB) are attributable to the supplied water.

2. OCWD Modified Sites (N1) - The OCWD-MOD water was modified with sodium bisulfite. Analyst added 270g of Sodium Bisulfite and the lowest ORP reading obtained was around -65mV. Analyst added another 20g to lower it more and the reading ended up approximately -45mV.

3. Sulfate OCWD Modified Sites (B1) - Sodium Bisulfite added to samples prior to extraction per special instructions. This appears to have elevated the sulfate values as well.

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-OCWD

ACZ Sample ID: ***L65898-01***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 12:04	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/11/21 22:35	kja
Antimony (1312)	M6020B ICP-MS	1	0.00070	B	*	mg/L	0.0004	0.002	06/11/21 13:12	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00208		*	mg/L	0.0002	0.001	06/11/21 13:12	bsu
Barium (1312)	M6010D ICP	1	0.0179	B	*	mg/L	0.007	0.035	06/11/21 22:35	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:12	bsu
Boron (1312)	M6010D ICP	1	0.234		*	mg/L	0.03	0.1	06/11/21 22:35	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/11/21 13:12	bsu
Calcium (1312)	M6010D ICP	1	60.7		*	mg/L	0.1	0.5	06/11/21 22:35	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:12	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/11/21 22:35	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/11/21 22:35	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:12	bsu
Magnesium (1312)	M6010D ICP	1	8.28			mg/L	0.2	1	06/11/21 22:35	kja
Manganese (1312)	M6010D ICP	1	0.055		*	mg/L	0.01	0.05	06/11/21 22:35	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	07/02/21 16:08	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/11/21 22:35	kja
Nickel (1312)	M6010D ICP	1	0.0093	B	*	mg/L	0.008	0.04	06/11/21 22:35	kja
Potassium (1312)	M6010D ICP	1	4.74			mg/L	0.2	1	06/11/21 22:35	kja
Selenium (1312)	M6020B ICP-MS	1	0.00040		*	mg/L	0.0001	0.00025	06/11/21 13:12	bsu
Silica (1312)	M6010D ICP	1	15.8		*	mg/L	0.2	1	06/11/21 22:35	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:12	bsu
Sodium (1312)	M6010D ICP	1	61.2		*	mg/L	0.2	1	06/11/21 22:35	kja
Strontium (1312)	M6010D ICP	1	0.380			mg/L	0.009	0.045	06/11/21 22:35	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:12	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00180			mg/L	0.0001	0.0005	06/11/21 13:12	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/11/21 22:35	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	6.86		*	mg/L	0.5	2	06/21/21 17:42	syw
Fluoride (1312)	SM4500F-C	1	0.23	B	*	mg/L	0.15	0.35	06/10/21 12:01	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	248		*	mg/L	15	75	06/12/21 10:56	wtc

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-OCWD-MOD

ACZ Sample ID: ***L65898-02***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS				*				06/30/21 10:10	bsu
Total Hot Plate Digestion	M3010A ICP				*				06/29/21 13:35	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	2	29.4			mg/L	0.1	0.5	06/30/21 12:45	kja
Antimony (1312)	M6020B ICP-MS	5	<0.002	U	*	mg/L	0.002	0.01	07/01/21 17:52	bsu
Arsenic (1312)	M6020B ICP-MS	5	0.0666			mg/L	0.001	0.005	07/01/21 17:52	bsu
Barium (1312)	M6010D ICP	2	0.398		*	mg/L	0.014	0.07	06/30/21 12:45	kja
Beryllium (1312)	M6020B ICP-MS	10	0.00365		*	mg/L	0.0008	0.0025	07/02/21 11:49	bsu
Boron (1312)	M6010D ICP	2	0.255		*	mg/L	0.06	0.2	06/30/21 12:45	kja
Cadmium (1312)	M6020B ICP-MS	5	0.00873		*	mg/L	0.00025	0.00125	07/01/21 17:52	bsu
Calcium (1312)	M6010D ICP	2	907		*	mg/L	0.2	1	06/30/21 12:45	kja
Chromium (1312)	M6020B ICP-MS	5	0.0996		*	mg/L	0.0025	0.01	07/01/21 17:52	bsu
Copper (1312)	M6010D ICP	5	<0.05	U	*	mg/L	0.05	0.25	07/01/21 0:36	kja
Iron (1312)	M6010D ICP	2	206		*	mg/L	0.12	0.3	06/30/21 12:45	kja
Lead (1312)	M6020B ICP-MS	5	0.00376		*	mg/L	0.0005	0.0025	07/01/21 17:52	bsu
Magnesium (1312)	M6010D ICP	2	46.6			mg/L	0.4	2	06/30/21 12:45	kja
Manganese (1312)	M6010D ICP	2	10.3		*	mg/L	0.02	0.1	06/30/21 12:45	kja
Mercury (1312)	M7470A CVAA	100	<0.02	UH	*	mg/L	0.02	0.1	06/30/21 11:03	mlh
Molybdenum (1312)	M6010D ICP	2	<0.04	U	*	mg/L	0.04	0.2	06/30/21 12:45	kja
Nickel (1312)	M6010D ICP	5	0.511		*	mg/L	0.04	0.2	07/01/21 0:36	kja
Potassium (1312)	M6010D ICP	5	37.1		*	mg/L	1	5	07/01/21 0:36	kja
Selenium (1312)	M6020B ICP-MS	10	0.00820		*	mg/L	0.001	0.0025	07/02/21 11:49	bsu
Silica (1312)	M6010D ICP	2	66.3			mg/L	0.4	2	06/30/21 12:45	kja
Silver (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 17:52	bsu
Sodium (1312)	M6010D ICP	50	14600		*	mg/L	10	50	07/01/21 17:24	kja
Strontium (1312)	M6010D ICP	2	3.22		*	mg/L	0.018	0.09	06/30/21 12:45	kja
Thallium (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 17:52	bsu
Uranium (1312)	M6020B ICP-MS	5	0.0225			mg/L	0.0005	0.0025	07/01/21 17:52	bsu
Zinc (1312)	M6010D ICP	2	0.469		*	mg/L	0.04	0.1	06/30/21 12:45	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)				*				06/24/21 15:30	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	50	<25	U	*	mg/L	25	100	07/15/21 10:04	wtc
Fluoride (1312)	SM4500F-C	40	6.97	B	*	mg/L	6	14	07/14/21 11:48	eep
Sulfate (1312)	D516-07 - Turbidimetric	800	31000		*	mg/L	800	4000	07/13/21 14:59	wtc

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-MOW

ACZ Sample ID: ***L65898-03***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 15:29	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/12/21 0:01	kja
Antimony (1312)	M6020B ICP-MS	1	0.00081	B	*	mg/L	0.0004	0.002	06/11/21 13:36	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00235		*	mg/L	0.0002	0.001	06/11/21 13:36	bsu
Barium (1312)	M6010D ICP	1	0.0195	B	*	mg/L	0.007	0.035	06/12/21 0:01	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:36	bsu
Boron (1312)	M6010D ICP	1	0.291		*	mg/L	0.03	0.1	06/12/21 0:01	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/11/21 13:36	bsu
Calcium (1312)	M6010D ICP	1	59.3		*	mg/L	0.1	0.5	06/12/21 0:01	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:36	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/12/21 0:01	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/12/21 0:01	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:36	bsu
Magnesium (1312)	M6010D ICP	1	8.58		*	mg/L	0.2	1	06/12/21 0:01	kja
Manganese (1312)	M6010D ICP	1	0.053		*	mg/L	0.01	0.05	06/12/21 0:01	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 10:46	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/12/21 0:01	kja
Nickel (1312)	M6010D ICP	1	0.0102	B	*	mg/L	0.008	0.04	06/12/21 0:01	kja
Potassium (1312)	M6010D ICP	1	5.82		*	mg/L	0.2	1	06/12/21 0:01	kja
Selenium (1312)	M6020B ICP-MS	1	0.00042		*	mg/L	0.0001	0.00025	06/11/21 13:36	bsu
Silica (1312)	M6010D ICP	1	14.4		*	mg/L	0.2	1	06/12/21 0:01	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:36	bsu
Sodium (1312)	M6010D ICP	1	76.7		*	mg/L	0.2	1	06/12/21 0:01	kja
Strontium (1312)	M6010D ICP	1	0.436		*	mg/L	0.009	0.045	06/12/21 0:01	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:36	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00188			mg/L	0.0001	0.0005	06/11/21 13:36	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/12/21 0:01	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	45.5		*	mg/L	0.5	2	06/21/21 17:43	syw
Fluoride (1312)	SM4500F-C	1	0.20	B	*	mg/L	0.15	0.35	06/10/21 12:48	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	224		*	mg/L	15	75	06/12/21 10:58	wtc

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-TIC

ACZ Sample ID: ***L65898-04***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/14/21 12:20	mfm
Total Hot Plate Digestion	M3010A ICP								06/13/21 12:04	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/14/21 22:46	kja
Antimony (1312)	M6020B ICP-MS	1	0.00063	B	*	mg/L	0.0004	0.002	06/15/21 14:09	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00144		*	mg/L	0.0002	0.001	06/15/21 14:09	bsu
Barium (1312)	M6010D ICP	1	0.0299	B	*	mg/L	0.007	0.035	06/14/21 22:46	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/15/21 14:09	bsu
Boron (1312)	M6010D ICP	1	0.514		*	mg/L	0.03	0.1	06/14/21 22:46	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/15/21 14:09	bsu
Calcium (1312)	M6010D ICP	1	91.9		*	mg/L	0.1	0.5	06/14/21 22:46	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/15/21 14:09	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/14/21 22:46	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/14/21 22:46	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:09	bsu
Magnesium (1312)	M6010D ICP	1	11.6			mg/L	0.2	1	06/14/21 22:46	kja
Manganese (1312)	M6010D ICP	1	0.080		*	mg/L	0.01	0.05	06/14/21 22:46	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 10:55	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/14/21 22:46	kja
Nickel (1312)	M6010D ICP	1	<0.008	U	*	mg/L	0.008	0.04	06/14/21 22:46	kja
Potassium (1312)	M6010D ICP	1	7.54		*	mg/L	0.2	1	06/14/21 22:46	kja
Selenium (1312)	M6020B ICP-MS	1	0.00047		*	mg/L	0.0001	0.00025	06/15/21 14:09	bsu
Silica (1312)	M6010D ICP	1	14.2		*	mg/L	0.2	1	06/14/21 22:46	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:09	bsu
Sodium (1312)	M6010D ICP	1	107		*	mg/L	0.2	1	06/14/21 22:46	kja
Strontium (1312)	M6010D ICP	1	0.754		*	mg/L	0.009	0.045	06/14/21 22:46	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:09	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00223			mg/L	0.0001	0.0005	06/15/21 14:09	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/14/21 22:46	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/10/21 15:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	10	115		*	mg/L	5	20	06/21/21 17:55	syw
Fluoride (1312)	SM4500F-C	1	0.21	B	*	mg/L	0.15	0.35	06/17/21 12:48	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	263		*	mg/L	15	75	06/12/21 10:56	wtc

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-ARC

ACZ Sample ID: ***L65898-05***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/21/21 9:55	bsu
Total Hot Plate Digestion	M3010A ICP								06/17/21 11:36	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/18/21 9:17	jlw
Antimony (1312)	M6020B ICP-MS	1	0.00075	B	*	mg/L	0.0004	0.002	06/22/21 15:48	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00158		*	mg/L	0.0002	0.001	06/22/21 15:48	bsu
Barium (1312)	M6010D ICP	1	0.0280	B	*	mg/L	0.007	0.035	06/18/21 9:17	jlw
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/22/21 15:48	bsu
Boron (1312)	M6010D ICP	1	0.249		*	mg/L	0.03	0.1	06/18/21 9:17	jlw
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/22/21 15:48	bsu
Calcium (1312)	M6010D ICP	1	88.6		*	mg/L	0.1	0.5	06/18/21 9:17	jlw
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/22/21 15:48	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/18/21 9:17	jlw
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/18/21 9:17	jlw
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:48	bsu
Magnesium (1312)	M6010D ICP	1	11.3		*	mg/L	0.2	1	06/18/21 9:17	jlw
Manganese (1312)	M6010D ICP	1	0.086		*	mg/L	0.01	0.05	06/18/21 9:17	jlw
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 11:12	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/18/21 9:17	jlw
Nickel (1312)	M6010D ICP	1	<0.008	U	*	mg/L	0.008	0.04	06/18/21 9:17	jlw
Potassium (1312)	M6010D ICP	1	6.33		*	mg/L	0.2	1	06/18/21 9:17	jlw
Selenium (1312)	M6020B ICP-MS	1	0.00040		*	mg/L	0.0001	0.00025	06/22/21 15:48	bsu
Silica (1312)	M6010D ICP	1	14.8			mg/L	0.2	1	06/18/21 9:17	jlw
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:48	bsu
Sodium (1312)	M6010D ICP	1	82.7		*	mg/L	0.2	1	06/18/21 9:17	jlw
Strontium (1312)	M6010D ICP	1	0.622		*	mg/L	0.009	0.045	06/18/21 9:17	jlw
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:48	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00252			mg/L	0.0001	0.0005	06/22/21 15:48	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/18/21 9:17	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/14/21 15:40	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	60.9		*	mg/L	0.5	2	06/21/21 17:45	syw
Fluoride (1312)	SM4500F-C	1	0.17	B	*	mg/L	0.15	0.35	06/17/21 13:26	eep
Sulfate (1312)	D516-07 - Turbidimetric	25	327		*	mg/L	25	125	06/18/21 14:03	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-OCWD

ACZ Sample ID: ***L65898-06***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 14:33	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/11/21 22:46	kja
Antimony (1312)	M6020B ICP-MS	1	<0.0004	U	*	mg/L	0.0004	0.002	06/11/21 13:16	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00166		*	mg/L	0.0002	0.001	06/11/21 13:16	bsu
Barium (1312)	M6010D ICP	1	0.0220	B	*	mg/L	0.007	0.035	06/11/21 22:46	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:16	bsu
Boron (1312)	M6010D ICP	1	0.222		*	mg/L	0.03	0.1	06/11/21 22:46	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/11/21 13:16	bsu
Calcium (1312)	M6010D ICP	1	53.9		*	mg/L	0.1	0.5	06/11/21 22:46	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:16	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/11/21 22:46	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/11/21 22:46	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:16	bsu
Magnesium (1312)	M6010D ICP	1	7.82			mg/L	0.2	1	06/11/21 22:46	kja
Manganese (1312)	M6010D ICP	1	0.061		*	mg/L	0.01	0.05	06/11/21 22:46	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	07/02/21 16:11	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/11/21 22:46	kja
Nickel (1312)	M6010D ICP	1	0.0123	B	*	mg/L	0.008	0.04	06/11/21 22:46	kja
Potassium (1312)	M6010D ICP	1	5.07			mg/L	0.2	1	06/11/21 22:46	kja
Selenium (1312)	M6020B ICP-MS	1	0.00023	B	*	mg/L	0.0001	0.00025	06/11/21 13:16	bsu
Silica (1312)	M6010D ICP	1	16.7		*	mg/L	0.2	1	06/11/21 22:46	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:16	bsu
Sodium (1312)	M6010D ICP	1	48.1		*	mg/L	0.2	1	06/11/21 22:46	kja
Strontium (1312)	M6010D ICP	1	0.294			mg/L	0.009	0.045	06/11/21 22:46	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:16	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00144			mg/L	0.0001	0.0005	06/11/21 13:16	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/11/21 22:46	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	6.85		*	mg/L	0.5	2	06/21/21 17:42	syw
Fluoride (1312)	SM4500F-C	1	0.21	B	*	mg/L	0.15	0.35	06/10/21 12:09	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	201		*	mg/L	15	75	06/12/21 10:56	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-OCWD-MOD

ACZ Sample ID: ***L65898-07***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS				*				06/30/21 11:23	bsu
Total Hot Plate Digestion	M3010A ICP								06/29/21 16:03	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	37.4			mg/L	0.05	0.25	06/30/21 12:57	kja
Antimony (1312)	M6020B ICP-MS	5	<0.002	U	*	mg/L	0.002	0.01	07/01/21 17:56	bsu
Arsenic (1312)	M6020B ICP-MS	5	0.0428			mg/L	0.001	0.005	07/01/21 17:56	bsu
Barium (1312)	M6010D ICP	1	0.303		*	mg/L	0.007	0.035	06/30/21 12:57	kja
Beryllium (1312)	M6020B ICP-MS	10	0.00344		*	mg/L	0.0008	0.0025	07/02/21 11:53	bsu
Boron (1312)	M6010D ICP	1	0.191		*	mg/L	0.03	0.1	06/30/21 12:57	kja
Cadmium (1312)	M6020B ICP-MS	5	0.00648		*	mg/L	0.00025	0.00125	07/01/21 17:56	bsu
Calcium (1312)	M6010D ICP	50	1410		*	mg/L	5	25	07/01/21 17:36	kja
Chromium (1312)	M6020B ICP-MS	5	0.0946		*	mg/L	0.0025	0.01	07/01/21 17:56	bsu
Copper (1312)	M6010D ICP	50	0.560	B	*	mg/L	0.5	2.5	07/01/21 17:36	kja
Iron (1312)	M6010D ICP	1	191		*	mg/L	0.06	0.15	06/30/21 12:57	kja
Lead (1312)	M6020B ICP-MS	5	0.00489		*	mg/L	0.0005	0.0025	07/01/21 17:56	bsu
Magnesium (1312)	M6010D ICP	1	34.3			mg/L	0.2	1	06/30/21 12:57	kja
Manganese (1312)	M6010D ICP	1	6.35		*	mg/L	0.01	0.05	06/30/21 12:57	kja
Mercury (1312)	M7470A CVAA	100	<0.02	UH	*	mg/L	0.02	0.1	06/30/21 11:07	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/30/21 12:57	kja
Nickel (1312)	M6010D ICP	50	0.650	B	*	mg/L	0.4	2	07/01/21 17:36	kja
Potassium (1312)	M6010D ICP	50	56.0		*	mg/L	10	50	07/01/21 17:36	kja
Selenium (1312)	M6020B ICP-MS	10	0.00594		*	mg/L	0.001	0.0025	07/02/21 11:53	bsu
Silica (1312)	M6010D ICP	1	66.6			mg/L	0.2	1	06/30/21 12:57	kja
Silver (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 17:56	bsu
Sodium (1312)	M6010D ICP	100	15000		*	mg/L	20	100	07/02/21 18:38	jlw
Strontium (1312)	M6010D ICP	1	1.99		*	mg/L	0.009	0.045	06/30/21 12:57	kja
Thallium (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 17:56	bsu
Uranium (1312)	M6020B ICP-MS	5	0.0176			mg/L	0.0005	0.0025	07/01/21 17:56	bsu
Zinc (1312)	M6010D ICP	1	0.263		*	mg/L	0.02	0.05	06/30/21 12:57	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)				*				06/24/21 15:30	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	50	<25	U	*	mg/L	25	100	07/15/21 10:04	wtc
Fluoride (1312)	SM4500F-C	50	<7.5	U	*	mg/L	7.5	17.5	07/14/21 12:05	eep
Sulfate (1312)	D516-07 - Turbidimetric	800	23600		*	mg/L	800	4000	07/13/21 15:11	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-MOW

ACZ Sample ID: ***L65898-08***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 15:50	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/12/21 0:13	kja
Antimony (1312)	M6020B ICP-MS	1	<0.0004	U	*	mg/L	0.0004	0.002	06/11/21 13:38	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00149		*	mg/L	0.0002	0.001	06/11/21 13:38	bsu
Barium (1312)	M6010D ICP	1	0.0241	B	*	mg/L	0.007	0.035	06/12/21 0:13	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:38	bsu
Boron (1312)	M6010D ICP	1	0.283		*	mg/L	0.03	0.1	06/12/21 0:13	kja
Cadmium (1312)	M6020B ICP-MS	1	0.000063	B	*	mg/L	0.00005	0.00025	06/11/21 13:38	bsu
Calcium (1312)	M6010D ICP	1	58.2		*	mg/L	0.1	0.5	06/12/21 0:13	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:38	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/12/21 0:13	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/12/21 0:13	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:38	bsu
Magnesium (1312)	M6010D ICP	1	8.41		*	mg/L	0.2	1	06/12/21 0:13	kja
Manganese (1312)	M6010D ICP	1	0.058		*	mg/L	0.01	0.05	06/12/21 0:13	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 10:48	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/12/21 0:13	kja
Nickel (1312)	M6010D ICP	1	<0.008	U	*	mg/L	0.008	0.04	06/12/21 0:13	kja
Potassium (1312)	M6010D ICP	1	6.48		*	mg/L	0.2	1	06/12/21 0:13	kja
Selenium (1312)	M6020B ICP-MS	1	0.00022	B	*	mg/L	0.0001	0.00025	06/11/21 13:38	bsu
Silica (1312)	M6010D ICP	1	14.7		*	mg/L	0.2	1	06/12/21 0:13	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:38	bsu
Sodium (1312)	M6010D ICP	1	59.9		*	mg/L	0.2	1	06/12/21 0:13	kja
Strontium (1312)	M6010D ICP	1	0.380		*	mg/L	0.009	0.045	06/12/21 0:13	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:38	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00140			mg/L	0.0001	0.0005	06/11/21 13:38	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/12/21 0:13	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	45.4		*	mg/L	0.5	2	06/21/21 17:43	syw
Fluoride (1312)	SM4500F-C	1	0.20	B	*	mg/L	0.15	0.35	06/10/21 12:51	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	252		*	mg/L	15	75	06/12/21 10:58	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-TIC

ACZ Sample ID: ***L65898-09***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/14/21 12:20	mfm
Total Hot Plate Digestion	M3010A ICP								06/13/21 14:31	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/14/21 22:57	kja
Antimony (1312)	M6020B ICP-MS	1	<0.0004	U	*	mg/L	0.0004	0.002	06/15/21 14:13	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00093	B	*	mg/L	0.0002	0.001	06/15/21 14:13	bsu
Barium (1312)	M6010D ICP	1	0.0354		*	mg/L	0.007	0.035	06/14/21 22:57	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/15/21 14:13	bsu
Boron (1312)	M6010D ICP	1	0.501		*	mg/L	0.03	0.1	06/14/21 22:57	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/15/21 14:13	bsu
Calcium (1312)	M6010D ICP	1	94.5		*	mg/L	0.1	0.5	06/14/21 22:57	kja
Chromium (1312)	M6020B ICP-MS	1	0.00079	B	*	mg/L	0.0005	0.002	06/15/21 14:13	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/14/21 22:57	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/14/21 22:57	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:13	bsu
Magnesium (1312)	M6010D ICP	1	11.5			mg/L	0.2	1	06/14/21 22:57	kja
Manganese (1312)	M6010D ICP	1	0.090		*	mg/L	0.01	0.05	06/14/21 22:57	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 10:58	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/14/21 22:57	kja
Nickel (1312)	M6010D ICP	1	<0.008	U	*	mg/L	0.008	0.04	06/14/21 22:57	kja
Potassium (1312)	M6010D ICP	1	8.22		*	mg/L	0.2	1	06/14/21 22:57	kja
Selenium (1312)	M6020B ICP-MS	1	0.00032		*	mg/L	0.0001	0.00025	06/15/21 14:13	bsu
Silica (1312)	M6010D ICP	1	14.9		*	mg/L	0.2	1	06/14/21 22:57	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:13	bsu
Sodium (1312)	M6010D ICP	1	91.6		*	mg/L	0.2	1	06/14/21 22:57	kja
Strontium (1312)	M6010D ICP	1	0.697		*	mg/L	0.009	0.045	06/14/21 22:57	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:13	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00163			mg/L	0.0001	0.0005	06/15/21 14:13	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/14/21 22:57	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/10/21 15:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	10	120		*	mg/L	5	20	06/21/21 17:55	syw
Fluoride (1312)	SM4500F-C	1	0.19	B	*	mg/L	0.15	0.35	06/17/21 12:56	eep
Sulfate (1312)	D516-07 - Turbidimetric	15	246		*	mg/L	15	75	06/12/21 10:56	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-ARC

ACZ Sample ID: ***L65898-10***
Date Sampled: *05/03/21 00:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/21/21 10:37	bsu
Total Hot Plate Digestion	M3010A ICP								06/17/21 14:29	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/18/21 9:28	jlw
Antimony (1312)	M6020B ICP-MS	1	<0.0004	U	*	mg/L	0.0004	0.002	06/22/21 15:52	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00113		*	mg/L	0.0002	0.001	06/22/21 15:52	bsu
Barium (1312)	M6010D ICP	1	0.0315	B	*	mg/L	0.007	0.035	06/18/21 9:28	jlw
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/22/21 15:52	bsu
Boron (1312)	M6010D ICP	1	0.242		*	mg/L	0.03	0.1	06/18/21 9:28	jlw
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/22/21 15:52	bsu
Calcium (1312)	M6010D ICP	1	79.4		*	mg/L	0.1	0.5	06/18/21 9:28	jlw
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/22/21 15:52	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/18/21 9:28	jlw
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/18/21 9:28	jlw
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:52	bsu
Magnesium (1312)	M6010D ICP	1	11.0		*	mg/L	0.2	1	06/18/21 9:28	jlw
Manganese (1312)	M6010D ICP	1	0.082		*	mg/L	0.01	0.05	06/18/21 9:28	jlw
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 11:15	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/18/21 9:28	jlw
Nickel (1312)	M6010D ICP	1	0.0093	B	*	mg/L	0.008	0.04	06/18/21 9:28	jlw
Potassium (1312)	M6010D ICP	1	6.68		*	mg/L	0.2	1	06/18/21 9:28	jlw
Selenium (1312)	M6020B ICP-MS	1	0.00022	B	*	mg/L	0.0001	0.00025	06/22/21 15:52	bsu
Silica (1312)	M6010D ICP	1	16.4			mg/L	0.2	1	06/18/21 9:28	jlw
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:52	bsu
Sodium (1312)	M6010D ICP	1	66.2		*	mg/L	0.2	1	06/18/21 9:28	jlw
Strontium (1312)	M6010D ICP	1	0.493		*	mg/L	0.009	0.045	06/18/21 9:28	jlw
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 15:52	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00165			mg/L	0.0001	0.0005	06/22/21 15:52	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/18/21 9:28	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/14/21 15:40	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	65.5		*	mg/L	0.5	2	06/21/21 17:45	syw
Fluoride (1312)	SM4500F-C	1	0.17	B	*	mg/L	0.15	0.35	06/17/21 13:34	eep
Sulfate (1312)	D516-07 - Turbidimetric	20	271		*	mg/L	20	100	06/18/21 14:03	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-OCWD

ACZ Sample ID: ***L65898-11***
Date Sampled: *03/23/21 15:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 16:13	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/11/21 22:54	kja
Antimony (1312)	M6020B ICP-MS	1	0.00118	B	*	mg/L	0.0004	0.002	06/11/21 13:19	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00241		*	mg/L	0.0002	0.001	06/11/21 13:19	bsu
Barium (1312)	M6010D ICP	1	0.0442		*	mg/L	0.007	0.035	06/11/21 22:54	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:19	bsu
Boron (1312)	M6010D ICP	1	0.258		*	mg/L	0.03	0.1	06/11/21 22:54	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/11/21 13:19	bsu
Calcium (1312)	M6010D ICP	1	141		*	mg/L	0.1	0.5	06/11/21 22:54	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:19	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/11/21 22:54	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/11/21 22:54	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:19	bsu
Magnesium (1312)	M6010D ICP	1	14.5			mg/L	0.2	1	06/11/21 22:54	kja
Manganese (1312)	M6010D ICP	1	0.103		*	mg/L	0.01	0.05	06/11/21 22:54	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	07/02/21 16:13	mlh
Molybdenum (1312)	M6010D ICP	1	0.028	B	*	mg/L	0.02	0.1	06/11/21 22:54	kja
Nickel (1312)	M6010D ICP	1	0.0183	B	*	mg/L	0.008	0.04	06/11/21 22:54	kja
Potassium (1312)	M6010D ICP	1	8.57			mg/L	0.2	1	06/11/21 22:54	kja
Selenium (1312)	M6020B ICP-MS	1	0.00070		*	mg/L	0.0001	0.00025	06/11/21 13:19	bsu
Silica (1312)	M6010D ICP	1	19.4		*	mg/L	0.2	1	06/11/21 22:54	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:19	bsu
Sodium (1312)	M6010D ICP	1	33.4		*	mg/L	0.2	1	06/11/21 22:54	kja
Strontium (1312)	M6010D ICP	1	0.629			mg/L	0.009	0.045	06/11/21 22:54	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:19	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00321			mg/L	0.0001	0.0005	06/11/21 13:19	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/11/21 22:54	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	9.55		*	mg/L	0.5	2	06/21/21 17:42	syw
Fluoride (1312)	SM4500F-C	1	0.28	B	*	mg/L	0.15	0.35	06/10/21 12:32	eep
Sulfate (1312)	D516-07 - Turbidimetric	20	400		*	mg/L	20	100	06/12/21 10:58	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-OCWD-MOD

ACZ Sample ID: ***L65898-12***
Date Sampled: *03/23/21 15:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS				*				06/30/21 13:49	bsu
Total Hot Plate Digestion	M3010A ICP								06/29/21 17:41	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	2.81			mg/L	0.05	0.25	06/30/21 13:05	kja
Antimony (1312)	M6020B ICP-MS	5	0.00248	B	*	mg/L	0.002	0.01	07/01/21 18:00	bsu
Arsenic (1312)	M6020B ICP-MS	5	0.0873			mg/L	0.001	0.005	07/01/21 18:00	bsu
Barium (1312)	M6010D ICP	1	0.210		*	mg/L	0.007	0.035	06/30/21 13:05	kja
Beryllium (1312)	M6020B ICP-MS	10	<0.0008	U	*	mg/L	0.0008	0.0025	07/02/21 11:56	bsu
Boron (1312)	M6010D ICP	1	0.297		*	mg/L	0.03	0.1	06/30/21 13:05	kja
Cadmium (1312)	M6020B ICP-MS	5	<0.00025	U	*	mg/L	0.00025	0.00125	07/01/21 18:00	bsu
Calcium (1312)	M6010D ICP	1	184		*	mg/L	0.1	0.5	06/30/21 13:05	kja
Chromium (1312)	M6020B ICP-MS	5	0.00934	B	*	mg/L	0.0025	0.01	07/01/21 18:00	bsu
Copper (1312)	M6010D ICP	25	0.255	B	*	mg/L	0.25	1.25	07/01/21 17:44	kja
Iron (1312)	M6010D ICP	1	66.9		*	mg/L	0.06	0.15	06/30/21 13:05	kja
Lead (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 18:00	bsu
Magnesium (1312)	M6010D ICP	1	42.3			mg/L	0.2	1	06/30/21 13:05	kja
Manganese (1312)	M6010D ICP	1	14.2		*	mg/L	0.01	0.05	06/30/21 13:05	kja
Mercury (1312)	M7470A CVAA	100	<0.02	UH	*	mg/L	0.02	0.1	06/30/21 11:09	mlh
Molybdenum (1312)	M6010D ICP	1	0.047	B	*	mg/L	0.02	0.1	06/30/21 13:05	kja
Nickel (1312)	M6010D ICP	25	0.283	B	*	mg/L	0.2	1	07/01/21 17:44	kja
Potassium (1312)	M6010D ICP	25	34.6		*	mg/L	5	25	07/01/21 17:44	kja
Selenium (1312)	M6020B ICP-MS	10	0.00843		*	mg/L	0.001	0.0025	07/02/21 11:56	bsu
Silica (1312)	M6010D ICP	1	49.7			mg/L	0.2	1	06/30/21 13:05	kja
Silver (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 18:00	bsu
Sodium (1312)	M6010D ICP	25	12400		*	mg/L	5	25	07/01/21 17:44	kja
Strontium (1312)	M6010D ICP	1	0.705		*	mg/L	0.009	0.045	06/30/21 13:05	kja
Thallium (1312)	M6020B ICP-MS	5	<0.0005	U	*	mg/L	0.0005	0.0025	07/01/21 18:00	bsu
Uranium (1312)	M6020B ICP-MS	5	<0.0005	U		mg/L	0.0005	0.0025	07/01/21 18:00	bsu
Zinc (1312)	M6010D ICP	1	0.023	B	*	mg/L	0.02	0.05	06/30/21 13:05	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)				*				06/24/21 15:30	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	50	<25	U	*	mg/L	25	100	07/15/21 10:05	wtc
Fluoride (1312)	SM4500F-C	2	0.42	B	*	mg/L	0.3	0.7	07/14/21 12:47	eep
Sulfate (1312)	D516-07 - Turbidimetric	800	17100		*	mg/L	800	4000	07/13/21 15:00	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-MOW

ACZ Sample ID: ***L65898-13***
Date Sampled: *03/23/21 15:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/10/21 8:40	mfm
Total Hot Plate Digestion	M3010A ICP								06/10/21 16:05	jlw

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/12/21 0:21	kja
Antimony (1312)	M6020B ICP-MS	1	0.00106	B	*	mg/L	0.0004	0.002	06/11/21 13:41	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00178		*	mg/L	0.0002	0.001	06/11/21 13:41	bsu
Barium (1312)	M6010D ICP	1	0.0467		*	mg/L	0.007	0.035	06/12/21 0:21	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/11/21 13:41	bsu
Boron (1312)	M6010D ICP	1	0.307		*	mg/L	0.03	0.1	06/12/21 0:21	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/11/21 13:41	bsu
Calcium (1312)	M6010D ICP	1	182		*	mg/L	0.1	0.5	06/12/21 0:21	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/11/21 13:41	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/12/21 0:21	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/12/21 0:21	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:41	bsu
Magnesium (1312)	M6010D ICP	1	17.1		*	mg/L	0.2	1	06/12/21 0:21	kja
Manganese (1312)	M6010D ICP	1	0.153		*	mg/L	0.01	0.05	06/12/21 0:21	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 10:51	mlh
Molybdenum (1312)	M6010D ICP	1	0.026	B	*	mg/L	0.02	0.1	06/12/21 0:21	kja
Nickel (1312)	M6010D ICP	1	0.0138	B	*	mg/L	0.008	0.04	06/12/21 0:21	kja
Potassium (1312)	M6010D ICP	1	10.4		*	mg/L	0.2	1	06/12/21 0:21	kja
Selenium (1312)	M6020B ICP-MS	1	0.00070		*	mg/L	0.0001	0.00025	06/11/21 13:41	bsu
Silica (1312)	M6010D ICP	1	18.0		*	mg/L	0.2	1	06/12/21 0:21	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:41	bsu
Sodium (1312)	M6010D ICP	1	47.4		*	mg/L	0.2	1	06/12/21 0:21	kja
Strontium (1312)	M6010D ICP	1	0.864		*	mg/L	0.009	0.045	06/12/21 0:21	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/11/21 13:41	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00332			mg/L	0.0001	0.0005	06/11/21 13:41	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/12/21 0:21	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/08/21 16:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	48.0		*	mg/L	0.5	2	06/21/21 17:43	syw
Fluoride (1312)	SM4500F-C	1	0.27	B	*	mg/L	0.15	0.35	06/10/21 13:15	eep
Sulfate (1312)	D516-07 - Turbidimetric	20	487		*	mg/L	20	100	06/12/21 10:54	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-TIC

ACZ Sample ID: ***L65898-14***
Date Sampled: *03/23/21 15:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/14/21 12:20	mfm
Total Hot Plate Digestion	M3010A ICP								06/13/21 16:08	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/14/21 23:05	kja
Antimony (1312)	M6020B ICP-MS	1	0.00089	B	*	mg/L	0.0004	0.002	06/15/21 14:17	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00197		*	mg/L	0.0002	0.001	06/15/21 14:17	bsu
Barium (1312)	M6010D ICP	1	0.0501		*	mg/L	0.007	0.035	06/14/21 23:05	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/15/21 14:17	bsu
Boron (1312)	M6010D ICP	1	0.517		*	mg/L	0.03	0.1	06/14/21 23:05	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/15/21 14:17	bsu
Calcium (1312)	M6010D ICP	1	187		*	mg/L	0.1	0.5	06/14/21 23:05	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/15/21 14:17	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/14/21 23:05	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/14/21 23:05	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:17	bsu
Magnesium (1312)	M6010D ICP	1	16.5			mg/L	0.2	1	06/14/21 23:05	kja
Manganese (1312)	M6010D ICP	1	0.125		*	mg/L	0.01	0.05	06/14/21 23:05	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	06/30/21 11:00	mlh
Molybdenum (1312)	M6010D ICP	1	0.026	B	*	mg/L	0.02	0.1	06/14/21 23:05	kja
Nickel (1312)	M6010D ICP	1	0.0096	B	*	mg/L	0.008	0.04	06/14/21 23:05	kja
Potassium (1312)	M6010D ICP	1	11.4		*	mg/L	0.2	1	06/14/21 23:05	kja
Selenium (1312)	M6020B ICP-MS	1	0.00072		*	mg/L	0.0001	0.00025	06/15/21 14:17	bsu
Silica (1312)	M6010D ICP	1	17.2		*	mg/L	0.2	1	06/14/21 23:05	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:17	bsu
Sodium (1312)	M6010D ICP	1	72.2		*	mg/L	0.2	1	06/14/21 23:05	kja
Strontium (1312)	M6010D ICP	1	1.08		*	mg/L	0.009	0.045	06/14/21 23:05	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/15/21 14:17	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00301			mg/L	0.0001	0.0005	06/15/21 14:17	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/14/21 23:05	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/10/21 15:45	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	10	119		*	mg/L	5	20	06/21/21 17:55	syw
Fluoride (1312)	SM4500F-C	1	0.26	B	*	mg/L	0.15	0.35	06/17/21 13:15	eep
Sulfate (1312)	D516-07 - Turbidimetric	20	456		*	mg/L	20	100	06/12/21 10:54	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-ARC

ACZ Sample ID: ***L65898-15***
Date Sampled: *03/23/21 15:00*
Date Received: *05/18/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP-MS								06/21/21 14:52	bsu
Total Hot Plate Digestion	M3010A ICP								06/18/21 12:00	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (1312)	M6010D ICP	1	<0.05	U	*	mg/L	0.05	0.25	06/20/21 21:46	kja
Antimony (1312)	M6020B ICP-MS	1	0.00097	B	*	mg/L	0.0004	0.002	06/22/21 16:06	bsu
Arsenic (1312)	M6020B ICP-MS	1	0.00199		*	mg/L	0.0002	0.001	06/22/21 16:06	bsu
Barium (1312)	M6010D ICP	1	0.0438		*	mg/L	0.007	0.035	06/20/21 21:46	kja
Beryllium (1312)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	06/22/21 16:06	bsu
Boron (1312)	M6010D ICP	1	0.271		*	mg/L	0.03	0.1	06/20/21 21:46	kja
Cadmium (1312)	M6020B ICP-MS	1	<0.00005	U	*	mg/L	0.00005	0.00025	06/22/21 16:06	bsu
Calcium (1312)	M6010D ICP	1	180		*	mg/L	0.1	0.5	06/20/21 21:46	kja
Chromium (1312)	M6020B ICP-MS	1	<0.0005	U	*	mg/L	0.0005	0.002	06/22/21 16:06	bsu
Copper (1312)	M6010D ICP	1	<0.01	U	*	mg/L	0.01	0.05	06/20/21 21:46	kja
Iron (1312)	M6010D ICP	1	<0.06	U	*	mg/L	0.06	0.15	06/20/21 21:46	kja
Lead (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 16:06	bsu
Magnesium (1312)	M6010D ICP	1	16.5		*	mg/L	0.2	1	06/20/21 21:46	kja
Manganese (1312)	M6010D ICP	1	0.122		*	mg/L	0.01	0.05	06/20/21 21:46	kja
Mercury (1312)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	07/02/21 16:17	mlh
Molybdenum (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.1	06/20/21 21:46	kja
Nickel (1312)	M6010D ICP	1	<0.008	U	*	mg/L	0.008	0.04	06/20/21 21:46	kja
Potassium (1312)	M6010D ICP	1	10.3		*	mg/L	0.2	1	06/20/21 21:46	kja
Selenium (1312)	M6020B ICP-MS	1	0.00065		*	mg/L	0.0001	0.00025	06/22/21 16:06	bsu
Silica (1312)	M6010D ICP	1	15.2		*	mg/L	0.2	1	06/20/21 21:46	kja
Silver (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 16:06	bsu
Sodium (1312)	M6010D ICP	1	55.5		*	mg/L	0.2	1	06/20/21 21:46	kja
Strontium (1312)	M6010D ICP	1	0.906		*	mg/L	0.009	0.045	06/20/21 21:46	kja
Thallium (1312)	M6020B ICP-MS	1	<0.0001	U	*	mg/L	0.0001	0.0005	06/22/21 16:06	bsu
Uranium (1312)	M6020B ICP-MS	1	0.00317			mg/L	0.0001	0.0005	06/22/21 16:06	bsu
Zinc (1312)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	06/20/21 21:46	kja

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Synthetic Precip. Leaching Procedure	M1312 (Modified)								06/16/21 14:30	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride (1312)	SM4500Cl-E	1	63.9		*	mg/L	0.5	2	06/21/21 17:45	syw
Fluoride (1312)	SM4500F-C	1	0.21	B	*	mg/L	0.15	0.35	06/17/21 13:56	eep
Sulfate (1312)	D516-07 - Turbidimetric	35	486		*	mg/L	35	175	06/18/21 14:04	wtc

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.949	mg/L	97	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.15	0.15			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.250325		.249	mg/L	99	70	130			
WG520882ICSAB	ICSAB	06/11/21 22:10	II210419-3	500.65		500.6	mg/L	100	80	120			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.15	0.15			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	1.0013		.998	mg/L	100	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	1.0013	U	.998	mg/L	100	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	1.0013	U	1.014	mg/L	101	75	125	2	20	
L65898-06DUP	DUP	06/11/21 22:50			U	U	mg/L				0	20	RA
L65898-11SDL	SDL	06/11/21 22:58			U	U	mg/L					10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		.988	mg/L	99	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.15	0.15			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.983	mg/L	99	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.15	0.15			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.250325		.244	mg/L	97	70	130			
WG520883ICSAB	ICSAB	06/11/21 23:37	II210419-3	500.65		501.5	mg/L	100	80	120			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.15	0.15			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	1.0013		1.019	mg/L	102	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	1.0013	U	1.018	mg/L	102	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	1.0013	U	1.007	mg/L	101	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			U	U	mg/L				0	20	RA
L65898-13SDL	SDL	06/12/21 0:25			U	U	mg/L					10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.968	mg/L	97	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.15	0.15			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.15	0.15			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.250325		.254	mg/L	101	70	130			
WG520989ICSAB	ICSAB	06/14/21 22:22	II210419-3	500.65		499.1	mg/L	100	80	120			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.15	0.15			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	1.0013		1.028	mg/L	103	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	1.0013	U	1.088	mg/L	109	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	1.0013	U	1.046	mg/L	104	75	125	4	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			U	U	mg/L					10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.986	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.15	0.15			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.994	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.15	0.15			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.250325		.257	mg/L	103	70	130			
WG521353ICSAB	ICSAB	06/18/21 8:53	II210419-3	500.65		495	mg/L	99	80	120			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.15	0.15			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	1.0013		.972	mg/L	97	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	1.0013	U	.992	mg/L	99	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	1.0013	U	.999	mg/L	100	75	125	1	20	
L65898-10SDL	SDL	06/18/21 9:32			U	U	mg/L					10	

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L65898-10DUP	DUP	06/18/21 9:36			U	U	mg/L				0	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.963	mg/L	96	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.15	0.15			
WG521447													
WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.947	mg/L	97	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.15	0.15			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.250325		.22	mg/L	88	70	130			
WG521447ICSAB	ICSAB	06/20/21 21:22	II210419-3	500.65		501.5	mg/L	100	80	120			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.15	0.15			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	1.0013		.982	mg/L	98	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L					10	
L65898-15DUP	DUP	06/20/21 21:53			U	U	mg/L				0	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	1.0013	U	1.015	mg/L	101	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	1.0013	U	1	mg/L	100	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.939	mg/L	94	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.15	0.15			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		1.998	mg/L	100	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.15	0.15			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.250325		.258	mg/L	103	70	130			
WG522228ICSAB	ICSAB	06/30/21 12:22	II210628-3	500.4		496.5	mg/L	99	80	120			
WG521102PBS	PBS	06/30/21 12:38				.085	mg/L		-0.15	0.15			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	1.0013		1.069	mg/L	107	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	2.0038	29.4	31.36	mg/L	98	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	2.0038	29.4	30.96	mg/L	78	75	125	1	20	
L65898-07DUP	DUP	06/30/21 13:01			37.4	37.67	mg/L				1	20	
L65898-12SDL	SDL	06/30/21 13:08			2.81	2.765	mg/L				2	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.967	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.15	0.15			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Antimony (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.0201		.02027	mg/L	101	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0012	0.0012			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.002		.00194	mg/L	97	70	130			
WG520892ICSA	ICSA	06/11/21 13:05				U	mg/L		-0.002	0.002			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.01		.00976	mg/L	98	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0012	0.0012			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.01		.00948	mg/L	95	80	120			
L65898-01SDL	SDL	06/11/21 13:14			.0007	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.01	.00118	.01072	mg/L	95	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.0125		.01183	mg/L	95	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0012	0.0012			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.01	.00118	.01085	mg/L	97	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.0125		.01185	mg/L	95	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0012	0.0012			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0012	0.0012			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.01		.00955	mg/L	96	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.01	.00106	.01073	mg/L	97	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.01	.00106	.01071	mg/L	97	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.0125		.01183	mg/L	95	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0012	0.0012			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.0201		.01978	mg/L	98	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0012	0.0012			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.002		.00182	mg/L	91	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.002	0.002			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.01		.00857	mg/L	86	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0012	0.0012			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.01		.00915	mg/L	92	80	120			
L65898-04SDL	SDL	06/15/21 14:11			.00063	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.0125		.01166	mg/L	93	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0012	0.0012			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.01	.00089	.01007	mg/L	92	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.01	.00089	.0102	mg/L	93	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.0125		.01156	mg/L	92	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0012	0.0012			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.0201		.01938	mg/L	96	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0012	0.0012			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.002		.00186	mg/L	93	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.002	0.002			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.01		.00951	mg/L	95	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0012	0.0012			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.01		.00992	mg/L	99	80	120			
L65898-05SDL	SDL	06/22/21 15:50			.00075	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.01	U	.01038	mg/L	104	75	125			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.0125		.01242	mg/L	99	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0012	0.0012			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.01	U	.01033	mg/L	103	75	125	0	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0012	0.0012			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.01		.0099	mg/L	99	80	120			
L65898-15DUP	DUP	06/22/21 16:08			.00097	.00095	mg/L				2	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.01	.00097	.01102	mg/L	101	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.01	.00097	.0111	mg/L	101	75	125	1	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.0125		.01245	mg/L	100	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0012	0.0012			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.0201		.02067	mg/L	103	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0012	0.0012			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.002		.00203	mg/L	102	70	130			
WG522390ICSA	ICSA	07/01/21 17:21				U	mg/L		-0.002	0.002			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.01		.00931	mg/L	93	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.0125		.01234	mg/L	99	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0012	0.0012			
WG521102PBS	PBS	07/01/21 17:49				U	mg/L		-0.006	0.006			
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.05		.04839	mg/L	97	80	120			
L65898-02SDL	SDL	07/01/21 17:54			U	U	mg/L					10	
L65898-07DUP	DUP	07/01/21 17:58			U	U	mg/L				0	20	RA
L65898-12MS	MS	07/01/21 18:02	MS5XW	.05	.00248	.05117	mg/L	97	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.05	.00248	.05101	mg/L	97	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.0125		.01257	mg/L	101	90	110			
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0012	0.0012			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Arsenic (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05242	mg/L	105	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0006	0.0006			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.001001		.00094	mg/L	94	70	130			
WG520892ICSA	ICSA	06/11/21 13:05				U	mg/L		-0.001	0.001			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02002		.01982	mg/L	99	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0006	0.0006			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05005		.04785	mg/L	96	80	120			
L65898-01SDL	SDL	06/11/21 13:14			.00208	.00175	mg/L				16	10	ZG
L65898-06DUP	DUP	06/11/21 13:18			.00166	.00154	mg/L				8	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05005	.00241	.0505	mg/L	96	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1001		.09568	mg/L	96	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0006	0.0006			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05005	.00241	.05074	mg/L	97	75	125	0	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1001		.09778	mg/L	98	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0006	0.0006			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0006	0.0006			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05005		.04669	mg/L	93	80	120			
L65898-08DUP	DUP	06/11/21 13:39			.00149	.00105	mg/L				35	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05005	.00178	.05007	mg/L	96	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05005	.00178	.04922	mg/L	95	75	125	2	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1001		.09613	mg/L	96	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0006	0.0006			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05095	mg/L	102	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0006	0.0006			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.001001		.00098	mg/L	98	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.001	0.001			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02002		.01823	mg/L	91	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0006	0.0006			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05005		.04492	mg/L	90	80	120			
L65898-04SDL	SDL	06/15/21 14:11			.00144	.00125	mg/L				13	10	ZG
L65898-09DUP	DUP	06/15/21 14:15			.00093	.00096	mg/L				3	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1001		.0938	mg/L	94	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0006	0.0006			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05005	.00197	.04684	mg/L	90	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05005	.00197	.04751	mg/L	91	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1001		.09186	mg/L	92	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0006	0.0006			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05183	mg/L	104	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0006	0.0006			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.001001		.00098	mg/L	98	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.001	0.001			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02002		.01968	mg/L	98	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0006	0.0006			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05005		.04935	mg/L	99	80	120			
L65898-05SDL	SDL	06/22/21 15:50			.00158	.0015	mg/L				5	10	
L65898-10DUP	DUP	06/22/21 15:54			.00113	.00109	mg/L				4	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05005	.00113	.05084	mg/L	99	75	125			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1001		.10016	mg/L	100	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0006	0.0006			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05005	.00113	.05087	mg/L	99	75	125	0	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0006	0.0006			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05005		.04898	mg/L	98	80	120			
L65898-15DUP	DUP	06/22/21 16:08			.00199	.00212	mg/L				6	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05005	.00199	.05208	mg/L	100	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05005	.00199	.05209	mg/L	100	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1001		.10175	mg/L	102	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0006	0.0006			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.05226	mg/L	105	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0006	0.0006			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.001001		.00104	mg/L	104	70	130			
WG522390ICSA	ICSA	07/01/21 17:21				U	mg/L		-0.001	0.001			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02002		.02001	mg/L	100	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.1001		.10077	mg/L	101	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0006	0.0006			
WG521102PBS	PBS	07/01/21 17:49				U	mg/L		-0.003	0.003			
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.25025		.26911	mg/L	108	80	120			
L65898-02SDL	SDL	07/01/21 17:54			.0666	.0614	mg/L				8	10	
L65898-07DUP	DUP	07/01/21 17:58			.0428	.04584	mg/L				7	20	
L65898-12MS	MS	07/01/21 18:02	MS5XW	.25025	.0873	.34779	mg/L	104	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.25025	.0873	.34945	mg/L	105	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.1001		.10038	mg/L	100	90	110			E6
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0006	0.0006			IA

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Barium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.972	mg/L	99	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.021	0.021			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.035		.0361	mg/L	103	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.021	0.021			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.5		.4862	mg/L	97	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.5	.0179	.5023	mg/L	97	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.5	.0179	.505	mg/L	97	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			.022	.0226	mg/L				3	20	RA
L65898-11SDL	SDL	06/11/21 22:58			.0442	.0485	mg/L				10	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		.9964	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.021	0.021			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.99	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.021	0.021			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.035		.0355	mg/L	101	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.021	0.021			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.5		.4975	mg/L	100	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.5	.0195	.5157	mg/L	99	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.5	.0195	.5115	mg/L	98	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			.0241	.028	mg/L				15	20	RA
L65898-13SDL	SDL	06/12/21 0:25			.0467	.047	mg/L				1	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.978	mg/L	98	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.021	0.021			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.008	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.021	0.021			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.035		.0387	mg/L	111	70	130			
WG520814PBS	PBS	06/14/21 22:38				.008	mg/L		-0.021	0.021			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.5		.5156	mg/L	103	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.5	.0299	.548	mg/L	104	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.5	.0299	.54	mg/L	102	75	125	1	20	
L65898-09DUP	DUP	06/14/21 23:01			.0354	.0347	mg/L				2	20	RA
L65898-14SDL	SDL	06/14/21 23:08			.0501	.0635	mg/L				27	10	ZG
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.9936	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.021	0.021			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.991	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.021	0.021			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.035		.0386	mg/L	110	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.021	0.021			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.5		.4814	mg/L	96	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.5	.028	.4873	mg/L	92	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.5	.028	.516	mg/L	98	75	125	6	20	
L65898-10SDL	SDL	06/18/21 9:32			.0315	.046	mg/L				46	10	ZG
L65898-10DUP	DUP	06/18/21 9:36			.0315	.0302	mg/L				4	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.9688	mg/L	97	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.021	0.021			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.982	mg/L	99	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.021	0.021			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.035		.0332	mg/L	95	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.021	0.021			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.5		.4946	mg/L	99	80	120			
L65898-15SDL	SDL	06/20/21 21:50			.0438	.04	mg/L				9	10	
L65898-15DUP	DUP	06/20/21 21:53			.0438	.0451	mg/L				3	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.5	.0438	.5488	mg/L	101	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.5	.0438	.5399	mg/L	99	75	125	2	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.9736	mg/L	97	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.021	0.021			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		1.984	mg/L	99	90	110			
WG522228ICB	ICB	06/30/21 12:15				.0102	mg/L		-0.021	0.021			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.035		.0424	mg/L	121	70	130			
WG521102PBS	PBS	06/30/21 12:38				.0101	mg/L		-0.021	0.021			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.5		.4805	mg/L	96	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	1.003	.398	1.2774	mg/L	88	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	1.003	.398	1.2696	mg/L	87	75	125	1	20	
L65898-07DUP	DUP	06/30/21 13:01			.303	.3137	mg/L				3	20	
L65898-12SDL	SDL	06/30/21 13:08			.21	.2415	mg/L				15	10	ZG
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.9679	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				.0093	mg/L		-0.021	0.021			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Beryllium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.048981	mg/L	98	90	110			
WG520892ICB	ICB	06/11/21 13:01				.000097	mg/L		-0.00024	0.00024			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.00025025		.000254	mg/L	101	70	130			
WG520892ICSA	ICSA	06/11/21 13:05				U	mg/L		-0.00025	0.00025			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02002		.019526	mg/L	98	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.00024	0.00024			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05005		.048136	mg/L	96	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05005	U	.042646	mg/L	85	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1001		.102318	mg/L	102	90	110			
WG520892CCB1	CCB	06/11/21 13:25				.000118	mg/L		-0.00024	0.00024			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05005	U	.0431	mg/L	86	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1001		.103258	mg/L	103	90	110			
WG520892CCB2	CCB	06/11/21 13:30				.000139	mg/L		-0.00024	0.00024			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.00024	0.00024			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05005		.046794	mg/L	93	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05005	U	.041106	mg/L	82	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05005	U	.04131	mg/L	83	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1001		.103394	mg/L	103	90	110			
WG520892CCB3	CCB	06/11/21 13:48				.000116	mg/L		-0.00024	0.00024			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.048588	mg/L	97	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.00024	0.00024			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.00025025		.00026	mg/L	104	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.00025	0.00025			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02002		.017283	mg/L	86	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.00024	0.00024			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05005		.046029	mg/L	92	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1001		.097676	mg/L	98	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.00024	0.00024			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05005	U	.044502	mg/L	89	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05005	U	.0444	mg/L	89	75	125	0	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1001		.09646	mg/L	96	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.00024	0.00024			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.048496	mg/L	97	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.00024	0.00024			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.00025025		.000237	mg/L	95	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.00025	0.00025			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02002		.021441	mg/L	107	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.00024	0.00024			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05005		.051807	mg/L	104	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05005	U	.045542	mg/L	91	75	125			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1001		.113042	mg/L	113	90	110			VC
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.00024	0.00024			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05005	U	.044741	mg/L	89	75	125	2	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.00024	0.00024			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05005		.048782	mg/L	97	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05005	U	.043789	mg/L	87	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05005	U	.043578	mg/L	87	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1001		.104753	mg/L	105	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.00024	0.00024			
WG522436													
WG522436ICV	ICV	07/02/21 11:35	MS210630-2	.05		.048709	mg/L	97	90	110			
WG522436ICB	ICB	07/02/21 11:36				.000117	mg/L		-0.00024	0.00024			
WG522436PQV	PQV	07/02/21 11:38	MS210526-2	.00025025		.000295	mg/L	118	70	130			
WG522436ICSA	ICSA	07/02/21 11:40				U	mg/L		-0.00025	0.00025			
WG522436ICSAB	ICSAB	07/02/21 11:42	MS210610-4	.02002		.019731	mg/L	99	80	120			
WG521102PBS	PBS	07/02/21 11:46				U	mg/L		-0.0024	0.0024			
WG521102LFB2	LFB	07/02/21 11:47	MS5XW	.25025		.256401	mg/L	102	80	120			
L65898-02SDL	SDL	07/02/21 11:51			.00365	U	mg/L					10	
L65898-07DUP	DUP	07/02/21 11:55			.00344	.003662	mg/L				6	20	RA
WG522436CCV1	CCV	07/02/21 12:01	MS210521-8	.1001		.101893	mg/L	102	90	110			
WG522436CCB1	CCB	07/02/21 12:03				.000099	mg/L		-0.00024	0.00024			
L65898-12MS	MS	07/02/21 12:05	MS5XW	.25025	U	.265893	mg/L	106	75	125			
L65898-12MSD	MSD	07/02/21 12:06	MS5XW	.25025	U	.259686	mg/L	104	75	125	2	20	
WG522436CCV2	CCV	07/02/21 12:08	MS210521-8	.1001		.101884	mg/L	102	90	110			
WG522436CCB2	CCB	07/02/21 12:10				.000112	mg/L		-0.00024	0.00024			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.968	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.09	0.09			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.1001		.106	mg/L	106	70	130			
WG520598PBS	PBS	06/11/21 22:27				.229	mg/L		-0.09	0.09			B1
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.5005		.714	mg/L	143	80	120			B1
L65898-01MS	MS	06/11/21 22:39	II210601-2	.5005	.234	.718	mg/L	97	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.5005	.234	.72	mg/L	97	75	125	0	20	
L65898-06DUP	DUP	06/11/21 22:50			.222	.213	mg/L				4	20	RA
L65898-11SDL	SDL	06/11/21 22:58			.258	.295	mg/L				14	10	ZG
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		1.001	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.09	0.09			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.986	mg/L	99	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.09	0.09			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.1001		.11	mg/L	110	70	130			
WG520599PBS	PBS	06/11/21 23:53				.286	mg/L		-0.09	0.09			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.5005		.781	mg/L	156	80	120			B1
L65898-03MS	MS	06/12/21 0:05	II210601-2	.5005	.291	.784	mg/L	99	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.5005	.291	.775	mg/L	97	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			.283	.277	mg/L				2	20	RA
L65898-13SDL	SDL	06/12/21 0:25			.307	.335	mg/L				9	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.986	mg/L	99	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.09	0.09			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.015	mg/L	101	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.09	0.09			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.1001		.107	mg/L	107	70	130			
WG520814PBS	PBS	06/14/21 22:38				.528	mg/L		-0.09	0.09			B1
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.5005		1.038	mg/L	207	80	120			B1
L65898-04MS	MS	06/14/21 22:50	II210601-2	.5005	.514	1.037	mg/L	104	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.5005	.514	1.019	mg/L	101	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			.501	.493	mg/L				2	20	
L65898-14SDL	SDL	06/14/21 23:08			.517	.545	mg/L				5	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.994	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.09	0.09			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.993	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.09	0.09			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.1001		.103	mg/L	103	70	130			
WG521175PBS	PBS	06/18/21 9:09				.231	mg/L		-0.09	0.09			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.5005		.719	mg/L	144	80	120			B1
L65898-05MS	MS	06/18/21 9:20	II210601-2	.5005	.249	.717	mg/L	94	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.5005	.249	.745	mg/L	99	75	125	4	20	
L65898-10SDL	SDL	06/18/21 9:32			.242	.26	mg/L				7	10	
L65898-10DUP	DUP	06/18/21 9:36			.242	.235	mg/L				3	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.967	mg/L	97	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.09	0.09			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		2.007	mg/L	100	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.09	0.09			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.1001		.092	mg/L	92	70	130			
WG521181PBS	PBS	06/20/21 21:38				.236	mg/L		-0.09	0.09			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.5005		.76	mg/L	152	80	120			B1
L65898-15SDL	SDL	06/20/21 21:50			.271	.245	mg/L				10	10	
L65898-15DUP	DUP	06/20/21 21:53			.271	.276	mg/L				2	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.5005	.271	.784	mg/L	102	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.5005	.271	.8	mg/L	106	75	125	2	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.986	mg/L	99	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.09	0.09			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		2.044	mg/L	102	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.09	0.09			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.1001		.109	mg/L	109	70	130			
WG521102PBS	PBS	06/30/21 12:38				.208	mg/L		-0.09	0.09			B1
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.5005		.668	mg/L	133	80	120			B1
L65898-02MS	MS	06/30/21 12:49	II2XWATER	1.001	.255	1.129	mg/L	87	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	1.001	.255	1.176	mg/L	92	75	125	4	20	
L65898-07DUP	DUP	06/30/21 13:01			.191	.196	mg/L				3	20	RA
L65898-12SDL	SDL	06/30/21 13:08			.297	.35	mg/L				18	10	ZG
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.967	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.09	0.09			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Cadmium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05274	mg/L	105	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.00015	0.00015			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.00025025		.000242	mg/L	97	70	130			
WG520892ICSA	ICSA	06/11/21 13:05		.000056		.000056	mg/L		-0.00025	0.00025			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02002		.019387	mg/L	97	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.00015	0.00015			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05005		.045535	mg/L	91	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05005	U	.04573	mg/L	91	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1001		.096263	mg/L	96	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.00015	0.00015			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05005	U	.045969	mg/L	92	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1001		.096727	mg/L	97	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.00015	0.00015			
WG520599PBS	PBS	06/11/21 13:32				.000129	mg/L		-0.00015	0.00015			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05005		.046169	mg/L	92	80	120			
L65898-08DUP	DUP	06/11/21 13:39			.000063	U	mg/L				200	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05005	U	.045461	mg/L	91	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05005	U	.045613	mg/L	91	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1001		.095708	mg/L	96	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.00015	0.00015			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.051758	mg/L	104	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.00015	0.00015			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.00025025		.000247	mg/L	99	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.00025	0.00025			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02002		.018067	mg/L	90	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.00015	0.00015			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05005		.044718	mg/L	89	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1001		.094416	mg/L	94	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.00015	0.00015			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05005	U	.044081	mg/L	88	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05005	U	.044851	mg/L	90	75	125	2	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1001		.093983	mg/L	94	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.00015	0.00015			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.052982	mg/L	106	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.00015	0.00015			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.00025025		.000244	mg/L	98	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.00025	0.00025			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02002		.019312	mg/L	96	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.00015	0.00015			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05005		.048681	mg/L	97	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05005	U	.0492	mg/L	98	75	125			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1001		.101631	mg/L	102	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.00015	0.00015			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05005	U	.04901	mg/L	98	75	125	0	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.00015	0.00015			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05005		.048854	mg/L	98	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05005	U	.04886	mg/L	98	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05005	U	.048999	mg/L	98	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1001		.100812	mg/L	101	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.00015	0.00015			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.052668	mg/L	105	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.00015	0.00015			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.00025025		.00025	mg/L	100	70	130			
WG522390ICSA	ICSA	07/01/21 17:21				U	mg/L		-0.00025	0.00025			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02002		.018889	mg/L	94	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.1001		.101777	mg/L	102	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.00015	0.00015			
WG521102PBS	PBS	07/01/21 17:49				.000821	mg/L		-0.00075	0.00075			B1
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.25025		.232247	mg/L	93	80	120			
L65898-02SDL	SDL	07/01/21 17:54			.00873	.008615	mg/L				1	10	
L65898-07DUP	DUP	07/01/21 17:58			.00648	.006795	mg/L				5	20	
L65898-12MS	MS	07/01/21 18:02	MS5XW	.25025	U	.230528	mg/L	92	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.25025	U	.23022	mg/L	92	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.1001		.100733	mg/L	101	90	110			
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.00015	0.00015			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Calcium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	100		99.45	mg/L	99	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.3	0.3			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.5006		.53	mg/L	106	70	130			
WG520882ICSAB	ICSAB	06/11/21 22:10	II210419-3	500.15		485.6	mg/L	97	80	120			
WG520598PBS	PBS	06/11/21 22:27				14.12	mg/L		-0.3	0.3			B1
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	67.98753		82.23	mg/L	121	80	120			B1
L65898-01MS	MS	06/11/21 22:39	II210601-2	67.98753	60.7	129.6	mg/L	101	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	67.98753	60.7	130.7	mg/L	103	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			53.9	57.95	mg/L				7	20	
L65898-11SDL	SDL	06/11/21 22:58			141	146.1	mg/L				4	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	50		50.91	mg/L	102	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.3	0.3			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	100		101.2	mg/L	101	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.3	0.3			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.5006		.51	mg/L	102	70	130			
WG520883ICSAB	ICSAB	06/11/21 23:37	II210419-3	500.15		487.4	mg/L	97	80	120			
WG520599PBS	PBS	06/11/21 23:53				17.24	mg/L		-0.3	0.3			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	67.98753		87.84	mg/L	129	80	120			B1
L65898-03MS	MS	06/12/21 0:05	II210601-2	67.98753	59.3	130.2	mg/L	104	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	67.98753	59.3	129.5	mg/L	103	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			58.2	78.88	mg/L				30	20	RD
L65898-13SDL	SDL	06/12/21 0:25			182	181.05	mg/L				1	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	50		50.18	mg/L	100	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.3	0.3			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	100		101.3	mg/L	101	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.3	0.3			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.5006		.54	mg/L	108	70	130			
WG520989ICSAB	ICSAB	06/14/21 22:22	II210419-3	500.15		478.8	mg/L	96	80	120			
WG520814PBS	PBS	06/14/21 22:38				44.67	mg/L		-0.3	0.3			B1
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	67.98753		115.5	mg/L	170	80	120			B1
L65898-04MS	MS	06/14/21 22:50	II210601-2	67.98753	91.9	167.2	mg/L	111	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	67.98753	91.9	163.4	mg/L	105	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			94.5	94.74	mg/L				0	20	
L65898-14SDL	SDL	06/14/21 23:08			187	187.4	mg/L				0	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	50		49.92	mg/L	100	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.3	0.3			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	100		101.3	mg/L	101	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.3	0.3			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.5006		.51	mg/L	102	70	130			
WG521353ICSAB	ICSAB	06/18/21 8:53	II210419-3	500.15		485.2	mg/L	97	80	120			
WG521175PBS	PBS	06/18/21 9:09				27.01	mg/L		-0.3	0.3			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	67.98753		93.9	mg/L	138	80	120			B1
L65898-05MS	MS	06/18/21 9:20	II210601-2	67.98753	88.6	155.2	mg/L	98	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	67.98753	88.6	157.4	mg/L	101	75	125	1	20	
L65898-10SDL	SDL	06/18/21 9:32			79.4	81.3	mg/L				2	10	

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L65898-10DUP	DUP	06/18/21 9:36			79.4	78.75	mg/L				1	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	50		48.8	mg/L	98	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.3	0.3			
WG521447													
WG521447ICV	ICV	06/20/21 21:11	II210620-2	100		100.8	mg/L	101	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.3	0.3			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.5006		.5	mg/L	100	70	130			
WG521447ICSAB	ICSAB	06/20/21 21:22	II210419-3	500.15		481.1	mg/L	96	80	120			
WG521181PBS	PBS	06/20/21 21:38				27.45	mg/L		-0.3	0.3			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	67.98753		98.33	mg/L	145	80	120			B1
L65898-15SDL	SDL	06/20/21 21:50			180	180.8	mg/L				0	10	
L65898-15DUP	DUP	06/20/21 21:53			180	189.6	mg/L				5	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	67.98753	180	255.5	mg/L	111	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	67.98753	180	253	mg/L	107	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	50		50.24	mg/L	100	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.3	0.3			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	100		100.6	mg/L	101	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.3	0.3			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.5006		.53	mg/L	106	70	130			
WG522228ICSAB	ICSAB	06/30/21 12:22	II210628-3	500.15		481.3	mg/L	96	80	120			
WG521102PBS	PBS	06/30/21 12:38				13.74	mg/L		-0.3	0.3			B1 BA
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	67.98753		75.72	mg/L	111	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	136.0667	907	993.2	mg/L	63	75	125			M3
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	136.0667	907	994.4	mg/L	64	75	125	0	20	M3
L65898-07DUP	DUP	06/30/21 13:01			555	594.7	mg/L				7	20	
L65898-12SDL	SDL	06/30/21 13:08			184	194.3	mg/L				6	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	50		47.49	mg/L	95	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.3	0.3			
WG522323													
WG522323ICV	ICV	07/01/21 16:48	II210620-2	100		99.09	mg/L	99	90	110			
WG522323ICB	ICB	07/01/21 16:52				U	mg/L		-0.3	0.3			
WG522323PQV	PQV	07/01/21 16:56	II210603-2	.5006		.56	mg/L	112	70	130			
WG522323ICSAB	ICSAB	07/01/21 17:00	II210628-3	500.15		478	mg/L	96	80	120			
WG521102PBS	PBS	07/01/21 17:16				14.29	mg/L		-1.5	1.5			B1
WG521102LFB1	LFB	07/01/21 17:20	II210622-2	67.98753		79.55	mg/L	117	80	120			
L65898-02MS	MS	07/01/21 17:28	II2XWATER	136.0667	991	1104.5	mg/L	83	75	125			
L65898-02MSD	MSD	07/01/21 17:32	II2XWATER	136.0667	991	1128.5	mg/L	101	75	125	2	20	
L65898-07DUP	DUP	07/01/21 17:40			1410	1551.5	mg/L				10	20	
L65898-12SDL	SDL	07/01/21 17:48			192	198.5	mg/L				3	10	
WG522323CCV1	CCV	07/01/21 17:52	II210629-1	50		48.28	mg/L	97	90	110			
WG522323CCB1	CCB	07/01/21 17:56				U	mg/L		-0.3	0.3			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Chloride (1312) SM4500Cl-E

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521553													
WG521553ICB	ICB	06/21/21 13:48				U	mg/L		-1.5	1.5			
WG521553ICV	ICV	06/21/21 13:48	WI210503-1	54.89		54.92	mg/L	100	90	110			
WG521553CCV1	CCV	06/21/21 17:42	WI210203-7	50.05		50.92	mg/L	102	90	110			
WG521553CCB1	CCB	06/21/21 17:42				U	mg/L		-1.5	1.5			
WG521553LFB	LFB	06/21/21 17:42	WI200327-3	30.03		31.14	mg/L	104	90	110			
WG520598PBS	PBS	06/21/21 17:42				4.04	mg/L		-1.5	1.5			B1
L65898-01AS	AS	06/21/21 17:42	WI200327-3	30.03	6.86	38.55	mg/L	106	90	110			
L65898-06DUP	DUP	06/21/21 17:42			6.85	6.73	mg/L				2	20	
WG520599PBS	PBS	06/21/21 17:42				43.49	mg/L		-1.5	1.5			B1
WG521553CCV2	CCV	06/21/21 17:43	WI210203-7	50.05		51.11	mg/L	102	90	110			
WG521553CCB2	CCB	06/21/21 17:43				.54	mg/L		-1.5	1.5			
L65898-08DUP	DUP	06/21/21 17:43			45.4	45.46	mg/L				0	20	
WG521175PBS	PBS	06/21/21 17:45				66.54	mg/L		-1.5	1.5			B1
WG521553CCV3	CCV	06/21/21 17:45	WI210203-7	50.05		51.44	mg/L	103	90	110			
WG521553CCB3	CCB	06/21/21 17:45				.69	mg/L		-1.5	1.5			
L65898-10DUP	DUP	06/21/21 17:45			65.5	63.84	mg/L				3	20	
WG521181PBS	PBS	06/21/21 17:46				61.26	mg/L		-1.5	1.5			B1
L65898-15DUP	DUP	06/21/21 17:46			63.9	62.92	mg/L				2	20	
WG521553CCV4	CCV	06/21/21 17:50	WI210203-7	50.05		50.73	mg/L	101	90	110			
WG521553CCB4	CCB	06/21/21 17:50				U	mg/L		-1.5	1.5			
WG520814PBS	PBS	06/21/21 17:55				114.32	mg/L		-15	15			B1
L65898-09DUP	DUP	06/21/21 17:55			120	118.59	mg/L				1	20	
WG521553CCV5	CCV	06/21/21 17:55	WI210203-7	50.05		50.63	mg/L	101	90	110			
WG521553CCB5	CCB	06/21/21 17:55				U	mg/L		-1.5	1.5			
WG523211													
WG523211ICB1	ICB	07/14/21 10:07				U	mg/L		-1.5	1.5			
WG523211ICB	ICB	07/14/21 10:07				U	mg/L		-1.5	1.5			
WG523211ICV1	ICV	07/14/21 10:07	WI210503-1	54.89		54.63	mg/L	100	90	110			
WG523211ICV	ICV	07/14/21 10:07	WI210503-1	54.89		54.63	mg/L	100	90	110			
WG523211CCV1	CCV	07/14/21 13:00	WI210203-7	50.05		48.72	mg/L	97	90	110			
WG523211CCB1	CCB	07/14/21 13:00				U	mg/L		-1.5	1.5			
WG523211LFB	LFB	07/14/21 13:00	WI200327-3	30.03		31.13	mg/L	104	90	110			
WG523211CCV2	CCV	07/14/21 13:01	WI210203-7	50.05		48.82	mg/L	98	90	110			
WG523211CCB2	CCB	07/14/21 13:01				U	mg/L		-1.5	1.5			
WG523211CCV3	CCV	07/15/21 10:04	WI210203-7	50.05		48.1	mg/L	96	90	110			
WG523211CCB3	CCB	07/15/21 10:04				U	mg/L		-1.5	1.5			
WG521102PBS	PBS	07/15/21 10:04				U	mg/L		-75	75			D1 M2
L65898-07DUP	DUP	07/15/21 10:04			U	U	mg/L				0	20	RA
L65898-12AS	AS	07/15/21 10:05	10XCL	150	U	55.64	mg/L	37	90	110			M2
WG523211CCV4	CCV	07/15/21 10:05	WI210203-7	50.05		48.2	mg/L	96	90	110			
WG523211CCB4	CCB	07/15/21 10:05				U	mg/L		-1.5	1.5			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Chromium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05265	mg/L	105	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0015	0.0015			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.002		.0019	mg/L	95	70	130			
WG520892ICSA	ICSA	06/11/21 13:05				U	mg/L		-0.002	0.002			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02		.01881	mg/L	94	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0015	0.0015			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05		.04735	mg/L	95	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05	U	.04671	mg/L	93	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1		.09824	mg/L	98	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0015	0.0015			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05	U	.04701	mg/L	94	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1		.0995	mg/L	100	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0015	0.0015			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0015	0.0015			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05		.04702	mg/L	94	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05	U	.04676	mg/L	94	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05	U	.04629	mg/L	93	75	125	1	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1		.0987	mg/L	99	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0015	0.0015			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05262	mg/L	105	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0015	0.0015			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.002		.00189	mg/L	95	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.002	0.002			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02		.01753	mg/L	88	80	120			
WG520814PBS	PBS	06/15/21 14:06				.00087	mg/L		-0.0015	0.0015			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05		.04479	mg/L	90	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			.00079	U	mg/L				200	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1		.09649	mg/L	96	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0015	0.0015			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05	U	.04407	mg/L	88	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05	U	.04468	mg/L	89	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1		.09492	mg/L	95	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0015	0.0015			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05266	mg/L	105	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0015	0.0015			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.002		.00197	mg/L	99	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.002	0.002			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02		.01888	mg/L	94	80	120			
WG521175PBS	PBS	06/22/21 15:45				.00066	mg/L		-0.0015	0.0015			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05		.04919	mg/L	98	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05	U	.04845	mg/L	97	75	125			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1		.10171	mg/L	102	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0015	0.0015			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05	U	.04889	mg/L	98	75	125	1	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0015	0.0015			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05		.04871	mg/L	97	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05	U	.04847	mg/L	97	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05	U	.04852	mg/L	97	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1		.10369	mg/L	104	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0015	0.0015			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.05263	mg/L	105	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0015	0.0015			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.002		.00198	mg/L	99	70	130			
WG522390ICSA	ICSA	07/01/21 17:21				U	mg/L		-0.002	0.002			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02		.01892	mg/L	95	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.1		.10424	mg/L	104	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0015	0.0015			
WG521102PBS	PBS	07/01/21 17:49				.01999	mg/L		-0.0075	0.0075			B1
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.25025		.26301	mg/L	105	80	120			
L65898-02SDL	SDL	07/01/21 17:54			.0996	.0986	mg/L				1	10	
L65898-07DUP	DUP	07/01/21 17:58			.0946	.09153	mg/L				3	20	
L65898-12MS	MS	07/01/21 18:02	MS5XW	.25025	.00934	.24769	mg/L	95	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.25025	.00934	.2478	mg/L	95	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.1		.10259	mg/L	103	90	110			E6
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0015	0.0015			IA

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Copper (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.941	mg/L	97	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.03	0.03			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.0502		.05	mg/L	100	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.03	0.03			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.502		.493	mg/L	98	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.502	U	.496	mg/L	99	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.502	U	.492	mg/L	98	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			U	U	mg/L				0	20	RA
L65898-11SDL	SDL	06/11/21 22:58			U	U	mg/L					10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		.989	mg/L	99	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.03	0.03			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.971	mg/L	99	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.03	0.03			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.0502		.05	mg/L	100	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.03	0.03			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.502		.506	mg/L	101	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.502	U	.5	mg/L	100	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.502	U	.498	mg/L	99	75	125	0	20	
L65898-08DUP	DUP	06/12/21 0:17			U	U	mg/L				0	20	RA
L65898-13SDL	SDL	06/12/21 0:25			U	U	mg/L					10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.974	mg/L	97	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.03	0.03			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.017	mg/L	101	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.03	0.03			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.0502		.049	mg/L	98	70	130			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.03	0.03			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.502		.519	mg/L	103	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.502	U	.535	mg/L	107	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.502	U	.522	mg/L	104	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			U	U	mg/L					10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.993	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.03	0.03			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.965	mg/L	98	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.03	0.03			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.0502		.051	mg/L	102	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.03	0.03			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.502		.471	mg/L	94	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.502	U	.46	mg/L	92	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.502	U	.483	mg/L	96	75	125	5	20	
L65898-10SDL	SDL	06/18/21 9:32			U	U	mg/L					10	
L65898-10DUP	DUP	06/18/21 9:36			U	U	mg/L				0	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.931	mg/L	93	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.03	0.03			
WG521447													

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.966	mg/L	98	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.03	0.03			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.0502		.047	mg/L	94	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.03	0.03			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.502		.504	mg/L	100	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L					10	
L65898-15DUP	DUP	06/20/21 21:53			U	U	mg/L				0	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.502	U	.51	mg/L	102	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.502	U	.507	mg/L	101	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.975	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.03	0.03			
WG522277													
WG522277ICV	ICV	07/01/21 0:02	II210620-2	2		1.979	mg/L	99	90	110			
WG522277ICB	ICB	07/01/21 0:05				U	mg/L		-0.03	0.03			
WG522277PQV	PQV	07/01/21 0:09	II210603-2	.0502		.052	mg/L	104	70	130			
WG521102PBS	PBS	07/01/21 0:28				U	mg/L		-0.15	0.15			
WG521102LFB1	LFB	07/01/21 0:32	II210622-2	.502		.51	mg/L	102	80	120			
L65898-02MS	MS	07/01/21 0:40	II2XWATER	1	U	1.004	mg/L	100	75	125			
L65898-02MSD	MSD	07/01/21 0:44	II2XWATER	1	U	1.003	mg/L	100	75	125	0	20	
L65898-07DUP	DUP	07/01/21 0:52			U	U	mg/L				0	20	RA
L65898-12SDL	SDL	07/01/21 0:59			U	U	mg/L					10	
WG522277CCV1	CCV	07/01/21 1:03	II210629-1	1		.982	mg/L	98	90	110			
WG522277CCB1	CCB	07/01/21 1:07				U	mg/L		-0.03	0.03			
WG522323													
WG522323ICV	ICV	07/01/21 16:48	II210620-2	2		1.877	mg/L	94	90	110			
WG522323ICB	ICB	07/01/21 16:52				.014	mg/L		-0.03	0.03			
WG522323PQV	PQV	07/01/21 16:56	II210603-2	.0502		.059	mg/L	118	70	130			
WG521102PBS	PBS	07/01/21 17:16				.051	mg/L		-0.15	0.15			
WG521102LFB1	LFB	07/01/21 17:20	II210622-2	.502		.52	mg/L	104	80	120			
L65898-02MS	MS	07/01/21 17:28	II2XWATER	1	U	1.505	mg/L	151	75	125			M1
L65898-02MSD	MSD	07/01/21 17:32	II2XWATER	1	U	1.48	mg/L	148	75	125	2	20	M1
L65898-07DUP	DUP	07/01/21 17:40			.56	.58	mg/L				4	20	RA
L65898-12SDL	SDL	07/01/21 17:48			.255	1.265	mg/L				396	10	ZG
WG522323CCV1	CCV	07/01/21 17:52	II210629-1	1		.939	mg/L	94	90	110			
WG522323CCB1	CCB	07/01/21 17:56				.011	mg/L		-0.03	0.03			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Fluoride (1312) SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520771													
WG520771ICV	ICV	06/10/21 11:30	WC210609-3	2.002		2.15	mg/L	107	90	110			
WG520771ICB	ICB	06/10/21 11:34				U	mg/L		-0.3	0.3			
WG520771PQV	PQV	06/10/21 11:37	WC210528-8	.35105		.43	mg/L	122	70	130			
WG520771LFB	LFB	06/10/21 11:45	WC201221-2	5.015		5.16	mg/L	103	90	110			
WG520598PBS	PBS	06/10/21 11:53				.19	mg/L		-0.3	0.3			
L65898-06AS	AS	06/10/21 12:17	WC201221-2	5.015	.21	5.4	mg/L	103	90	110			
L65898-06DUP	DUP	06/10/21 12:24			.21	.25	mg/L				17	20	RA
WG520599PBS	PBS	06/10/21 12:40				U	mg/L		-0.3	0.3			
L65898-08AS	AS	06/10/21 12:59	WC201221-2	5.015	.2	5.37	mg/L	103	90	110			
L65898-08DUP	DUP	06/10/21 13:07			.2	.26	mg/L				26	20	RA
WG520771CCV	CCV	06/10/21 13:18	WC210609-3	2.002		2.16	mg/L	108	90	110			
WG520771CCB	CCB	06/10/21 13:24				U	mg/L		-0.3	0.3			
WG521282													
WG521282ICV	ICV	06/17/21 12:22	WC210609-3	2.002		2.08	mg/L	104	90	110			
WG521282ICB	ICB	06/17/21 12:26				U	mg/L		-0.3	0.3			
WG521282PQV	PQV	06/17/21 12:29	WC210528-8	.35105		.42	mg/L	120	70	130			
WG521282LFB	LFB	06/17/21 12:32	WC201221-2	5.015		5.16	mg/L	103	90	110			
WG520814PBS	PBS	06/17/21 12:40				.19	mg/L		-0.3	0.3			
L65898-09AS	AS	06/17/21 13:04	WC201221-2	5.015	.19	5.12	mg/L	98	90	110			
L65898-09DUP	DUP	06/17/21 13:12			.19	.23	mg/L				19	20	RA
WG521175PBS	PBS	06/17/21 13:23				U	mg/L		-0.3	0.3			
L65898-10DUP	DUP	06/17/21 13:42			.17	.17	mg/L				0	20	RA
WG521181PBS	PBS	06/17/21 13:48				U	mg/L		-0.3	0.3			
L65898-15DUP	DUP	06/17/21 14:03			.21	.28	mg/L				29	20	RA
WG521282CCV	CCV	06/17/21 14:07	WC210609-3	2.002		2.02	mg/L	101	90	110			
WG521282CCB	CCB	06/17/21 14:15				U	mg/L		-0.3	0.3			
WG523190													
WG523190ICV	ICV	07/14/21 11:28	WC210703-1	2.002		1.97	mg/L	98	90	110			
WG523190ICB	ICB	07/14/21 11:32				U	mg/L		-0.3	0.3			
WG523190PQV	PQV	07/14/21 11:35	WC210528-8	.35105		.37	mg/L	105	70	130			
WG523190LFB	LFB	07/14/21 11:38	WC201221-2	5.015		4.89	mg/L	98	90	110			
WG521102PBS	PBS	07/14/21 11:42				.19	mg/L		-0.3	0.3			
L65898-07AS	AS	07/14/21 12:20	WC201221-2	5.015	U	3.48	mg/L	69	90	110			M2
L65898-07DUP	DUP	07/14/21 12:33			U	U	mg/L				0	20	RA
WG523190CCV	CCV	07/14/21 13:04	WC210703-1	2.002		2.14	mg/L	107	90	110			
WG523190CCB	CCB	07/14/21 13:14				U	mg/L		-0.3	0.3			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.96	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.18	0.18			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.15027		.143	mg/L	95	70	130			
WG520882ICSAB	ICSAB	06/11/21 22:10	II210419-3	200.02		189	mg/L	94	80	120			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.18	0.18			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	1.0018		1.001	mg/L	100	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	1.0018	U	.99	mg/L	99	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	1.0018	U	1.005	mg/L	100	75	125	2	20	
L65898-06DUP	DUP	06/11/21 22:50			U	.119	mg/L				200	20	RA
L65898-11SDL	SDL	06/11/21 22:58			U	U	mg/L				0	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		.999	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.18	0.18			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.992	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.18	0.18			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.15027		.136	mg/L	91	70	130			
WG520883ICSAB	ICSAB	06/11/21 23:37	II210419-3	200.02		189	mg/L	94	80	120			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.18	0.18			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	1.0018		1.016	mg/L	101	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	1.0018	U	1.023	mg/L	102	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	1.0018	U	1.004	mg/L	100	75	125	2	20	
L65898-08DUP	DUP	06/12/21 0:17			U	U	mg/L				0	20	RA
L65898-13SDL	SDL	06/12/21 0:25			U	U	mg/L				0	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.974	mg/L	97	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.18	0.18			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.035	mg/L	102	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.18	0.18			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.15027		.145	mg/L	96	70	130			
WG520989ICSAB	ICSAB	06/14/21 22:22	II210419-3	200.02		197.8	mg/L	99	80	120			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.18	0.18			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	1.0018		1.066	mg/L	106	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	1.0018	U	1.076	mg/L	107	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	1.0018	U	1.037	mg/L	104	75	125	4	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			U	U	mg/L				0	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.995	mg/L	100	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.18	0.18			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.977	mg/L	99	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.18	0.18			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.15027		.153	mg/L	102	70	130			
WG521353ICSAB	ICSAB	06/18/21 8:53	II210419-3	200.02		185.6	mg/L	93	80	120			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.18	0.18			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	1.0018		1.004	mg/L	100	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	1.0018	U	.947	mg/L	95	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	1.0018	U	.991	mg/L	99	75	125	5	20	
L65898-10SDL	SDL	06/18/21 9:32			U	U	mg/L				0	10	

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L65898-10DUP	DUP	06/18/21 9:36			U	U	mg/L				0	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.96	mg/L	96	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.18	0.18			
WG521447													
WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.98	mg/L	99	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.18	0.18			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.15027		.153	mg/L	102	70	130			
WG521447ICSAB	ICSAB	06/20/21 21:22	II210419-3	200.02		187.2	mg/L	94	80	120			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.18	0.18			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	1.0018		1.031	mg/L	103	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L				0	10	
L65898-15DUP	DUP	06/20/21 21:53			U	U	mg/L				0	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	1.0018	U	1.045	mg/L	104	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	1.0018	U	1.021	mg/L	102	75	125	2	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.982	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.18	0.18			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		2.039	mg/L	102	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.18	0.18			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.15027		.15	mg/L	100	70	130			
WG522228ICSAB	ICSAB	06/30/21 12:22	II210628-3	200.02		201.4	mg/L	101	80	120			
WG521102PBS	PBS	06/30/21 12:38				.134	mg/L		-0.18	0.18			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	1.0018		1.069	mg/L	107	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	2.0022	206	210	mg/L	200	75	125			M3
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	2.0022	206	210	mg/L	200	75	125	0	20	M3
L65898-07DUP	DUP	06/30/21 13:01			191	199.2	mg/L				4	20	
L65898-12SDL	SDL	06/30/21 13:08			66.9	67	mg/L				0	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.947	mg/L	95	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.18	0.18			

Brown and Caldwell

ACZ Project ID: ***L65898***

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Lead (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05348	mg/L	107	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0003	0.0003			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.0005005		.00047	mg/L	94	70	130			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02002		.0196	mg/L	98	80	120			
WG520598PBS	PBS	06/11/21 13:08				.00012	mg/L		-0.0003	0.0003			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05005		.04688	mg/L	94	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05005	U	.047	mg/L	94	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.25025		.24439	mg/L	98	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0003	0.0003			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05005	U	.04709	mg/L	94	75	125	0	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.25025		.2433	mg/L	97	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0003	0.0003			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0003	0.0003			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05005		.04724	mg/L	94	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05005	U	.04685	mg/L	94	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05005	U	.04708	mg/L	94	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.25025		.24358	mg/L	97	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0003	0.0003			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05214	mg/L	104	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0003	0.0003			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.0005005		.0005	mg/L	100	70	130			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02002		.01818	mg/L	91	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0003	0.0003			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05005		.04593	mg/L	92	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.25025		.24131	mg/L	96	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0003	0.0003			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05005	U	.0459	mg/L	92	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05005	U	.04654	mg/L	93	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.25025		.24076	mg/L	96	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0003	0.0003			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05256	mg/L	105	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0003	0.0003			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.0005005		.0005	mg/L	100	70	130			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02002		.01926	mg/L	96	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0003	0.0003			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05005		.04938	mg/L	99	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05005	U	.04927	mg/L	98	75	125			
WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.25025		.25202	mg/L	101	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0003	0.0003			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05005	U	.0492	mg/L	98	75	125	0	20	

Brown and Caldwell

ACZ Project ID: ***L65898***

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WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0003	0.0003			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05005		.04917	mg/L	98	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05005	U	.0498	mg/L	100	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05005	U	.04952	mg/L	99	75	125	1	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.25025		.25352	mg/L	101	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0003	0.0003			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.05213	mg/L	104	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0003	0.0003			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.0005005		.0005	mg/L	100	70	130			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02002		.01753	mg/L	88	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.25025		.25041	mg/L	100	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0003	0.0003			
WG521102PBS	PBS	07/01/21 17:49				U	mg/L		-0.0015	0.0015			
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.25025		.22098	mg/L	88	80	120			
L65898-02SDL	SDL	07/01/21 17:54			.00376	.00425	mg/L				13	10	ZG
L65898-07DUP	DUP	07/01/21 17:58			.00489	.00472	mg/L				4	20	RA
L65898-12MS	MS	07/01/21 18:02	MS5XW	.25025	U	.21624	mg/L	86	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.25025	U	.21608	mg/L	86	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.25025		.2537	mg/L	101	90	110			
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0003	0.0003			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Magnesium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	100		98	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.6	0.6			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	1.0001		.95	mg/L	95	70	130			
WG520882ICSAB	ICSAB	06/11/21 22:10	II210419-3	500.05		506.6	mg/L	101	80	120			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.6	0.6			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	50.00302		49.25	mg/L	98	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	50.00302	8.28	57.74	mg/L	99	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	50.00302	8.28	58.32	mg/L	100	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			7.82	8.26	mg/L				5	20	
L65898-11SDL	SDL	06/11/21 22:58			14.5	14.75	mg/L				2	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	50		50.15	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.6	0.6			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	100		99.77	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.6	0.6			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	1.0001		.94	mg/L	94	70	130			
WG520883ICSAB	ICSAB	06/11/21 23:37	II210419-3	500.05		506.7	mg/L	101	80	120			
WG520599PBS	PBS	06/11/21 23:53				.49	mg/L		-0.6	0.6			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	50.00302		51.46	mg/L	103	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	50.00302	8.58	59.63	mg/L	102	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	50.00302	8.58	59.29	mg/L	101	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			8.41	10.55	mg/L				23	20	RD
L65898-13SDL	SDL	06/12/21 0:25			17.1	16.45	mg/L				4	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	50		49.32	mg/L	99	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.6	0.6			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	100		100.4	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.6	0.6			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	1.0001		.96	mg/L	96	70	130			
WG520989ICSAB	ICSAB	06/14/21 22:22	II210419-3	500.05		511.4	mg/L	102	80	120			
WG520814PBS	PBS	06/14/21 22:38				.55	mg/L		-0.6	0.6			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	50.00302		51.83	mg/L	104	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	50.00302	11.6	65.77	mg/L	108	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	50.00302	11.6	62.92	mg/L	103	75	125	4	20	
L65898-09DUP	DUP	06/14/21 23:01			11.5	11.63	mg/L				1	20	
L65898-14SDL	SDL	06/14/21 23:08			16.5	16.2	mg/L				2	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	50		49.08	mg/L	98	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.6	0.6			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	100		99.75	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.6	0.6			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	1.0001		.91	mg/L	91	70	130			
WG521353ICSAB	ICSAB	06/18/21 8:53	II210419-3	500.05		505.7	mg/L	101	80	120			
WG521175PBS	PBS	06/18/21 9:09				1.75	mg/L		-0.6	0.6			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	50.00302		49.99	mg/L	100	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	50.00302	11.3	59.93	mg/L	97	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	50.00302	11.3	60.29	mg/L	98	75	125	1	20	
L65898-10SDL	SDL	06/18/21 9:32			11	10.65	mg/L				3	10	

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L65898-10DUP	DUP	06/18/21 9:36			11	10.77	mg/L				2	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	50		48.13	mg/L	96	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.6	0.6			
WG521447													
WG521447ICV	ICV	06/20/21 21:11	II210620-2	100		99.53	mg/L	100	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.6	0.6			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	1.0001		.87	mg/L	87	70	130			
WG521447ICSAB	ICSAB	06/20/21 21:22	II210419-3	500.05		516.8	mg/L	103	80	120			
WG521181PBS	PBS	06/20/21 21:38				.84	mg/L		-0.6	0.6			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	50.00302		52.02	mg/L	104	80	120			
L65898-15SDL	SDL	06/20/21 21:50			16.5	16.15	mg/L				2	10	
L65898-15DUP	DUP	06/20/21 21:53			16.5	17.12	mg/L				4	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	50.00302	16.5	68.73	mg/L	104	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	50.00302	16.5	67.57	mg/L	102	75	125	2	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	50		49.2	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.6	0.6			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	100		99.37	mg/L	99	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.6	0.6			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	1.0001		.93	mg/L	93	70	130			
WG522228ICSAB	ICSAB	06/30/21 12:22	II210628-3	500.05		515.1	mg/L	103	80	120			
WG521102PBS	PBS	06/30/21 12:38				U	mg/L		-0.6	0.6			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	50.00302		43.28	mg/L	87	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	100.1149	46.6	128.7	mg/L	82	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	100.1149	46.6	129.58	mg/L	83	75	125	1	20	
L65898-07DUP	DUP	06/30/21 13:01			34.3	34.87	mg/L				2	20	
L65898-12SDL	SDL	06/30/21 13:08			42.3	45.05	mg/L				7	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	50		45.72	mg/L	91	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Manganese (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.949	mg/L	97	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.03	0.03			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.05005		.05	mg/L	100	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.03	0.03			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.5005		.485	mg/L	97	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.5005	.055	.538	mg/L	97	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.5005	.055	.541	mg/L	97	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			.061	.058	mg/L				5	20	RA
L65898-11SDL	SDL	06/11/21 22:58			.103	.095	mg/L				8	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		1	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.03	0.03			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.968	mg/L	98	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.03	0.03			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.05005		.05	mg/L	100	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.03	0.03			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.5005		.492	mg/L	98	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.5005	.053	.546	mg/L	99	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.5005	.053	.542	mg/L	98	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			.058	.089	mg/L				42	20	RA
L65898-13SDL	SDL	06/12/21 0:25			.153	.145	mg/L				5	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.981	mg/L	98	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.03	0.03			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		1.983	mg/L	99	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.03	0.03			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.05005		.05	mg/L	100	70	130			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.03	0.03			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.5005		.506	mg/L	101	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.5005	.08	.595	mg/L	103	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.5005	.08	.586	mg/L	101	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			.09	.092	mg/L				2	20	RA
L65898-14SDL	SDL	06/14/21 23:08			.125	.12	mg/L				4	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.985	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.03	0.03			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.96	mg/L	98	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.03	0.03			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.05005		.052	mg/L	104	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.03	0.03			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.5005		.475	mg/L	95	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.5005	.086	.535	mg/L	90	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.5005	.086	.562	mg/L	95	75	125	5	20	
L65898-10SDL	SDL	06/18/21 9:32			.082	.085	mg/L				4	10	
L65898-10DUP	DUP	06/18/21 9:36			.082	.081	mg/L				1	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.955	mg/L	96	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.03	0.03			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.953	mg/L	98	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.03	0.03			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.05005		.046	mg/L	92	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.03	0.03			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.5005		.492	mg/L	98	80	120			
L65898-15SDL	SDL	06/20/21 21:50			.122	.105	mg/L				14	10	ZG
L65898-15DUP	DUP	06/20/21 21:53			.122	.131	mg/L				7	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.5005	.122	.628	mg/L	101	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.5005	.122	.618	mg/L	99	75	125	2	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.975	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.03	0.03			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		1.973	mg/L	99	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.03	0.03			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.05005		.052	mg/L	104	70	130			
WG521102PBS	PBS	06/30/21 12:38				U	mg/L		-0.03	0.03			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.5005		.425	mg/L	85	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	1	10.3	11.028	mg/L	73	75	125			M3
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	1	10.3	10.942	mg/L	64	75	125	1	20	M3
L65898-07DUP	DUP	06/30/21 13:01			6.35	7.613	mg/L				18	20	
L65898-12SDL	SDL	06/30/21 13:08			14.2	14.77	mg/L				4	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.948	mg/L	95	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.03	0.03			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury (1312) M7470A CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG522141													
WG522141ICV	ICV	06/30/21 10:31	HG210601-3	.00501		.00487	mg/L	97	90	110			
WG522141ICB	ICB	06/30/21 10:31				U	mg/L		-0.0006	0.0006			
WG522141PQV	PQV	06/30/21 10:32	HG210628-2	.001001		.00081	mg/L	81	70	130			
WG522141LFB	LFB	06/30/21 10:33	HG210628-3	.002002		.00176	mg/L	88	85	115			
WG520598PBS	PBS	06/30/21 10:34				U	mg/L		-0.0006	0.0006			
L65898-01MS	MS	06/30/21 10:37	HG210628-3	.002002	U	.00177	mg/L	88	85	115			
L65898-01MSD	MSD	06/30/21 10:38	HG210628-3	.002002	U	.00175	mg/L	87	85	115	1	20	
L65898-06DUP	DUP	06/30/21 10:40			U	U	mg/L				0	20	RA
WG522141CCV1	CCV	06/30/21 10:42	HG210601-3	.00501		.00477	mg/L	95	90	110			
WG522141CCB1	CCB	06/30/21 10:43				U	mg/L		-0.0006	0.0006			
WG520599PBS	PBS	06/30/21 10:44				U	mg/L		-0.0006	0.0006			
WG520599LFB1	LFB	06/30/21 10:45	HG210628-3	.002002		.0018	mg/L	90	85	115			
L65898-03MS	MS	06/30/21 10:47	HG210628-3	.002002	U	.00171	mg/L	85	85	115			
L65898-03MSD	MSD	06/30/21 10:47	HG210628-3	.002002	U	.00184	mg/L	92	85	115	7	20	
L65898-08DUP	DUP	06/30/21 10:49			U	U	mg/L				0	20	RA
WG520814PBS	PBS	06/30/21 10:50				U	mg/L		-0.0006	0.0006			
WG520814LFB1	LFB	06/30/21 10:52	HG210628-3	.002002		.00199	mg/L	99	85	115			
WG522141CCV2	CCV	06/30/21 10:53	HG210601-3	.00501		.00484	mg/L	97	90	110			
WG522141CCB2	CCB	06/30/21 10:54				U	mg/L		-0.0006	0.0006			
L65898-04MS	MS	06/30/21 10:56	HG210628-3	.002002	U	.00201	mg/L	100	85	115			
L65898-04MSD	MSD	06/30/21 10:57	HG210628-3	.002002	U	.00188	mg/L	94	85	115	7	20	
L65898-09DUP	DUP	06/30/21 10:59			U	U	mg/L				0	20	RA
WG521102PBS	PBS	06/30/21 11:01				U	mg/L		-0.06	0.06			
WG521102LFB1	LFB	06/30/21 11:02	HG100XPREP	.2002		.173	mg/L	86	85	115			
L65898-02MS	MS	06/30/21 11:04	HG100XPREP	.2002	U	.173	mg/L	86	85	115			
WG522141CCV3	CCV	06/30/21 11:04	HG210601-3	.00501		.00488	mg/L	97	90	110			
WG522141CCB3	CCB	06/30/21 11:05				U	mg/L		-0.0006	0.0006			
L65898-02MSD	MSD	06/30/21 11:06	HG100XPREP	.2002	U	.175	mg/L	87	85	115	1	20	
L65898-07DUP	DUP	06/30/21 11:08			U	U	mg/L				0	20	RA
WG521175LFB1	LFB	06/30/21 11:10	HG210628-3	.002002		.00174	mg/L	87	85	115			
WG521175PBS	PBS	06/30/21 11:11				U	mg/L		-0.0006	0.0006			
L65898-05MS	MS	06/30/21 11:13	HG210628-3	.002002	U	.00166	mg/L	83	85	115			MA
L65898-05MSD	MSD	06/30/21 11:14	HG210628-3	.002002	U	.00191	mg/L	95	85	115	14	20	
WG522141CCV4	CCV	06/30/21 11:16	HG210601-3	.00501		.00484	mg/L	97	90	110			
WG522141CCB4	CCB	06/30/21 11:17				U	mg/L		-0.0006	0.0006			
L65898-10DUP	DUP	06/30/21 11:18			U	U	mg/L				0	20	RA
WG521181PBS	PBS	06/30/21 11:20				U	mg/L		-0.0006	0.0006			
L65898-15DUP	DUP	06/30/21 11:21			U	U	mg/L				0	20	RA
WG522141CCV5	CCV	06/30/21 11:24	HG210601-3	.00501		.00478	mg/L	95	90	110			
WG522141CCB5	CCB	06/30/21 11:25				U	mg/L		-0.0006	0.0006			
WG522141CCV6	CCV	06/30/21 11:56	HG210601-3	.00501		.00478	mg/L	95	90	110			
WG522141CCB6	CCB	06/30/21 11:57				U	mg/L		-0.0006	0.0006			
WG522259													
WG522259ICV	ICV	07/02/21 13:17	HG210701-3	.00501		.005	mg/L	100	95	105			
WG522259ICB	ICB	07/02/21 13:18				U	mg/L		-0.0002	0.0002			
WG522379													
WG522379CCV1	CCV	07/02/21 16:02	HG210701-3	.00501		.00524	mg/L	105	90	110			
WG522379CCB1	CCB	07/02/21 16:03				U	mg/L		-0.0006	0.0006			
WG522379PQV	PQV	07/02/21 16:04	HG210701-5	.001001		.00085	mg/L	85	70	130			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG520598PBS	PBS	07/02/21 16:06				U	mg/L		-0.0006	0.0006			
WG520598LFB1	LFB	07/02/21 16:07	HG210701-6	.002002		.00181	mg/L	90	85	115			
L65898-01MS	MS	07/02/21 16:09	HG210701-6	.002002	U	.00207	mg/L	103	85	115			
L65898-01MSD	MSD	07/02/21 16:10	HG210701-6	.002002	U	.00184	mg/L	92	85	115	12	20	
L65898-06DUP	DUP	07/02/21 16:12			U	U	mg/L				0	20	RA
WG522379CCV2	CCV	07/02/21 16:14	HG210701-3	.00501		.00507	mg/L	101	90	110			
WG522379CCB2	CCB	07/02/21 16:14				U	mg/L		-0.0006	0.0006			
WG521181LFB1	LFB	07/02/21 16:15	HG210701-6	.002002		.00215	mg/L	107	85	115			
WG521181PBS	PBS	07/02/21 16:16				U	mg/L		-0.0006	0.0006			
L65898-15DUP	DUP	07/02/21 16:18			U	U	mg/L				0	20	RA
L65898-15MS2	MS	07/02/21 16:19	HG210701-6	.002002	U	.00169	mg/L	84	85	115			MA
L65898-15MSD2	MSD	07/02/21 16:20	HG210701-6	.002002	U	.00177	mg/L	88	85	115	5	20	
WG522379CCV3	CCV	07/02/21 16:21	HG210701-3	.00501		.00504	mg/L	101	90	110			
WG522379CCB3	CCB	07/02/21 16:22				U	mg/L		-0.0006	0.0006			
WG522379LFB	LFB	07/02/21 16:41	HG210701-6	.002002		.00176	mg/L	88	85	115			
WG522379CCV4	CCV	07/02/21 16:42	HG210701-3	.00501		.00501	mg/L	100	90	110			
WG522379CCB4	CCB	07/02/21 16:43				U	mg/L		-0.0006	0.0006			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		2.017	mg/L	101	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.06	0.06			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.1002		.107	mg/L	107	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.06	0.06			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.501		.5	mg/L	100	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.501	U	.509	mg/L	102	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.501	U	.514	mg/L	103	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			U	U	mg/L				0	20	RA
L65898-11SDL	SDL	06/11/21 22:58			.028	U	mg/L					10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		1.027	mg/L	103	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.06	0.06			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		2.04	mg/L	102	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.06	0.06			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.1002		.106	mg/L	106	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.06	0.06			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.501		.509	mg/L	102	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.501	U	.52	mg/L	104	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.501	U	.516	mg/L	103	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			U	U	mg/L				0	20	RA
L65898-13SDL	SDL	06/12/21 0:25			.026	U	mg/L					10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		1.006	mg/L	101	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.06	0.06			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.043	mg/L	102	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.06	0.06			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.1002		.106	mg/L	106	70	130			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.06	0.06			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.501		.511	mg/L	102	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.501	U	.547	mg/L	109	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.501	U	.52	mg/L	104	75	125	5	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			.026	U	mg/L					10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		1.016	mg/L	102	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.06	0.06			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		2.035	mg/L	102	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.06	0.06			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.1002		.102	mg/L	102	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.06	0.06			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.501		.475	mg/L	95	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.501	U	.493	mg/L	98	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.501	U	.493	mg/L	98	75	125	0	20	
L65898-10SDL	SDL	06/18/21 9:32			U	U	mg/L					10	
L65898-10DUP	DUP	06/18/21 9:36			U	U	mg/L				0	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.97	mg/L	97	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.06	0.06			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		2.009	mg/L	100	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.06	0.06			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.1002		.099	mg/L	99	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.06	0.06			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.501		.504	mg/L	101	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L					10	
L65898-15DUP	DUP	06/20/21 21:53			U	.022	mg/L				200	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.501	U	.526	mg/L	105	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.501	U	.526	mg/L	105	75	125	0	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		1	mg/L	100	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.06	0.06			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		2.023	mg/L	101	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.06	0.06			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.1002		.105	mg/L	105	70	130			
WG521102PBS	PBS	06/30/21 12:38				U	mg/L		-0.06	0.06			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.501		.465	mg/L	93	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	1.003	U	.872	mg/L	87	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	1.003	U	.892	mg/L	89	75	125	2	20	
L65898-07DUP	DUP	06/30/21 13:01			U	U	mg/L				0	20	RA
L65898-12SDL	SDL	06/30/21 13:08			.047	U	mg/L					10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.968	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.06	0.06			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nickel (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.962	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.024	0.024			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.04016		.0476	mg/L	119	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.024	0.024			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.5		.4956	mg/L	99	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.5	.0093	.4962	mg/L	97	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.5	.0093	.5017	mg/L	98	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			.0123	.0081	mg/L				41	20	RA
L65898-11SDL	SDL	06/11/21 22:58			.0183	.06	mg/L				228	10	ZG
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		1.02	mg/L	102	90	110			
WG520882CCB1	CCB	06/11/21 23:06				.0092	mg/L		-0.024	0.024			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		2.003	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.024	0.024			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.04016		.0454	mg/L	113	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.024	0.024			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.5		.5028	mg/L	101	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.5	.0102	.5089	mg/L	100	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.5	.0102	.5062	mg/L	99	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			U	.0109	mg/L				200	20	RA
L65898-13SDL	SDL	06/12/21 0:25			.0138	.0435	mg/L				215	10	ZG
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		1.009	mg/L	101	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.024	0.024			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		2.014	mg/L	101	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.024	0.024			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.04016		.0433	mg/L	108	70	130			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.024	0.024			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.5		.5155	mg/L	103	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.5	U	.5247	mg/L	105	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.5	U	.5189	mg/L	104	75	125	1	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			.0096	U	mg/L					10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		1.012	mg/L	101	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.024	0.024			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		2.01	mg/L	101	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.024	0.024			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.04016		.0406	mg/L	101	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.024	0.024			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.5		.4927	mg/L	99	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.5	U	.4717	mg/L	94	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.5	U	.4953	mg/L	99	75	125	5	20	
L65898-10SDL	SDL	06/18/21 9:32			.0093	U	mg/L					10	
L65898-10DUP	DUP	06/18/21 9:36			.0093	U	mg/L				200	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.9894	mg/L	99	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.024	0.024			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.988	mg/L	99	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.024	0.024			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.04016		.0406	mg/L	101	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.024	0.024			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.5		.5093	mg/L	102	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L					10	
L65898-15DUP	DUP	06/20/21 21:53			U	U	mg/L				0	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.5	U	.5151	mg/L	103	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.5	U	.5125	mg/L	103	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		1.013	mg/L	101	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.024	0.024			
WG522277													
WG522277ICV	ICV	07/01/21 0:02	II210620-2	2		1.983	mg/L	99	90	110			
WG522277ICB	ICB	07/01/21 0:05				U	mg/L		-0.024	0.024			
WG522277PQV	PQV	07/01/21 0:09	II210603-2	.04016		.0425	mg/L	106	70	130			
WG521102PBS	PBS	07/01/21 0:28				U	mg/L		-0.12	0.12			
WG521102LFB1	LFB	07/01/21 0:32	II210622-2	.5		.534	mg/L	107	80	120			
L65898-02MS	MS	07/01/21 0:40	II2XWATER	.999	.511	1.4645	mg/L	95	75	125			
L65898-02MSD	MSD	07/01/21 0:44	II2XWATER	.999	.511	1.466	mg/L	96	75	125	0	20	
L65898-07DUP	DUP	07/01/21 0:52			.359	.378	mg/L				5	20	RA
L65898-12SDL	SDL	07/01/21 0:59			.308	.36	mg/L				17	10	ZG
WG522277CCV1	CCV	07/01/21 1:03	II210629-1	1		1.002	mg/L	100	90	110			
WG522277CCB1	CCB	07/01/21 1:07				U	mg/L		-0.024	0.024			
WG522323													
WG522323ICV	ICV	07/01/21 16:48	II210620-2	2		1.94	mg/L	97	90	110			
WG522323ICB	ICB	07/01/21 16:52				U	mg/L		-0.024	0.024			
WG522323PQV	PQV	07/01/21 16:56	II210603-2	.04016		.0409	mg/L	102	70	130			
WG521102PBS	PBS	07/01/21 17:16				U	mg/L		-0.12	0.12			
WG521102LFB1	LFB	07/01/21 17:20	II210622-2	.5		.486	mg/L	97	80	120			
L65898-02MS	MS	07/01/21 17:28	II2XWATER	.999	.45	1.585	mg/L	114	75	125			
L65898-02MSD	MSD	07/01/21 17:32	II2XWATER	.999	.45	1.52	mg/L	107	75	125	4	20	
L65898-07DUP	DUP	07/01/21 17:40			.65	.815	mg/L				23	20	RA
L65898-12SDL	SDL	07/01/21 17:48			.283	U	mg/L					10	
WG522323CCV1	CCV	07/01/21 17:52	II210629-1	1		.9852	mg/L	99	90	110			
WG522323CCB1	CCB	07/01/21 17:56				U	mg/L		-0.024	0.024			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Potassium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	20		19.65	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.6	0.6			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	1.004		.96	mg/L	96	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.6	0.6			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	100.0157		98.79	mg/L	99	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	100.0157	4.74	103.5	mg/L	99	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	100.0157	4.74	104.1	mg/L	99	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			5.07	5.07	mg/L				0	20	
L65898-11SDL	SDL	06/11/21 22:58			8.57	8.55	mg/L				0	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	10		9.91	mg/L	99	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.6	0.6			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	20		20.09	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.6	0.6			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	1.004		1	mg/L	100	70	130			
WG520599PBS	PBS	06/11/21 23:53				1.79	mg/L		-0.6	0.6			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	100.0157		103.2	mg/L	103	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	100.0157	5.82	107.4	mg/L	102	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	100.0157	5.82	106.6	mg/L	101	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			6.48	6.9	mg/L				6	20	
L65898-13SDL	SDL	06/12/21 0:25			10.4	10.35	mg/L				0	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	10		9.81	mg/L	98	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.6	0.6			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	20		20.08	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.6	0.6			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	1.004		1.05	mg/L	105	70	130			
WG520814PBS	PBS	06/14/21 22:38				4.14	mg/L		-0.6	0.6			B1
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	100.0157		106.7	mg/L	107	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	100.0157	7.54	116.1	mg/L	109	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	100.0157	7.54	111	mg/L	103	75	125	4	20	
L65898-09DUP	DUP	06/14/21 23:01			8.22	8.03	mg/L				2	20	
L65898-14SDL	SDL	06/14/21 23:08			11.4	11.5	mg/L				1	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	10		9.9	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.6	0.6			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	20		20.1	mg/L	101	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.6	0.6			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	1.004		1	mg/L	100	70	130			
WG521175PBS	PBS	06/18/21 9:09				2.41	mg/L		-0.6	0.6			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	100.0157		97.72	mg/L	98	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	100.0157	6.33	103	mg/L	97	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	100.0157	6.33	103.7	mg/L	97	75	125	1	20	
L65898-10SDL	SDL	06/18/21 9:32			6.68	6.75	mg/L				1	10	
L65898-10DUP	DUP	06/18/21 9:36			6.68	6.56	mg/L				2	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	10		9.54	mg/L	95	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.6	0.6			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	20		19.98	mg/L	100	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.6	0.6			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	1.004		.99	mg/L	99	70	130			
WG521181PBS	PBS	06/20/21 21:38				2.61	mg/L		-0.6	0.6			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	100.0157		105.3	mg/L	105	80	120			
L65898-15SDL	SDL	06/20/21 21:50			10.3	10.1	mg/L				2	10	
L65898-15DUP	DUP	06/20/21 21:53			10.3	10.73	mg/L				4	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	100.0157	10.3	115.7	mg/L	105	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	100.0157	10.3	114.3	mg/L	104	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	10		9.84	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.6	0.6			
WG522277													
WG522277ICV	ICV	07/01/21 0:02	II210620-2	20		19.9	mg/L	100	90	110			
WG522277ICB	ICB	07/01/21 0:05				U	mg/L		-0.6	0.6			
WG522277PQV	PQV	07/01/21 0:09	II210603-2	1.004		1.01	mg/L	101	70	130			
WG521102PBS	PBS	07/01/21 0:28				3.48	mg/L		-3	3			B1
WG521102LFB1	LFB	07/01/21 0:32	II210622-2	100.0157		107.2	mg/L	107	80	120			
L65898-02MS	MS	07/01/21 0:40	II2XWATER	200.0188	37.1	234.35	mg/L	99	75	125			
L65898-02MSD	MSD	07/01/21 0:44	II2XWATER	200.0188	37.1	235.15	mg/L	99	75	125	0	20	
L65898-07DUP	DUP	07/01/21 0:52			33.7	35.31	mg/L				5	20	
L65898-12SDL	SDL	07/01/21 0:59			43.4	46.45	mg/L				7	10	
WG522277CCV1	CCV	07/01/21 1:03	II210629-1	10		10.05	mg/L	101	90	110			
WG522277CCB1	CCB	07/01/21 1:07				U	mg/L		-0.6	0.6			
WG522323													
WG522323ICV	ICV	07/01/21 16:48	II210620-2	20		19.6	mg/L	98	90	110			
WG522323ICB	ICB	07/01/21 16:52				U	mg/L		-0.6	0.6			
WG522323PQV	PQV	07/01/21 16:56	II210603-2	1.004		.93	mg/L	93	70	130			
WG521102PBS	PBS	07/01/21 17:16				3.32	mg/L		-3	3			B1
WG521102LFB1	LFB	07/01/21 17:20	II210622-2	100.0157		103.3	mg/L	103	80	120			
L65898-02MS	MS	07/01/21 17:28	II2XWATER	200.0188	35.9	218.7	mg/L	91	75	125			
L65898-02MSD	MSD	07/01/21 17:32	II2XWATER	200.0188	35.9	228.05	mg/L	96	75	125	4	20	
L65898-07DUP	DUP	07/01/21 17:40			56	55.6	mg/L				1	20	RA
L65898-12SDL	SDL	07/01/21 17:48			34.6	34.6	mg/L				0	10	
WG522323CCV1	CCV	07/01/21 17:52	II210629-1	10		9.73	mg/L	97	90	110			
WG522323CCB1	CCB	07/01/21 17:56				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05225	mg/L	105	90	110			
WG520892ICB	ICB	06/11/21 13:01				.00014	mg/L		-0.0003	0.0003			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.00025		.0003	mg/L	120	70	130			
WG520892ICSA	ICSA	06/11/21 13:05		.00016		.00016	mg/L		-0.00025	0.00025			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02		.02048	mg/L	102	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0003	0.0003			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05		.04831	mg/L	97	80	120			
L65898-01SDL	SDL	06/11/21 13:14			.0004	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			.00023	.00023	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05	.0007	.04979	mg/L	98	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.25		.2471	mg/L	99	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0003	0.0003			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05	.0007	.0501	mg/L	99	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.25		.25166	mg/L	101	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0003	0.0003			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0003	0.0003			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05		.04748	mg/L	95	80	120			
L65898-08DUP	DUP	06/11/21 13:39			.00022	.00019	mg/L				15	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05	.0007	.05021	mg/L	99	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05	.0007	.05021	mg/L	99	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.25		.25053	mg/L	100	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0003	0.0003			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05122	mg/L	102	90	110			
WG521077ICB	ICB	06/15/21 13:57				.00011	mg/L		-0.0003	0.0003			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.00025		.00027	mg/L	108	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.00025	0.00025			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02		.01845	mg/L	92	80	120			
WG520814PBS	PBS	06/15/21 14:06				.0001	mg/L		-0.0003	0.0003			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05		.04476	mg/L	90	80	120			
L65898-04SDL	SDL	06/15/21 14:11			.00047	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			.00032	.00031	mg/L				3	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.25		.23269	mg/L	93	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0003	0.0003			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05	.00072	.04629	mg/L	91	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05	.00072	.04744	mg/L	93	75	125	2	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.25		.23314	mg/L	93	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0003	0.0003			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05145	mg/L	103	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0003	0.0003			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.00025		.00026	mg/L	104	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.00025	0.00025			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02		.01978	mg/L	99	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0003	0.0003			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05		.04948	mg/L	99	80	120			
L65898-05SDL	SDL	06/22/21 15:50			.0004	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			.00022	.00021	mg/L				5	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05	.00022	.05091	mg/L	101	75	125			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.25		.2488	mg/L	100	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0003	0.0003			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05	.00022	.05124	mg/L	102	75	125	1	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0003	0.0003			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05		.0493	mg/L	99	80	120			
L65898-15DUP	DUP	06/22/21 16:08			.00065	.00067	mg/L				3	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05	.00065	.05265	mg/L	104	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05	.00065	.0529	mg/L	105	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.25		.25682	mg/L	103	90	110			
WG521608CCB2	CCB	06/22/21 16:15				.00013	mg/L		-0.0003	0.0003			
WG522436													
WG522436ICV	ICV	07/02/21 11:35	MS210630-2	.05		.05145	mg/L	103	90	110			
WG522436ICB	ICB	07/02/21 11:36				.00014	mg/L		-0.0003	0.0003			
WG522436PQV	PQV	07/02/21 11:38	MS210526-2	.00025		.00031	mg/L	124	70	130			
WG522436ICSA	ICSA	07/02/21 11:40				U	mg/L		-0.00025	0.00025			
WG522436ICSAB	ICSAB	07/02/21 11:42	MS210610-4	.02		.02041	mg/L	102	80	120			
WG521102PBS	PBS	07/02/21 11:46				.00408	mg/L		-0.003	0.003			B1
WG521102LFB2	LFB	07/02/21 11:47	MS5XW	.25025		.29719	mg/L	119	80	120			
L65898-02SDL	SDL	07/02/21 11:51			.0082	.01	mg/L				22	10	ZG
L65898-07DUP	DUP	07/02/21 11:55			.00594	.00586	mg/L				1	20	RA
WG522436CCV1	CCV	07/02/21 12:01	MS210521-8	.25		.2454	mg/L	98	90	110			
WG522436CCB1	CCB	07/02/21 12:03				.00018	mg/L		-0.0003	0.0003			
L65898-12MS	MS	07/02/21 12:05	MS5XW	.25025	.00843	.27881	mg/L	108	75	125			
L65898-12MSD	MSD	07/02/21 12:06	MS5XW	.25025	.00843	.27208	mg/L	105	75	125	2	20	
WG522436CCV2	CCV	07/02/21 12:08	MS210521-8	.25		.24581	mg/L	98	90	110			
WG522436CCB2	CCB	07/02/21 12:10				.00018	mg/L		-0.0003	0.0003			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	42.8		42.35	mg/L	99	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.6	0.6			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	1.07075		1.1	mg/L	103	70	130			
WG520598PBS	PBS	06/11/21 22:27				.27	mg/L		-0.6	0.6			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	21.415		21.3	mg/L	99	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	21.415	15.8	30.16	mg/L	67	75	125			M2
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	21.415	15.8	29.14	mg/L	62	75	125	3	20	M2
L65898-06DUP	DUP	06/11/21 22:50			16.7	14.99	mg/L				11	20	
L65898-11SDL	SDL	06/11/21 22:58			19.4	20.05	mg/L				3	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	21.4		21.99	mg/L	103	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.6	0.6			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	42.8		42.88	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.6	0.6			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	1.07075		1.12	mg/L	105	70	130			
WG520599PBS	PBS	06/11/21 23:53				.69	mg/L		-0.6	0.6			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	21.415		16.64	mg/L	78	80	120			B1
L65898-03MS	MS	06/12/21 0:05	II210601-2	21.415	14.4	26.86	mg/L	58	75	125			M2
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	21.415	14.4	26.69	mg/L	57	75	125	1	20	M2
L65898-08DUP	DUP	06/12/21 0:17			14.7	15.6	mg/L				6	20	
L65898-13SDL	SDL	06/12/21 0:25			18	18.3	mg/L				2	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	21.4		21.61	mg/L	101	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.6	0.6			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	42.8		43.96	mg/L	103	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.6	0.6			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	1.07075		1.09	mg/L	102	70	130			
WG520814PBS	PBS	06/14/21 22:38				.37	mg/L		-0.6	0.6			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	21.415		22.15	mg/L	103	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	21.415	14.2	30.15	mg/L	74	75	125			M2
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	21.415	14.2	26.87	mg/L	59	75	125	12	20	M2
L65898-09DUP	DUP	06/14/21 23:01			14.9	14.96	mg/L				0	20	
L65898-14SDL	SDL	06/14/21 23:08			17.2	17.75	mg/L				3	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	21.4		21.87	mg/L	102	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.6	0.6			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	42.8		42.79	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.6	0.6			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	1.07075		1.12	mg/L	105	70	130			
WG521175PBS	PBS	06/18/21 9:09				.48	mg/L		-0.6	0.6			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	21.415		20.63	mg/L	96	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	21.415	14.8	33.63	mg/L	88	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	21.415	14.8	35.81	mg/L	98	75	125	6	20	
L65898-10SDL	SDL	06/18/21 9:32			16.4	16.55	mg/L				1	10	
L65898-10DUP	DUP	06/18/21 9:36			16.4	16	mg/L				2	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	21.4		20.86	mg/L	97	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.6	0.6			
WG521447													

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	42.8		42.36	mg/L	99	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.6	0.6			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	1.07075		1.08	mg/L	101	70	130			
WG521181PBS	PBS	06/20/21 21:38				.51	mg/L		-0.6	0.6			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	21.415		22.05	mg/L	103	80	120			
L65898-15SDL	SDL	06/20/21 21:50			15.2	17	mg/L				12	10	ZH
L65898-15DUP	DUP	06/20/21 21:53			15.2	18.08	mg/L				17	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	21.415	15.2	25.86	mg/L	50	75	125			M2
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	21.415	15.2	32.19	mg/L	79	75	125	22	20	RS
WG521447CCV	CCV	06/20/21 22:05	II210607-1	21.4		21.41	mg/L	100	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.6	0.6			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	42.8		43.2	mg/L	101	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.6	0.6			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	1.07075		1.09	mg/L	102	70	130			
WG521102PBS	PBS	06/30/21 12:38				.31	mg/L		-0.6	0.6			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	21.415		20.61	mg/L	96	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	42.83	66.3	105.3	mg/L	91	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	42.83	66.3	105.38	mg/L	91	75	125	0	20	
L65898-07DUP	DUP	06/30/21 13:01			66.6	69.54	mg/L				4	20	
L65898-12SDL	SDL	06/30/21 13:08			49.7	50.8	mg/L				2	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	21.4		20.76	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silver (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.02		.01857	mg/L	93	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0003	0.0003			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.000501		.00041	mg/L	82	70	130			
WG520892ICSA	ICSA	06/11/21 13:05		.00024		.00024	mg/L		-0.0005	0.0005			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.01002		.00844	mg/L	84	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0003	0.0003			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.01002		.00848	mg/L	85	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.01002	U	.00823	mg/L	82	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.02505		.02389	mg/L	95	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0003	0.0003			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.01002	U	.00831	mg/L	83	75	125	1	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.02505		.02387	mg/L	95	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0003	0.0003			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0003	0.0003			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.01002		.00854	mg/L	85	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.01002	U	.00828	mg/L	83	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.01002	U	.00828	mg/L	83	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.02505		.0238	mg/L	95	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0003	0.0003			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.02		.01892	mg/L	95	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0003	0.0003			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.000501		.0004	mg/L	80	70	130			
WG521077ICSA	ICSA	06/15/21 14:00		.00022		.00022	mg/L		-0.0005	0.0005			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.01002		.00814	mg/L	81	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0003	0.0003			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.01002		.0086	mg/L	86	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.02505		.0247	mg/L	99	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0003	0.0003			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.01002	U	.00845	mg/L	84	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.01002	U	.00855	mg/L	85	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.02505		.02466	mg/L	98	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0003	0.0003			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.02		.02065	mg/L	103	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0003	0.0003			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.000501		.00045	mg/L	90	70	130			
WG521608ICSA	ICSA	06/22/21 15:39		.00025		.00025	mg/L		-0.0005	0.0005			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.01002		.00975	mg/L	97	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0003	0.0003			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.01002		.01017	mg/L	101	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.01002	U	.00991	mg/L	99	75	125			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.02505		.02595	mg/L	104	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0003	0.0003			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.01002	U	.00991	mg/L	99	75	125	0	20	
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0003	0.0003			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.01002		.01006	mg/L	100	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.01002	U	.00989	mg/L	99	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.01002	U	.00991	mg/L	99	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.02505		.02539	mg/L	101	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0003	0.0003			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.02		.02122	mg/L	106	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0003	0.0003			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.000501		.0005	mg/L	100	70	130			
WG522390ICSA	ICSA	07/01/21 17:21		.00027		.00027	mg/L		-0.0005	0.0005			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.01002		.00963	mg/L	96	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.02505		.024	mg/L	96	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0003	0.0003			
WG521102PBS	PBS	07/01/21 17:49				.00141	mg/L		-0.0015	0.0015			B1
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.0501		.04922	mg/L	98	80	120			
L65898-02SDL	SDL	07/01/21 17:54			U	U	mg/L					10	
L65898-07DUP	DUP	07/01/21 17:58			U	U	mg/L				0	20	RA
L65898-12MS	MS	07/01/21 18:02	MS5XW	.0501	U	.04788	mg/L	96	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.0501	U	.04776	mg/L	95	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.02505		.0237	mg/L	95	90	110			
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0003	0.0003			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sodium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	100		97.89	mg/L	98	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.6	0.6			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.998		1.01	mg/L	101	70	130			
WG520598PBS	PBS	06/11/21 22:27				4.12	mg/L		-0.6	0.6			B1
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	100.0605		101.8	mg/L	102	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	100.0605	61.2	157.9	mg/L	97	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	100.0605	61.2	158.7	mg/L	97	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			48.1	47.75	mg/L				1	20	
L65898-11SDL	SDL	06/11/21 22:58			33.4	33.95	mg/L				2	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	50		49.39	mg/L	99	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.6	0.6			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	100		99.72	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.6	0.6			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.998		1.05	mg/L	105	70	130			
WG520599PBS	PBS	06/11/21 23:53				18.81	mg/L		-0.6	0.6			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	100.0605		118.5	mg/L	118	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	100.0605	76.7	175.7	mg/L	99	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	100.0605	76.7	174.7	mg/L	98	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			59.9	63.4	mg/L				6	20	
L65898-13SDL	SDL	06/12/21 0:25			47.4	46.8	mg/L				1	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	50		48.48	mg/L	97	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.6	0.6			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	100		99.57	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.6	0.6			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.998		1.06	mg/L	106	70	130			
WG520814PBS	PBS	06/14/21 22:38				52.15	mg/L		-0.6	0.6			B1
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	100.0605		151	mg/L	151	80	120			B1
L65898-04MS	MS	06/14/21 22:50	II210601-2	100.0605	107	210	mg/L	103	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	100.0605	107	206.1	mg/L	99	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			91.6	90.23	mg/L				2	20	
L65898-14SDL	SDL	06/14/21 23:08			72.2	72.15	mg/L				0	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	50		49.31	mg/L	99	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.6	0.6			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	100		99.93	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.6	0.6			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.998		1.03	mg/L	103	70	130			
WG521175PBS	PBS	06/18/21 9:09				26.89	mg/L		-0.6	0.6			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	100.0605		119.2	mg/L	119	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	100.0605	82.7	175.2	mg/L	92	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	100.0605	82.7	177.3	mg/L	95	75	125	1	20	
L65898-10SDL	SDL	06/18/21 9:32			66.2	67.15	mg/L				1	10	
L65898-10DUP	DUP	06/18/21 9:36			66.2	65.94	mg/L				0	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	50		46.39	mg/L	93	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.6	0.6			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	100		99.52	mg/L	100	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.6	0.6			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.998		1.01	mg/L	101	70	130			
WG521181PBS	PBS	06/20/21 21:38				29.91	mg/L		-0.6	0.6			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	100.0605		130.6	mg/L	131	80	120			B1
L65898-15SDL	SDL	06/20/21 21:50			55.5	54.9	mg/L				1	10	
L65898-15DUP	DUP	06/20/21 21:53			55.5	56.65	mg/L				2	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	100.0605	55.5	155.4	mg/L	100	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	100.0605	55.5	154.7	mg/L	99	75	125	0	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	50		49.28	mg/L	99	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.6	0.6			
WG522323													
WG522323ICV	ICV	07/01/21 16:48	II210620-2	100		97.77	mg/L	98	90	110			
WG522323ICB	ICB	07/01/21 16:52				U	mg/L		-0.6	0.6			
WG522323PQV	PQV	07/01/21 16:56	II210603-2	.998		1.01	mg/L	101	70	130			
WG521102PBS	PBS	07/01/21 17:16				13505	mg/L		-3	3			B1
WG521102LFB1	LFB	07/01/21 17:20	II210622-2	100.0605		13565	mg/L	13557	80	120			B1
L65898-02MS	MS	07/01/21 17:28	II2XWATER	200.0124	14600	14360	mg/L	-120	75	125			M3
L65898-02MSD	MSD	07/01/21 17:32	II2XWATER	200.0124	14600	14765	mg/L	82	75	125	3	20	
L65898-07DUP	DUP	07/01/21 17:40			28400	28700	mg/L				1	20	
L65898-12SDL	SDL	07/01/21 17:48			12400	12625	mg/L				2	10	
WG522323CCV1	CCV	07/01/21 17:52	II210629-1	50		48.4	mg/L	97	90	110			
WG522323CCB1	CCB	07/01/21 17:56				U	mg/L		-0.6	0.6			
WG522445													
WG522445ICV	ICV	07/02/21 17:45	II210620-2	100		98.99	mg/L	99	90	110			
WG522445ICB	ICB	07/02/21 17:49				U	mg/L		-0.6	0.6			
WG522445PQV	PQV	07/02/21 17:53	II210603-2	.998		1.02	mg/L	102	70	130			
WG521102PBS	PBS	07/02/21 18:13				13900	mg/L		-3	3			B1
WG521102LFB1	LFB	07/02/21 18:18	II210622-2	100.0605		14270	mg/L	14261	80	120			B1
L65898-02SDL	SDL	07/02/21 18:26			15000	15307.5	mg/L				2	10	
L65898-02MS	MS	07/02/21 18:30	II2XWATER	200.0124	15000	15155	mg/L	77	75	125			
L65898-02MSD	MSD	07/02/21 18:34	II2XWATER	200.0124	15000	15020	mg/L	10	75	125	1	20	M3
L65898-07DUP	DUP	07/02/21 18:42			15000	14870	mg/L				1	20	
WG522445CCV	CCV	07/02/21 18:45	II210629-1	50		47.88	mg/L	96	90	110			
WG522445CCB	CCB	07/02/21 18:49				U	mg/L		-0.6	0.6			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Strontium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.949	mg/L	97	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.027	0.027			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.045225		.0479	mg/L	106	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.027	0.027			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.5005		.5266	mg/L	105	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.5005	.38	.9039	mg/L	105	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.5005	.38	.9095	mg/L	106	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			.294	.3115	mg/L				6	20	
L65898-11SDL	SDL	06/11/21 22:58			.629	.658	mg/L				5	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		.985	mg/L	99	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.027	0.027			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.976	mg/L	99	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.027	0.027			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.045225		.0459	mg/L	101	70	130			
WG520599PBS	PBS	06/11/21 23:53				.2965	mg/L		-0.027	0.027			B1
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.5005		.8322	mg/L	166	80	120			B1
L65898-03MS	MS	06/12/21 0:05	II210601-2	.5005	.436	.9728	mg/L	107	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.5005	.436	.9666	mg/L	106	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			.38	.4782	mg/L				23	20	RD
L65898-13SDL	SDL	06/12/21 0:25			.864	.8615	mg/L				0	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.9675	mg/L	97	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.027	0.027			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		1.982	mg/L	99	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.027	0.027			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.045225		.0498	mg/L	110	70	130			
WG520814PBS	PBS	06/14/21 22:38				.8511	mg/L		-0.027	0.027			B1
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.5005		1.396	mg/L	279	80	120			B1
L65898-04MS	MS	06/14/21 22:50	II210601-2	.5005	.754	1.334	mg/L	116	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.5005	.754	1.309	mg/L	111	75	125	2	20	
L65898-09DUP	DUP	06/14/21 23:01			.697	.693	mg/L				1	20	
L65898-14SDL	SDL	06/14/21 23:08			1.08	1.097	mg/L				2	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.9817	mg/L	98	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.027	0.027			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.971	mg/L	99	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.027	0.027			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.045225		.0468	mg/L	103	70	130			
WG521175PBS	PBS	06/18/21 9:09				.4157	mg/L		-0.027	0.027			B1
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.5005		.9196	mg/L	184	80	120			B1
L65898-05MS	MS	06/18/21 9:20	II210601-2	.5005	.622	1.127	mg/L	101	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.5005	.622	1.145	mg/L	104	75	125	2	20	
L65898-10SDL	SDL	06/18/21 9:32			.493	.5115	mg/L				4	10	
L65898-10DUP	DUP	06/18/21 9:36			.493	.4907	mg/L				0	20	
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.9365	mg/L	94	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.027	0.027			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.972	mg/L	99	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.027	0.027			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.045225		.0425	mg/L	94	70	130			
WG521181PBS	PBS	06/20/21 21:38				.45	mg/L		-0.027	0.027			B1
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.5005		.9883	mg/L	197	80	120			B1
L65898-15SDL	SDL	06/20/21 21:50			.906	.899	mg/L				1	10	
L65898-15DUP	DUP	06/20/21 21:53			.906	.9413	mg/L				4	20	
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.5005	.906	1.468	mg/L	112	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.5005	.906	1.457	mg/L	110	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.9753	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.027	0.027			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		1.974	mg/L	99	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.027	0.027			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.045225		.0515	mg/L	114	70	130			
WG521102PBS	PBS	06/30/21 12:38				.0419	mg/L		-0.027	0.027			B1 BA
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.5005		.5522	mg/L	110	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	1.003	3.22	4.168	mg/L	95	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	1.003	3.22	4.112	mg/L	89	75	125	1	20	
L65898-07DUP	DUP	06/30/21 13:01			1.99	2.063	mg/L				4	20	
L65898-12SDL	SDL	06/30/21 13:08			.705	.724	mg/L				3	10	
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.9651	mg/L	97	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.027	0.027			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sulfate (1312) D516-07 - Turbidimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520929													
WG520929ICB	ICB	06/12/21 9:04				U	mg/L		-3	3			
WG520929ICV	ICV	06/12/21 9:04	WI210531-2	20.46		19.4	mg/L	95	90	110			
WG520929CCV1	CCV	06/12/21 10:40	WI210531-3	25		24.8	mg/L	99	90	110			
WG520929CCB1	CCB	06/12/21 10:40				U	mg/L		-3	3			
WG520929LFB	LFB	06/12/21 10:40	WI210105-3	10		9.8	mg/L	98	90	110			
WG520598PBS	PBS	06/12/21 10:40				U	mg/L		-3	3			
WG520929CCV2	CCV	06/12/21 10:42	WI210531-3	25		24.7	mg/L	99	90	110			
WG520929CCB2	CCB	06/12/21 10:42				U	mg/L		-3	3			
WG520929CCV3	CCV	06/12/21 10:50	WI210531-3	25		24.6	mg/L	98	90	110			
WG520929CCB3	CCB	06/12/21 10:50				U	mg/L		-3	3			
L65898-01AS	AS	06/12/21 10:56	SO4TURB15X	10.0000005	248	254.7	mg/L	67	90	110			M3
WG520929CCV4	CCV	06/12/21 10:57	WI210531-3	25		24.6	mg/L	98	90	110			
WG520929CCB4	CCB	06/12/21 10:57				U	mg/L		-3	3			
L65898-06DUP	DUP	06/12/21 10:58			201	217.6	mg/L				8	20	
WG520929CCV5	CCV	06/12/21 10:59	WI210531-3	25		24.5	mg/L	98	90	110			
WG520929CCB5	CCB	06/12/21 10:59				U	mg/L		-3	3			
WG520929CCV6	CCV	06/12/21 12:30	WI210531-3	25		24.9	mg/L	100	90	110			
WG520929CCB6	CCB	06/12/21 12:30				U	mg/L		-3	3			
WG520599PBS	PBS	06/12/21 12:30				U	mg/L		-3	3			
WG520814PBS	PBS	06/12/21 12:30				3.7	mg/L		-3	3			B7
WG520929CCV7	CCV	06/12/21 12:31	WI210531-3	25		24.8	mg/L	99	90	110			
WG520929CCB7	CCB	06/12/21 12:31				U	mg/L		-3	3			
WG521367													
WG521367ICB	ICB	06/18/21 8:38				U	mg/L		-3	3			
WG521367ICV	ICV	06/18/21 8:38	WI210615-1	20.46		19.9	mg/L	97	90	110			
WG521367CCV1	CCV	06/18/21 13:18	WI210615-2	25		25.2	mg/L	101	90	110			
WG521367CCB1	CCB	06/18/21 13:18				U	mg/L		-3	3			
WG521367LFB	LFB	06/18/21 13:18	WI210105-3	10		10.1	mg/L	101	90	110			
WG521175PBS	PBS	06/18/21 13:18				6.2	mg/L		-3	3			B7
WG521181PBS	PBS	06/18/21 13:18				7.8	mg/L		-3	3			B7
WG521367CCV2	CCV	06/18/21 13:18	WI210615-2	25		25.1	mg/L	100	90	110			
WG521367CCB2	CCB	06/18/21 13:18				U	mg/L		-3	3			
WG521367CCV3	CCV	06/18/21 14:03	WI210615-2	25		25.4	mg/L	102	90	110			
WG521367CCB3	CCB	06/18/21 14:03				U	mg/L		-3	3			
L65898-10DUP	DUP	06/18/21 14:03			271	276.7	mg/L				2	20	
WG521367CCV4	CCV	06/18/21 14:05	WI210615-2	25		25.2	mg/L	101	90	110			
WG521367CCB4	CCB	06/18/21 14:05				U	mg/L		-3	3			
WG523092													
WG523092ICB	ICB	07/13/21 9:59				U	mg/L		-3	3			
WG523092ICV	ICV	07/13/21 9:59	WI210629-1	20.46		19.9	mg/L	97	90	110			
WG523092CCV1	CCV	07/13/21 14:59	WI210629-2	25		25.5	mg/L	102	90	110			
WG523092CCB1	CCB	07/13/21 14:59				U	mg/L		-3	3			
WG521102PBS	PBS	07/13/21 14:59				12768.7	mg/L		-2400	2400			B1
L65898-02DUP	DUP	07/13/21 14:59			31000	31208.4	mg/L				1	20	
WG523092CCV2	CCV	07/13/21 15:01	WI210629-2	25		25.1	mg/L	100	90	110			
WG523092CCB2	CCB	07/13/21 15:01				U	mg/L		-3	3			
WG523092CCV3	CCV	07/13/21 15:11	WI210629-2	25		25.5	mg/L	102	90	110			
WG523092CCB3	CCB	07/13/21 15:11				U	mg/L		-3	3			
L65898-07AS	AS	07/13/21 15:11	SO4TURB40X	199.8	23600	24493.9	mg/L	447	90	110			M3

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG523092CCV4	CCV	07/13/21 15:12	WI210629-2	25	25	mg/L	100	90	110
WG523092CCB4	CCB	07/13/21 15:12			U	mg/L		-3	3
WG523092CCV5	CCV	07/13/21 15:58	WI210629-2	25	25.6	mg/L	102	90	110
WG523092CCB5	CCB	07/13/21 15:58			U	mg/L		-3	3
WG523092LFB	LFB	07/13/21 15:58	WI210105-3	10	9.6	mg/L	96	90	110
WG523092CCV6	CCV	07/13/21 15:59	WI210629-2	25	25.2	mg/L	101	90	110
WG523092CCB6	CCB	07/13/21 15:59			U	mg/L		-3	3

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05344	mg/L	107	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0003	0.0003			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.0005		.00043	mg/L	86	70	130			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02		.01954	mg/L	98	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0003	0.0003			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05		.04588	mg/L	92	80	120			
L65898-01SDL	SDL	06/11/21 13:14			U	U	mg/L					10	
L65898-06DUP	DUP	06/11/21 13:18			U	U	mg/L				0	20	RA
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05	U	.04599	mg/L	92	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1		.09699	mg/L	97	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0003	0.0003			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05	U	.04607	mg/L	92	75	125	0	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1		.09735	mg/L	97	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0003	0.0003			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0003	0.0003			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05		.04625	mg/L	93	80	120			
L65898-08DUP	DUP	06/11/21 13:39			U	U	mg/L				0	20	RA
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05	U	.04626	mg/L	93	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05	U	.04607	mg/L	92	75	125	0	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1		.09689	mg/L	97	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0003	0.0003			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05177	mg/L	104	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0003	0.0003			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.0005		.00046	mg/L	92	70	130			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02		.01796	mg/L	90	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0003	0.0003			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05		.04428	mg/L	89	80	120			
L65898-04SDL	SDL	06/15/21 14:11			U	U	mg/L					10	
L65898-09DUP	DUP	06/15/21 14:15			U	U	mg/L				0	20	RA
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1		.09534	mg/L	95	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0003	0.0003			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05	U	.04464	mg/L	89	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05	U	.04529	mg/L	91	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1		.09452	mg/L	95	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0003	0.0003			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05277	mg/L	106	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0003	0.0003			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.0005		.00048	mg/L	96	70	130			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02		.01932	mg/L	97	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0003	0.0003			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05		.04858	mg/L	97	80	120			
L65898-05SDL	SDL	06/22/21 15:50			U	U	mg/L					10	
L65898-10DUP	DUP	06/22/21 15:54			U	U	mg/L				0	20	RA
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05	U	.04853	mg/L	97	75	125			
WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1		.10017	mg/L	100	90	110			
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0003	0.0003			
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05	U	.04832	mg/L	97	75	125	0	20	

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0003	0.0003			
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05		.04795	mg/L	96	80	120			
L65898-15DUP	DUP	06/22/21 16:08			U	U	mg/L				0	20	RA
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05	U	.04879	mg/L	98	75	125			
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05	U	.04892	mg/L	98	75	125	0	20	
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1		.1002	mg/L	100	90	110			
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0003	0.0003			
WG522390													
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.05217	mg/L	104	90	110			
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0003	0.0003			
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.0005		.00049	mg/L	98	70	130			
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02		.01761	mg/L	88	80	120			
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.1		.10025	mg/L	100	90	110			
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0003	0.0003			
WG521102PBS	PBS	07/01/21 17:49				U	mg/L		-0.0015	0.0015			
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.2505		.22115	mg/L	88	80	120			
L65898-02SDL	SDL	07/01/21 17:54			U	U	mg/L					10	
L65898-07DUP	DUP	07/01/21 17:58			U	U	mg/L				0	20	RA
L65898-12MS	MS	07/01/21 18:02	MS5XW	.2505	U	.21695	mg/L	87	75	125			
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.2505	U	.21671	mg/L	87	75	125	0	20	
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.1		.10069	mg/L	101	90	110			
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0003	0.0003			

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium (1312) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520892													
WG520892ICV	ICV	06/11/21 12:59	MS210503-1	.05		.05254	mg/L	105	90	110			
WG520892ICB	ICB	06/11/21 13:01				U	mg/L		-0.0003	0.0003			
WG520892PQV	PQV	06/11/21 13:03	MS210526-2	.0005		.00048	mg/L	96	70	130			
WG520892ICSA	ICSA	06/11/21 13:05				U	mg/L		-0.0005	0.0005			
WG520892ICSAB	ICSAB	06/11/21 13:07	MS210420-5	.02		.0201	mg/L	101	80	120			
WG520598PBS	PBS	06/11/21 13:08				U	mg/L		-0.0003	0.0003			
WG520598LFB2	LFB	06/11/21 13:10	MS210420-3	.05		.0467	mg/L	93	80	120			
L65898-01SDL	SDL	06/11/21 13:14			.0018	.0017	mg/L				6	10	
L65898-06DUP	DUP	06/11/21 13:18			.00144	.00147	mg/L				2	20	
L65898-11MS	MS	06/11/21 13:21	MS210420-3	.05	.00321	.05126	mg/L	96	75	125			
WG520892CCV1	CCV	06/11/21 13:23	MS210521-8	.1		.09701	mg/L	97	90	110			
WG520892CCB1	CCB	06/11/21 13:25				U	mg/L		-0.0003	0.0003			
L65898-11MSD	MSD	06/11/21 13:27	MS210420-3	.05	.00321	.05114	mg/L	96	75	125	0	20	
WG520892CCV2	CCV	06/11/21 13:28	MS210521-8	.1		.09736	mg/L	97	90	110			
WG520892CCB2	CCB	06/11/21 13:30				U	mg/L		-0.0003	0.0003			
WG520599PBS	PBS	06/11/21 13:32				U	mg/L		-0.0003	0.0003			
WG520599LFB2	LFB	06/11/21 13:34	MS210420-3	.05		.04715	mg/L	94	80	120			
L65898-08DUP	DUP	06/11/21 13:39			.0014	.00144	mg/L				3	20	
L65898-13MS	MS	06/11/21 13:43	MS210420-3	.05	.00332	.05141	mg/L	96	75	125			
L65898-13MSD	MSD	06/11/21 13:45	MS210420-3	.05	.00332	.05185	mg/L	97	75	125	1	20	
WG520892CCV3	CCV	06/11/21 13:47	MS210521-8	.1		.0973	mg/L	97	90	110			
WG520892CCB3	CCB	06/11/21 13:48				U	mg/L		-0.0003	0.0003			
WG521077													
WG521077ICV	ICV	06/15/21 13:55	MS210503-1	.05		.05161	mg/L	103	90	110			
WG521077ICB	ICB	06/15/21 13:57				U	mg/L		-0.0003	0.0003			
WG521077PQV	PQV	06/15/21 13:58	MS210526-2	.0005		.00048	mg/L	96	70	130			
WG521077ICSA	ICSA	06/15/21 14:00				U	mg/L		-0.0005	0.0005			
WG521077ICSAB	ICSAB	06/15/21 14:02	MS210610-4	.02		.01866	mg/L	93	80	120			
WG520814PBS	PBS	06/15/21 14:06				U	mg/L		-0.0003	0.0003			
WG520814LFB2	LFB	06/15/21 14:08	MS210610-2	.05		.04609	mg/L	92	80	120			
L65898-04SDL	SDL	06/15/21 14:11			.00223	.00215	mg/L				4	10	
L65898-09DUP	DUP	06/15/21 14:15			.00163	.00166	mg/L				2	20	
WG521077CCV1	CCV	06/15/21 14:19	MS210521-8	.1		.0965	mg/L	97	90	110			
WG521077CCB1	CCB	06/15/21 14:20				U	mg/L		-0.0003	0.0003			
L65898-14MS	MS	06/15/21 14:22	MS210610-2	.05	.00301	.05032	mg/L	95	75	125			
L65898-14MSD	MSD	06/15/21 14:24	MS210610-2	.05	.00301	.05092	mg/L	96	75	125	1	20	
WG521077CCV2	CCV	06/15/21 14:26	MS210521-8	.1		.09582	mg/L	96	90	110			
WG521077CCB2	CCB	06/15/21 14:28				U	mg/L		-0.0003	0.0003			
WG521608													
WG521608ICV	ICV	06/22/21 15:34	MS210503-1	.05		.05206	mg/L	104	90	110			
WG521608ICB	ICB	06/22/21 15:35				U	mg/L		-0.0003	0.0003			
WG521608PQV	PQV	06/22/21 15:37	MS210526-2	.0005		.00049	mg/L	98	70	130			
WG521608ICSA	ICSA	06/22/21 15:39				U	mg/L		-0.0005	0.0005			
WG521608ICSAB	ICSAB	06/22/21 15:41	MS210610-4	.02		.0202	mg/L	101	80	120			
WG521175PBS	PBS	06/22/21 15:45				U	mg/L		-0.0003	0.0003			
WG521175LFB2	LFB	06/22/21 15:46	MS210610-2	.05		.04932	mg/L	99	80	120			
L65898-05SDL	SDL	06/22/21 15:50			.00252	.00245	mg/L				3	10	
L65898-10DUP	DUP	06/22/21 15:54			.00165	.00163	mg/L				1	20	
L65898-10MS	MS	06/22/21 15:55	MS210610-2	.05	.00165	.05213	mg/L	101	75	125			

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521608CCV1	CCV	06/22/21 15:57	MS210521-8	.1		.10046	mg/L	100	90	110		
WG521608CCB1	CCB	06/22/21 15:59				U	mg/L		-0.0003	0.0003		
L65898-10MSD	MSD	06/22/21 16:01	MS210610-2	.05	.00165	.05188	mg/L	100	75	125	0	20
WG521181PBS	PBS	06/22/21 16:03				U	mg/L		-0.0003	0.0003		
WG521181LFB2	LFB	06/22/21 16:04	MS210610-2	.05		.04962	mg/L	99	80	120		
L65898-15DUP	DUP	06/22/21 16:08			.00317	.00322	mg/L				2	20
L65898-15MS1	MS	06/22/21 16:10	MS210610-2	.05	.00317	.05412	mg/L	102	75	125		
L65898-15MSD1	MSD	06/22/21 16:12	MS210610-2	.05	.00317	.05446	mg/L	103	75	125	1	20
WG521608CCV2	CCV	06/22/21 16:14	MS210521-8	.1		.10168	mg/L	102	90	110		
WG521608CCB2	CCB	06/22/21 16:15				U	mg/L		-0.0003	0.0003		
WG522390												
WG522390ICV	ICV	07/01/21 17:16	MS210630-2	.05		.0518	mg/L	104	90	110		
WG522390ICB	ICB	07/01/21 17:18				U	mg/L		-0.0003	0.0003		
WG522390PQV	PQV	07/01/21 17:20	MS210526-2	.0005		.00049	mg/L	98	70	130		
WG522390ICSA	ICSA	07/01/21 17:21				U	mg/L		-0.0005	0.0005		
WG522390ICSAB	ICSAB	07/01/21 17:23	MS210610-4	.02		.01829	mg/L	91	80	120		
WG522390CCV1	CCV	07/01/21 17:45	MS210521-8	.1		.1007	mg/L	101	90	110		
WG522390CCB1	CCB	07/01/21 17:47				U	mg/L		-0.0003	0.0003		
WG521102PBS	PBS	07/01/21 17:49				U	mg/L		-0.0015	0.0015		
WG521102LFB2	LFB	07/01/21 17:51	MS5XW	.25		.23231	mg/L	93	80	120		
L65898-02SDL	SDL	07/01/21 17:54			.0225	.0234	mg/L				4	10
L65898-07DUP	DUP	07/01/21 17:58			.0176	.0174	mg/L				1	20
L65898-12MS	MS	07/01/21 18:02	MS5XW	.25	U	.22988	mg/L	92	75	125		
L65898-12MSD	MSD	07/01/21 18:04	MS5XW	.25	U	.2285	mg/L	91	75	125	1	20
WG522390CCV2	CCV	07/01/21 18:05	MS210521-8	.1		.10303	mg/L	103	90	110		
WG522390CCB2	CCB	07/01/21 18:07				U	mg/L		-0.0003	0.0003		

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ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Zinc (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520882													
WG520882ICV	ICV	06/11/21 21:59	II210524-1	2		1.972	mg/L	99	90	110			
WG520882ICB	ICB	06/11/21 22:02				U	mg/L		-0.06	0.06			
WG520882PQV	PQV	06/11/21 22:06	II210603-2	.05015		.053	mg/L	106	70	130			
WG520598PBS	PBS	06/11/21 22:27				U	mg/L		-0.06	0.06			
WG520598LFB1	LFB	06/11/21 22:31	II210601-2	.50075		.502	mg/L	100	80	120			
L65898-01MS	MS	06/11/21 22:39	II210601-2	.50075	U	.496	mg/L	99	75	125			
L65898-01MSD	MSD	06/11/21 22:42	II210601-2	.50075	U	.5	mg/L	100	75	125	1	20	
L65898-06DUP	DUP	06/11/21 22:50			U	U	mg/L				0	20	RA
L65898-11SDL	SDL	06/11/21 22:58			U	U	mg/L				0	10	
WG520882CCV1	CCV	06/11/21 23:02	II210607-1	1		1.003	mg/L	100	90	110			
WG520882CCB1	CCB	06/11/21 23:06				U	mg/L		-0.06	0.06			
WG520883													
WG520883ICV	ICV	06/11/21 23:25	II210524-1	2		1.992	mg/L	100	90	110			
WG520883ICB	ICB	06/11/21 23:29				U	mg/L		-0.06	0.06			
WG520883PQV	PQV	06/11/21 23:33	II210603-2	.05015		.053	mg/L	106	70	130			
WG520599PBS	PBS	06/11/21 23:53				U	mg/L		-0.06	0.06			
WG520599LFB1	LFB	06/11/21 23:57	II210601-2	.50075		.509	mg/L	102	80	120			
L65898-03MS	MS	06/12/21 0:05	II210601-2	.50075	U	.508	mg/L	101	75	125			
L65898-03MSD	MSD	06/12/21 0:09	II210601-2	.50075	U	.503	mg/L	100	75	125	1	20	
L65898-08DUP	DUP	06/12/21 0:17			U	U	mg/L				0	20	RA
L65898-13SDL	SDL	06/12/21 0:25			U	U	mg/L				0	10	
WG520883CCV1	CCV	06/12/21 0:29	II210607-1	1		.983	mg/L	98	90	110			
WG520883CCB1	CCB	06/12/21 0:32				U	mg/L		-0.06	0.06			
WG520989													
WG520989ICV	ICV	06/14/21 22:11	II210524-1	2		1.999	mg/L	100	90	110			
WG520989ICB	ICB	06/14/21 22:15				U	mg/L		-0.06	0.06			
WG520989PQV	PQV	06/14/21 22:18	II210603-2	.05015		.037	mg/L	74	70	130			
WG520814PBS	PBS	06/14/21 22:38				U	mg/L		-0.06	0.06			
WG520814LFB1	LFB	06/14/21 22:42	II210601-2	.50075		.497	mg/L	99	80	120			
L65898-04MS	MS	06/14/21 22:50	II210601-2	.50075	U	.518	mg/L	103	75	125			
L65898-04MSD	MSD	06/14/21 22:53	II210601-2	.50075	U	.486	mg/L	97	75	125	6	20	
L65898-09DUP	DUP	06/14/21 23:01			U	U	mg/L				0	20	RA
L65898-14SDL	SDL	06/14/21 23:08			U	U	mg/L				0	10	
WG520989CCV1	CCV	06/14/21 23:12	II210607-1	1		.983	mg/L	98	90	110			
WG520989CCB1	CCB	06/14/21 23:16				U	mg/L		-0.06	0.06			
WG521353													
WG521353ICV	ICV	06/18/21 8:41	II210524-1	2		1.998	mg/L	100	90	110			
WG521353ICB	ICB	06/18/21 8:44				U	mg/L		-0.06	0.06			
WG521353PQV	PQV	06/18/21 8:48	II210603-2	.05015		.053	mg/L	106	70	130			
WG521175PBS	PBS	06/18/21 9:09				U	mg/L		-0.06	0.06			
WG521175LFB1	LFB	06/18/21 9:13	II210601-2	.50075		.485	mg/L	97	80	120			
L65898-05MS	MS	06/18/21 9:20	II210601-2	.50075	U	.488	mg/L	97	75	125			
L65898-05MSD	MSD	06/18/21 9:24	II210601-2	.50075	U	.489	mg/L	98	75	125	0	20	
L65898-10SDL	SDL	06/18/21 9:32			U	U	mg/L				0	10	
L65898-10DUP	DUP	06/18/21 9:36			U	U	mg/L				0	20	RA
WG521353CCV	CCV	06/18/21 9:40	II210607-1	1		.956	mg/L	96	90	110			
WG521353CCB	CCB	06/18/21 9:43				U	mg/L		-0.06	0.06			
WG521447													

Brown and Caldwell

ACZ Project ID: ***L65898***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG521447ICV	ICV	06/20/21 21:11	II210620-2	2		1.966	mg/L	98	90	110			
WG521447ICB	ICB	06/20/21 21:15				U	mg/L		-0.06	0.06			
WG521447PQV	PQV	06/20/21 21:19	II210603-2	.05015		.047	mg/L	94	70	130			
WG521181PBS	PBS	06/20/21 21:38				U	mg/L		-0.06	0.06			
WG521181LFB1	LFB	06/20/21 21:42	II210614-2	.50075		.508	mg/L	101	80	120			
L65898-15SDL	SDL	06/20/21 21:50			U	U	mg/L				0	10	
L65898-15DUP	DUP	06/20/21 21:53			U	U	mg/L				0	20	RA
L65898-15MS2	MS	06/20/21 21:57	II210614-2	.50075	U	.513	mg/L	102	75	125			
L65898-15MSD2	MSD	06/20/21 22:01	II210614-2	.50075	U	.51	mg/L	102	75	125	1	20	
WG521447CCV	CCV	06/20/21 22:05	II210607-1	1		.98	mg/L	98	90	110			
WG521447CCB	CCB	06/20/21 22:08				U	mg/L		-0.06	0.06			
WG522228													
WG522228ICV	ICV	06/30/21 12:11	II210620-2	2		1.987	mg/L	99	90	110			
WG522228ICB	ICB	06/30/21 12:15				U	mg/L		-0.06	0.06			
WG522228PQV	PQV	06/30/21 12:18	II210603-2	.05015		.049	mg/L	98	70	130			
WG521102PBS	PBS	06/30/21 12:38				U	mg/L		-0.06	0.06			
WG521102LFB1	LFB	06/30/21 12:42	II210622-2	.50075		.435	mg/L	87	80	120			
L65898-02MS	MS	06/30/21 12:49	II2XWATER	.9884	.469	1.295	mg/L	84	75	125			
L65898-02MSD	MSD	06/30/21 12:53	II2XWATER	.9884	.469	1.331	mg/L	87	75	125	3	20	
L65898-07DUP	DUP	06/30/21 13:01			.263	.279	mg/L				6	20	
L65898-12SDL	SDL	06/30/21 13:08			.023	U	mg/L				100	10	ZG
WG522228CCV1	CCV	06/30/21 13:12	II210629-1	1		.908	mg/L	91	90	110			
WG522228CCB1	CCB	06/30/21 13:16				U	mg/L		-0.06	0.06			

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-01	WG520882	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520882	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522379	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-02	WG522390	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Barium (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522436	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Cadmium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522228	Calcium (1312)	M6010D ICP	BA	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 20X the concentration in the method blank.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG523211	Chloride (1312)	SM4500Cl-E	D1	Sample required dilution due to matrix.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522390	Chromium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522277	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523190	Fluoride (1312)	SM4500F-C	DL	Sample required dilution due to high AL and/or FE value.
			SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Iron (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522390	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522228	Manganese (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522141	Mercury (1312)	M7470A CVAA	D1	Sample required dilution due to matrix.
			M7470A CVAA	DA	Sample required dilution due to reactivity.
			M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522277	Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522436	Selenium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Silver (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522323	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522228	Strontium (1312)	M6010D ICP	BA	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 20X the concentration in the method blank.
	WG523092	Sulfate (1312)	D516-07 - Turbidimetric	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521102	Synthetic Precip. Leaching Procedure	M1312 (Modified)	N1	See Case Narrative.
	WG522390	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522206	Total Hot Plate Digestion	M3010A ICP-MS	D1	Sample required dilution due to matrix.
			M3010A ICP-MS	DA	Sample required dilution due to reactivity.
			M3010A ICP-MS	DD	Sample required dilution due to matrix color or odor.
			M3010A ICP-MS	DH	Sample required dilution due to high TDS and/or EC value.
	WG522020		M3010A ICP	DJ	Sample dilution required due to insufficient sample.
	WG522228	Zinc (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-03	WG520883	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520883	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Magnesium (1312)	M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
		Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Silica (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-04	WG520989	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520989	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521077	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521077	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-05	WG521353	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521608	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [< MDL].
	WG521353	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521608	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Magnesium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521608	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521367	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521608	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-06	WG520882	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520882	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522379	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-07	WG522390	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Barium (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522436	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Cadmium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522323	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG523211	Chloride (1312)	SM4500Cl-E	D1	Sample required dilution due to matrix.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522390	Chromium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522323	Copper (1312)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG523190	Fluoride (1312)	SM4500F-C	DL	Sample required dilution due to high AL and/or FE value.
			SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Iron (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522390	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522228	Manganese (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522141	Mercury (1312)	M7470A CVAA	D1	Sample required dilution due to matrix.
			M7470A CVAA	DA	Sample required dilution due to reactivity.
			M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522323	Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522436	Selenium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Silver (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522445	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522228	Strontium (1312)	M6010D ICP	BA	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 20X the concentration in the method blank.
	WG523092	Sulfate (1312)	D516-07 - Turbidimetric	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521102	Synthetic Precip. Leaching Procedure	M1312 (Modified)	N1	See Case Narrative.
	WG522390	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522206	Total Hot Plate Digestion	M3010A ICP-MS	D1	Sample required dilution due to matrix.
			M3010A ICP-MS	DA	Sample required dilution due to reactivity.
			M3010A ICP-MS	DD	Sample required dilution due to matrix color or odor.
			M3010A ICP-MS	DH	Sample required dilution due to high TDS and/or EC value.
	WG522228	Zinc (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-08	WG520883	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520883	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Magnesium (1312)	M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
		Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Silica (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-09	WG520989	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520989	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521077	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521077	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-10	WG521353	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521608	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [< MDL].
	WG521353	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521608	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Magnesium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521608	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521367	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521608	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521353	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-11	WG520882	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520882	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522379	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520882	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-12	WG522390	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Barium (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522436	Beryllium (1312)	M6020B ICP-MS	D1	Sample required dilution due to matrix.
			M6020B ICP-MS	D5	Sample required dilution. Sample matrix causing internal standards to recover outside method limits.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Cadmium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522228	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG523211	Chloride (1312)	SM4500Cl-E	D1	Sample required dilution due to matrix.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522390	Chromium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522323	Copper (1312)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG523190	Fluoride (1312)	SM4500F-C	DL	Sample required dilution due to high AL and/or FE value.
			SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Iron (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522390	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522228	Manganese (1312)	M6010D ICP	M3	The spike recovery value is unusable since the analyte

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG522141	Mercury (1312)	M7470A CVAA	D1	Sample required dilution due to matrix.
			M7470A CVAA	DA	Sample required dilution due to reactivity.
			M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522228	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522323	Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522436	Selenium (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522390	Silver (1312)	M6020B ICP-MS	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522323	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG522228	Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG523092	Sulfate (1312)	D516-07 - Turbidimetric	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521102	Synthetic Precip. Leaching Procedure	M1312 (Modified)	N1	See Case Narrative.
	WG522390	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522206	Total Hot Plate Digestion	M3010A ICP-MS	D1	Sample required dilution due to matrix.
			M3010A ICP-MS	DA	Sample required dilution due to reactivity.
			M3010A ICP-MS	DD	Sample required dilution due to matrix color or odor.
			M3010A ICP-MS	DH	Sample required dilution due to high TDS and/or EC value.
	WG522228	Zinc (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-13	WG520883	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520883	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG520892	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520771	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520892	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Magnesium (1312)	M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
		Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520892	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Silica (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG520892	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520883	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-14	WG520989	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520989	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521077	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521077	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521077	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Manganese (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG522141	Mercury (1312)	M7470A CVAA	H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521077	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG520929	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521077	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG520989	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L65898-15	WG521447	Aluminum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Antimony (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Arsenic (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Beryllium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6020B ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [< MDL].
	WG521447	Boron (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Cadmium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Calcium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521553	Chloride (1312)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG521608	Chromium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Copper (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521282	Fluoride (1312)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Iron (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521608	Lead (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Magnesium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Manganese (1312)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG522379	Mercury (1312)	M7470A CVAA	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Molybdenum (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nickel (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Potassium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above

Brown and Caldwell ACZ Project ID: ***L65898***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					the method reporting limit. See Case Narrative.
	WG521608	Selenium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Silica (1312)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	RS	RPD of matrix spikes for total or total recoverable silica is outside acceptance limits. Acceptable precision for other metals indicates silica RPD failure may be attributed to digestion-triggered silica polymerization and precipitation.
			M6010D ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG521608	Silver (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Sodium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (1312)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG521367	Sulfate (1312)	D516-07 - Turbidimetric	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521608	Thallium (1312)	M6020B ICP-MS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521447	Zinc (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L65898
Date Received: 05/18/2021 16:11
Received By:
Date Printed: 5/19/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L65898
Date Received:	05/18/2021 16:11
Received By:	
Date Printed:	5/19/2021

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L65898

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald.com
Address: 1527 Cole Blvd, Suite 300
Lakewood, CO 80401
Telephone: 575-418-7069

Copy of Report to:

Name:
Company:
E-mail:
Telephone:

Invoice to:

Name: Same as above
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SPLP-MOD-2021
PO#:
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SPLP-MOD-2021							
WBA-480-720-OCWD	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
WBA-480-720-ocwd-mod	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WBA-480-720-MOW	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WBA-480-720-TIC	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WBA-480-720-ARC	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WHAT-640-710-OCWD	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
What-640-710-ocwd-mod	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WHAT-640-710-MOW	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WHAT-640-710-TIC	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐
WHAT-640-710-ARC	5/3/21			☒	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			~~5/5~~ 4/5/21 .35
			5/5/21

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L65898 Chain of Custody

ACZ Laboratories, Inc. L65898

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald.com
Address: 1527 Cole Blvd, Suite 300
Lakewood, CO 80401
Telephone: 575-418-7069

Copy of Report to:

Name:
Company:
E-mail:
Telephone:

Invoice to:

Name: Same as above
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SPLP-MOD-2021
PO#:
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SPLP-MOD-2021							
TLCHT-670-720-OCWD	3/23/21 15:00	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
Tlcht-670-720-ocwd-mod	3/23/21 15:00			☒	☐	☐	☐	☐	☐	☐	☐
TLCHT-670-720-MOW	3/23/21 15:00			☒	☐	☐	☐	☐	☐	☐	☐
TLCHT-670-720-TIC	3/23/21 15:00			☒	☐	☐	☐	☐	☐	☐	☐
TLCHT-670-720-ARC	3/23/21 15:00			☒	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			4/5/21 13:11

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald.com
Address: 1527 Cole Blvd ste. 300
Lakewood CO 80401
Telephone: 575-418-7069

Copy of Report to:

Name:
Company:
E-mail:
Telephone:

Invoice to:

Name: Kelly Donahue
Company: BC
E-mail: kdonahue@brwncald.com
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: KDonahue

Sampler's Site Information State CA Zip code_____ Time Zone_____

***Sampler's Signature:** Kelly Donahue

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: SOQUEL BAC-MWMP-SPLP-2020
PO#: 155341
Reporting state for compliance testing: CA
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	MWMP	SPLP	H4 HCL	H2O2	Whole Rock 365			
WBA-480-720	3/23/21 10:00	SO	2	[redacted]	☒	☒	☒	☒	☐	☐	☐
WHTA-640-710	3/23/21 13:00	SO	2	[redacted]	☒	☒	☒	☒	☐	☐	☐
TLCHT-670-720	3/23/21 15:00	SO	2	[redacted]	☒	☒	☒	☒	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

MWMP samples will be selected after SPLP tests are complete hold materials

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Kelly Donahue	3/23/21 1700		

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Quote Number: SPLP-MOD-2021

Matrix: Soil — 3 Soil Samples x 5 Water Types = 15 samples

Parameter	Method	Detection Limit	Cost/Sample
Diskette/QC Summary			
Quality Control Summary			$0.00
Special reporting requirements			$0.00
Inorganic Prep			
Total Hot Plate Digestion	M3010A ICP		$0.00
Total Hot Plate Digestion	M3010A ICP-MS		$0.00
Metals Analysis			
Metals by ICP			$75.00
Metals by ICP-MS			$80.00
Aluminum (1312)	M6010D ICP	0.05 mg/L	$0.00
Antimony (1312)	M6020B ICP-MS	0.0004 mg/L	$0.00
Arsenic (1312)	M6020B ICP-MS	0.0002 mg/L	$0.00
Barium (1312)	M6010D ICP	0.007 mg/L	$0.00
Beryllium (1312)	M6020B ICP-MS	0.00008 mg/L	$0.00
Boron (1312)	M6010D ICP	0.03 mg/L	$0.00
Cadmium (1312)	M6020B ICP-MS	0.00005 mg/L	$0.00
Calcium (1312)	M6010D ICP	0.1 mg/L	$0.00
Chromium (1312)	M6020B ICP-MS	0.0005 mg/L	$0.00
Copper (1312)	M6010D ICP	0.01 mg/L	$0.00
Iron (1312)	M6010D ICP	0.06 mg/L	$0.00
Lead (1312)	M6020B ICP-MS	0.0001 mg/L	$0.00
Magnesium (1312)	M6010D ICP	0.2 mg/L	$0.00
Manganese (1312)	M6010D ICP	0.01 mg/L	$0.00
Mercury (1312)	M7470A CVAA	0.0002 mg/L	$26.75
Molybdenum (1312)	M6010D ICP	0.02 mg/L	$0.00
Nickel (1312)	M6010D ICP	0.008 mg/L	$0.00
Potassium (1312)	M6010D ICP	0.2 mg/L	$0.00
Selenium (1312)	M6020B ICP-MS	0.0001 mg/L	$0.00
Silica (1312)	M6010D ICP	0.214 mg/L	$0.00
Silver (1312)	M6020B ICP-MS	0.0001 mg/L	$0.00
Sodium (1312)	M6010D ICP	0.2 mg/L	$0.00
Strontium (1312)	M6010D ICP	0.009 mg/L	$0.00
Thallium (1312)	M6020B ICP-MS	0.0001 mg/L	$0.00
Uranium (1312)	M6020B ICP-MS	0.0001 mg/L	$0.00
Zinc (1312)	M6010D ICP	0.02 mg/L	$0.00

REPAD.09.06.05.01

S/ sw D/ 21 P/

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Misc.			
Electronic Data Deliverable			$0.00
Sample Preparation			
Synthetic Precip. Leaching Procedure	M1312 (Modified)		$77.25
Soil Analysis			
Sample Weight	Rad Disposal Compliance	g	$0.00
Wet Chemistry			
Chloride (1312)	SM4500Cl-E	0.5 mg/L	$11.25
Fluoride (1312)	SM4500F-C	0.15 mg/L	$11.25
Sulfate (1312)	D516-07 - Turbidimetric	1 mg/L	$11.25
		Cost/Sample:	**$292.75**

SPLP Method 1312 using a solution to solids ratio of 4:1
Five soil samples xFour reagent solutions
Deionized water to compare with previous results
Three client prepared water solutions. Pricing is based on standard TAT.

BAC SPLP requirements - run each sample for quote SPLP-MOD-2021

#	To create leachate - Sample ID	Use Soil ID	Use Water ID
1	WBA-480-720-OCWD	WBA-480-720	OCWD
2	WBA-480-720-OCWD-MOD	WBA-480-720	OCWD modified w/ sodium bisulfate to get ORP around 100 Mv (Ag/AgCl electrode)
3	WBA-480-720-MOW	WBA-480-720	MOW
4	WBA-480-720-TIC	WBA-480-720	TIC
5	WBA-480-720-ARC	WBA-480-720	ARC
6	WHAT-640-710-OCWD	WHAT-640-710	OCWD
7	WHAT-640-710-OCWD-MOD	WHAT-640-710	OCWD modified w/ sodium bisulfate to get ORP around 100 Mv (Ag/AgCl electrode)
8	WHAT-640-710-MOW	WHAT-640-710	MOW
9	WHAT-640-710-TIC	WHAT-640-710	TIC
10	WHAT-640-710-ARC	WHAT-640-710	ARC
11	TLCHT-670-720-OCWD	TLCHT-670-720	OCWD
12	TLCHT-670-720-OCWD-MOD	TLCHT-670-720	OCWD modified w/ sodium bisulfate to get ORP around 100 Mv (Ag/AgCl electrode)
13	TLCHT-670-720-MOW	TLCHT-670-720	MOW
14	TLCHT-670-720-TIC	TLCHT-670-720	TIC
15	TLCHT-670-720-ARC	TLCHT-670-720	ARC

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520598

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/08/2021 14:13
Start Date/Time: 06/08/2021 16:45
End Date/Time: 06/09/2021 2:30

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520598CSTD1	NONE	As Rec		06/08/21 16:45			10.08		10.01	10.01			21.8	
2	WG520598CSTD2	NONE	As Rec		06/08/21 16:45			7.04		7	7			21.9	
3	WG520598CSTD3	NONE	As Rec		06/08/21 16:45			2.06		2.03	2.03			21.9	
4	WG520598ICV	PCN63115	As Rec		06/08/21 16:45			4.07		3.97	4.02			22	
5	WG520598PBS	NONE	As Rec		06/08/21 16:45	0	600	7.67	1080	7.51	7.6	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.9	
6	WG520598LFB1	II210601-2	As Rec		06/08/21 16:45	0	600	7.67	1080	7.51	7.6	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.9	
7	WG520598LFB2	MS210420-3	As Rec		06/08/21 16:45	0	600	7.67	1080	7.51	7.6	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.9	
8	**L65898-01**	WBA-480-720-OCWD	As Rec		06/08/21 16:45	150	600	7.67	1080	7.88	7.93	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.3	
9	L65898-01MS	II210601-2	As Rec		06/08/21 16:45	150	600	7.67	1080	7.88	7.93	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.3	
10	L65898-01MSD	II210601-2	As Rec		06/08/21 16:45	150	600	7.67	1080	7.88	7.93	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.3	
11	**L65898-06**	WHAT-640-710-OCWD	As Rec		06/08/21 16:45	150	600	7.67	1080	7.97	7.97	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.5	
12	L65898-06DUP	NONE	As Rec		06/08/21 16:45	150	600	7.67	1080	7.99	7.99	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.4	
13	**L65898-11**	TLCHT-670-720-OCWD	As Rec		06/08/21 16:45	150	600	7.67	1080	7.86	7.89	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.4	
14	L65898-11MS	MS210420-3	As Rec		06/08/21 16:45	150	600	7.67	1080	7.86	7.89	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.4	
15	WG520598CCV1	PCN63115	As Rec		06/08/21 16:45			4.07		4.01	4.02				Buffers at room temp. analysis not affected. CM 6-11-21
16	L65898-11MSD	MS210420-3	As Rec		06/08/21 16:45	150	600	7.67	1080	7.86	7.89	6/8/2021 4:45:00 PM	6/9/2021 10:45:00 AM	21.4	
17	WG520598CCV2	PCN63115	As Rec		06/08/21 16:45			4.07		4.01	4.03				

Report Comments: _____

Internal Comments _____

6/9/2021 2:24:33 PM 60421

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520598

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/08/2021 14:13
Start Date/Time: 06/08/2021 16:45
End Date/Time: 06/09/2021 2:30

Sample	Login Comments
L65898-01	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-01MS	ICP Spike
L65898-01MSD	ICP Spike
L65898-06	U,ZIPLOCK(2) ||
L65898-11	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-11MS	ICPMS Spike
L65898-11MSD	ICPMS Spike
WG520598LFB1	ICP LFB
WG520598LFB2	ICPMS LFB

Report Comments: _____

Internal Comments _____

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: GKH
Date: 6/9/21

Approved: CCA
Date: 6-11-21

Analyst: GKH

Workgroup: WG520598

Analysis Date: 6/8/21 - 6/9/21

Sample type used: SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?	✓		
4. Was the proper sub-sample used (as received, client prep,<2000, <500, <250, dry, R&P, RPLL)?	✓		
5. Were the dilution factor calculation checked (~~final~~ volume, weight, %solid)? 4:1	✓		
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?	✓		
8. Is the appropriate spike in the computer-designated line?	✓		
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?	✓		
11. Is your instrument calibration passing (and included in the data package if needed)?	✓		
12. Are any Special Instructions pertaining to the workgroup included in the data package?	✓		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
BUFFER 10	PCN63117	6/30/22
7	PCN63116	9/30/22
2	PCN63355	3/31/23

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments: _____

Qualtrax ID: 1223
Revision #: 3

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
5/14/2021	sw		Use a 4:1 liquid to solid ratio. For sample IDs ending in SPLP, use standard solution. For IDs ending in SCVWD, use water labeled SCVWD. For MOW IDs, use MOW water. For OCWD IDs, use OCWD water.

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # WG520598

Sample # PBS/LFB

Preliminary Evaluations

Sample is 100 % Solid

↓

Proceed to Particle Size / Surface Area Determination

Sample is Multiphase

↓

Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid

↓

The liquid filtrate is analyzed as the extract.

Extraction

↓

Weight of Sample (100g min)	0
Extraction Fluid Used	OCWD
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	7.67
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/8/21 4:45P
Time out of Extractor	6/9/21 10:45A
High Temperature (C)	24
Low Temperature (C)	24

18 Hrs ± 2 Hrs

23° C ± 2° C

Sample is > 0.5% solid

↓

Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? NO

Method of Reduction: N/A

↓

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

↓

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 520598

Sample # L65898-01 MS/MSD
L65898-06/DUP

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? NO

Method of Reduction: N/A

Extraction

Weight of Sample (100g min) 150.0

Extraction Fluid Used DCWD

SCN of Extraction Fluid N/A

pH of Extraction Fluid 7.67

Vol. of Extraction Fluid (mL) 600

Time in Extractor 6/8/21 4:45P

Time out of Extractor 6/9/21 10:45A

} 18 Hrs ± 2 Hrs

High Temperature (C) 24

Low Temperature (C) 24

} 23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

→ Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 520598

Sample # L658896-11 MS/MSD

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____
Filtrate Container Weight: _____
Sample Weight (100g min): _____
Weight of Filtrate: _____
Weight of Solid _____
Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? YES
> 3.1 cm² ? NO
Method of Reduction: SIEVE

Extraction

Extraction Fluid Determination

Weight of Sample (100g min)	150.0
Extraction Fluid Used	OCWD
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	7.67
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/8/21 4:45P
Time out of Extractor	6/9/21 10:45A
High Temperature (C)	24
Low Temperature (C)	24

18 Hrs ± 2 Hrs

23° C ± 2° C

Sample Description _____
Sampling Location _____
Testing for Cyanide _____

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520598

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/08/2021 14:13
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520598CSTD1	NONE						10.08							
2	WG520598CSTD2	NONE						7.04							
3	WG520598CSTD3	NONE						2.06							
4	WG520598ICV	PCN63115						4.07							
5	WG520598PBS	NONE						7.67							
6	WG520598LFB1	II210601-2													
7	WG520598LFB2	MS210420-3													
8	**L65898-01**	WBA-480-720-OCWD													
9	L65898-01MS	II210601-2													
10	L65898-01MSD	II210601-2													
11	**L65898-06**	WHAT-640-710-OCWD													
12	L65898-06DUP	NONE													
13	**L65898-11**	TLCHT-670-720-OCWD													
14	L65898-11MS	MS210420-3													
15	WG520598CCV1	PCN63115						4.07							
16	L65898-11MSD	MS210420-3						7.67							
17	WG520598CCV2	PCN63115						4.07							

Report Comments: 4:1 LIQUID TO SOLID RATIO PER CLIENT REQUEST GKH 6/9/21

Internal Comments

6/9/2021 9:38:43 AM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520598

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/08/2021 14:13
Start Date/Time:
End Date/Time:

Sample	Login Comments
L65898-01	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-01MS	ICP Spike
L65898-01MSD	ICP Spike
L65898-06	U,ZIPLOCK(2) ||
L65898-11	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-11MS	ICPMS Spike
L65898-11MSD	ICPMS Spike
WG520598LFB1	ICP LFB
WG520598LFB2	ICPMS LFB

Report Comments: _____

_____

Internal Comments _____

_____

6/9/2021 9:38:43 AM 60421

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG520598

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	6/9/2021 3:03:04 PM
SREV:	CRA	6/11/2021 3:50:21 PM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG520598

Date Reported: 11-Jun-21
Run ID: R1823281
Date Analyzed: 08-Jun-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG520598ICV

Tag:

Measured: 6/8/2021 4:45:03 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.07	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	3.97	1		units	++					
SREV	TEMPERATURE	PREP	22	1		C	++	0.1	0.1			

WG520598PBS

Tag:

Measured: 6/8/2021 4:45:04 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.6	1		units	++					
SREV	PRE FILTER PH	PREP	7.51	1		units	++					
SREV	TEMPERATURE	PREP	21.9	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG520598LFB1

Tag:

Measured: 6/8/2021 4:45:05 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.6	1		units	++					
SREV	PRE FILTER PH	PREP	7.51	1		units	++					
SREV	TEMPERATURE	PREP	21.9	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG520598LFB2

Tag:

Measured: 6/8/2021 4:45:06 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.6	1		units	++					
SREV	PRE FILTER PH	PREP	7.51	1		units	++					
SREV	TEMPERATURE	PREP	21.9	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

L65898-01

Tag:

Measured: 6/8/2021 4:45:07 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.67	1		units	++					
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++					
SREV	POST FILTER PH	312-MOD	7.93	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.88	1		units	++					
SREV	TEMPERATURE	312-MOD	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-01MS

Tag:

Measured: 6/8/2021 4:45:08 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.93	1		units	++					
SREV	PRE FILTER PH	PREP	7.88	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-01MSD

Tag:

Measured: 6/8/2021 4:45:09 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.93	1		units	++					
SREV	PRE FILTER PH	PREP	7.88	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-06

Tag:

Measured: 6/8/2021 4:45:10 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.67	1		units	++					
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++					
SREV	POST FILTER PH	312-MOD	7.97	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.97	1		units	++					
SREV	TEMPERATURE	312-MOD	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-06DUP

Tag: Measured: 6/8/2021 4:45:11 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.99	1		units	++					
SREV	PRE FILTER PH	PREP	7.99	1		units	++					
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-11

Tag: Measured: 6/8/2021 4:45:12 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.67	1		units	++					
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++					
SREV	POST FILTER PH	312-MOD	7.89	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.86	1		units	++					
SREV	TEMPERATURE	312-MOD	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-11MS

Tag: Measured: 6/8/2021 4:45:13 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.89	1		units	++					
SREV	PRE FILTER PH	PREP	7.86	1		units	++					
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

WG520598CCV1

Tag: Measured: 6/8/2021 4:45:14 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.07	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	4.01	1		units	++					

L65898-11MSD

Tag:

Measured: 6/8/2021 4:45:15 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.67	1		units	++					
SREV	EXTRACTION TIME	PREP	1080	1		min	++					
SREV	POST FILTER PH	PREP	7.89	1		units	++					
SREV	PRE FILTER PH	PREP	7.86	1		units	++					
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

WG520598CCV2

Tag:

Measured: 6/8/2021 4:45:16 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.07	1		units	++					
SREV	POST FILTER PH	PREP	4.03	1		units	++					
SREV	PRE FILTER PH	PREP	4.01	1		units	++					

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520814

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/10/2021 14:14
Start Date/Time: 06/10/2021 15:45
End Date/Time: 06/11/2021 9:45

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520814CSTD1	NONE	As rec		06/10/21 15:45			10.04		10.01	10.01			22.7	
2	WG520814CSTD2	NONE	As rec		06/10/21 15:45			7		6.98	6.98			22.7	
3	WG520814CSTD3	NONE	As rec		06/10/21 15:45			2.04		2.01	2.01			22.7	
4	WG520814ICV	PCN63115	As rec		06/10/21 15:45			3.95		3.95	4.02			22.8	
5	WG520814PBS	NONE	As rec		06/10/21 15:45	0	600	7.73	960	7.59	7.66	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	21	
6	WG520814LFB1	II210601-2	As rec		06/10/21 15:45	0	600	7.73	960	7.59	7.66	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	21	
7	WG520814LFB2	MS210420-3	As rec		06/10/21 15:45	0	600	7.73	960	7.59	7.66	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	21	
8	**L65898-04**	WBA-480-720-TIC	As rec		06/10/21 15:45	150	600	7.73	960	7.74	7.76	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.7	
9	L65898-04MS	II210601-2	As rec		06/10/21 15:45	150	600	7.73	960	7.74	7.76	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.7	
10	L65898-04MSD	II210601-2	As rec		06/10/21 15:45	150	600	7.73	960	7.74	7.76	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.7	
11	**L65898-09**	WHAT-640-710-TIC	As rec		06/10/21 15:45	150	600	7.73	960	7.73	7.77	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.7	
12	L65898-09DUP	NONE	As rec		06/10/21 15:45	150	600	7.73	960	7.76	7.79	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.6	
13	**L65898-14**	TLCHT-670-720-TIC	As rec		06/10/21 15:45	150	600	7.73	960	7.75	7.8	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.9	
14	L65898-14MS	MS210420-3	As rec		06/10/21 15:45	150	600	7.73	960	7.75	7.8	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.9	
15	WG520814CCV1	PCN63115	As rec		06/10/21 15:45			4.04		4.03	4.02			22.3	
16	L65898-14MSD	MS210420-3	As rec		06/10/21 15:45	150	600	7.73	960	7.75	7.8	6/10/2021 3:45:00 PM	6/11/2021 7:45:00 AM	20.9	
17	WG520814CCV2	PCN63115	As rec		06/10/21 15:45			4.04		4.03	4.02			22.3	

Report Comments: _____

Internal Comments _____

6/11/2021 9:37:11 AM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520814

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/10/2021 14:14
Start Date/Time: 06/10/2021 15:45
End Date/Time: 06/11/2021 9:45

Sample	Login Comments
L65898-04	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-04MS	ICP Spike
L65898-04MSD	ICP Spike
L65898-09	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-14	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-14MS	ICPMS Spike
L65898-14MSD	ICPMS Spike
WG520814LFB1	ICP LFB
WG520814LFB2	ICPMS LFB

Report Comments:

Internal Comments

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: GKH
Date: 6/11/21

Approved: EKA
Date: 6-15-21

Analyst: GKH

Workgroup: WG520814

Analysis Date: 6/10/21-6/11/21

Sample type used: SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?	✓		✓ GKH 6/11/21
4. Was the proper sub-sample used (as received, client prep,<2000, <500, <250, dry, R&P, RPLL)?	✓		
5.Were the dilution factor calculation checked (final volume, weight, %solid)?	✓		
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?	✓		
8. Is the appropriate spike in the computer-designated line?	✓		
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?	✓		
11. Is your instrument calibration passing (and included in the data package if needed)?	✓		
12. Are any Special Instructions pertaining to the workgroup included in the data package?	✓		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?			

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
BUFFER 10	PCN63117	6/30/22
7	PCN63116	9/30/22
2	PCN63355	3/31/23

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments:

Qualtrax ID: 1223
Revision #: 3

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 520814

Sample # PBS/LFB

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? NO

Method of Reduction: N/A

Extraction

Weight of Sample (100g min)	0
Extraction Fluid Used	TIC
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	7.73
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/10/21 345P
Time out of Extractor	6/11/21 7:45A
High Temperature (C)	24
Low Temperature (C)	23

18 Hrs ± 2 Hrs

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

→ Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 520814

Sample # L65898-04 MS/MSD
L65898-09/DUP

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? NO

Method of Reduction: N/A

Extraction

Weight of Sample (100g min)	150.0
Extraction Fluid Used	TIC
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	7.73
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/10/21 3:45P
Time out of Extractor	6/11/21 7:45A
High Temperature (C)	24
Low Temperature (C)	23

18 Hrs ± 2 Hrs

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 520814

Sample # L65898-14 MS/MSD

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? YES

> 3.1 cm² ? NO

Method of Reduction: SIEVE

Extraction

Weight of Sample (100g min)	150.0
Extraction Fluid Used	TIC
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	7.73
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/10/21 3:45P
Time out of Extractor	6/11/21 7:45A
High Temperature (C)	24
Low Temperature (C)	23

18 Hrs ± 2 Hrs

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
5/14/2021	sw	

Instruction

Use a 4:1 liquid to solid ratio. For sample IDs ending in SPLP, use standard solution. For IDs ending in SCVWD, use water labeled SCVWD. For MOW IDs, use MOW water. For OCWD IDs, use OCWD water.

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520814

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/10/2021 14:14
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520814CSTD1	NONE						10.04							
2	WG520814CSTD2	NONE						7.00							
3	WG520814CSTD3	NONE						2.04							
4	WG520814ICV	PCN63115						3.95							
5	WG520814PBS	NONE						7.73							
6	WG520814LFB1	II210601-2													
7	WG520814LFB2	MS210420-3													
8	**L65898-04**	WBA-480-720-TIC													
9	L65898-04MS	II210601-2													
10	L65898-04MSD	II210601-2													
11	**L65898-09**	WHAT-640-710-TIC													
12	L65898-09DUP	NONE													
13	**L65898-14**	TLCHT-670-720-TIC													
14	L65898-14MS	MS210420-3													
15	WG520814CCV1	PCN63115						4.04							
16	L65898-14MSD	MS210420-3						7.73							
17	WG520814CCV2	PCN63115						4.04							

Report Comments: 4:1 LIQUID TO SOLID RATO PER CLIENT REQUEST - GKH 6/11/21

Internal Comments

6/10/2021 2:15:34 PM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520814

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/10/2021 14:14
Start Date/Time:
End Date/Time:

Sample	Login Comments
L65898-04	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-04MS	ICP Spike
L65898-04MSD	ICP Spike
L65898-09	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-14	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-14MS	ICPMS Spike
L65898-14MSD	ICPMS Spike
WG520814LFB1	ICP LFB
WG520814LFB2	ICPMS LFB

Report Comments:

Internal Comments

6/10/2021 2:15:34 PM 60421

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG520814

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	6/11/2021 11:47:55 AM
SREV:	CRA	6/15/2021 1:29:27 PM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG520814

Date Reported: 15-Jun-21
Run ID: R1823551
Date Analyzed: 10-Jun-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG520814ICV

Tag:

Measured: 6/10/2021 3:45:03 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	3.95	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	3.95	1		units	++					
SREV	TEMPERATURE	PREP	22.8	1		C	++	0.1	0.1			

WG520814PBS

Tag:

Measured: 6/10/2021 3:45:04 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.66	1		units	++					
SREV	PRE FILTER PH	PREP	7.59	1		units	++					
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG520814LFB1

Tag:

Measured: 6/10/2021 3:45:05 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.66	1		units	++					
SREV	PRE FILTER PH	PREP	7.59	1		units	++					
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG520814LFB2

Tag:

Measured: 6/10/2021 3:45:06 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.66	1		units	++					
SREV	PRE FILTER PH	PREP	7.59	1		units	++					
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

L65898-04

Tag:

Measured: 6/10/2021 3:45:07 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.73	1		units	++					
SREV	EXTRACTION TIME	312-MOD	960	1		min	++					
SREV	POST FILTER PH	312-MOD	7.76	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.74	1		units	++					
SREV	TEMPERATURE	312-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-04MS

Tag:

Measured: 6/10/2021 3:45:08 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.76	1		units	++					
SREV	PRE FILTER PH	PREP	7.74	1		units	++					
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-04MSD

Tag:

Measured: 6/10/2021 3:45:09 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.76	1		units	++					
SREV	PRE FILTER PH	PREP	7.74	1		units	++					
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-09

Tag:

Measured: 6/10/2021 3:45:10 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.73	1		units	++					
SREV	EXTRACTION TIME	312-MOD	960	1		min	++					
SREV	POST FILTER PH	312-MOD	7.77	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.73	1		units	++					
SREV	TEMPERATURE	312-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-09DUP

Tag: Measured: 6/10/2021 3:45:11 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.79	1		units	++					
SREV	PRE FILTER PH	PREP	7.76	1		units	++					
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-14

Tag: Measured: 6/10/2021 3:45:12 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.73	1		units	++					
SREV	EXTRACTION TIME	312-MOD	960	1		min	++					
SREV	POST FILTER PH	312-MOD	7.8	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.75	1		units	++					
SREV	TEMPERATURE	312-MOD	20.9	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-14MS

Tag: Measured: 6/10/2021 3:45:13 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.8	1		units	++					
SREV	PRE FILTER PH	PREP	7.75	1		units	++					
SREV	TEMPERATURE	PREP	20.9	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

WG520814CCV1

Tag: Measured: 6/10/2021 3:45:14 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.04	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	4.03	1		units	++					
SREV	TEMPERATURE	PREP	22.3	1		C	++	0.1	0.1			

L65898-14MSD

Tag:

Measured: 6/10/2021 3:45:15 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.73	1		units	++					
SREV	EXTRACTION TIME	PREP	960	1		min	++					
SREV	POST FILTER PH	PREP	7.8	1		units	++					
SREV	PRE FILTER PH	PREP	7.75	1		units	++					
SREV	TEMPERATURE	PREP	20.9	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

WG520814CCV2

Tag:

Measured: 6/10/2021 3:45:16 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.04	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	4.03	1		units	++					
SREV	TEMPERATURE	PREP	22.3	1		C	++	0.1	0.1			

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG521102

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/15/2021 14:20
Start Date/Time: 06/24/2021 15:30
End Date/Time: 06/25/2021 11:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG521102CSTD1	NONE	As Rec		06/24/21 15:30			10.04		10.04	10.04			22.1	
2	WG521102CSTD2	NONE	As Rec		06/24/21 15:30			6.98		7.01	7.01			22	
3	WG521102CSTD3	NONE	As Rec		06/24/21 15:30			2.05		2.01	2.01			22.1	
4	WG521102ICV	PCN63115	As Rec		06/24/21 15:30			4.03		3.98	3.99			22.1	
5	WG521102PBS	NONE	As Rec		06/24/21 15:30	0	600	2.97	1080	2.57	2.59	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	20.4	
6	WG521102LFB1	II210614-2	As Rec		06/24/21 15:30	0	600	2.97	1080	2.57	2.59	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	20.4	
7	WG521102LFB2	MS210610-2	As Rec		06/24/21 15:30	0	600	2.97	1080	2.57	2.59	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	20.4	
8	**L65898-02**	WBA-480-720-OCWD-MOD	As Rec		06/24/21 15:30	150	600	2.97	1080	3.25	3.4	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.2	
9	L65898-02MS	II210614-2	As Rec		06/24/21 15:30	150	600	2.97	1080	3.25	3.4	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.2	
10	L65898-02MSD	II210614-2	As Rec		06/24/21 15:30	150	600	2.97	1080	3.25	3.4	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.2	
11	**L65898-07**	WHAT-640-710-OCWD-MO	As Rec		06/24/21 15:30	150	600	2.97	1080	3.08	3.15	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.4	
12	L65898-07DUP	NONE	As Rec		06/24/21 15:30	150	600	2.97	1080	3.07	3.14	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.3	
13	**L65898-12**	TLCHT-670-720-OCWD-M	As Rec		06/24/21 15:30	150	600	2.97	1080	4.65	4.26	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.4	
14	L65898-12MS	MS210610-2	As Rec		06/24/21 15:30	150	600	2.97	1080	4.65	4.26	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.4	
15	WG521102CCV1	PCN63115	As Rec		06/24/21 15:30			4.01		3.98	3.99			21.7	
16	L65898-12MSD	MS210610-2	As Rec		06/24/21 15:30	150	600	2.97	1080	4.65	4.26	6/24/2021 3:30:00 PM	6/25/2021 9:30:00 AM	21.4	
17	WG521102CCV2	PCN63115	As Rec		06/24/21 15:30			4.01		3.98	3.99			21.7	

Report Comments: _____

Internal Comments _____

6/25/2021 10:50:21 AM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG521102

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/15/2021 14:20
Start Date/Time: 06/24/2021 15:30
End Date/Time: 06/25/2021 11:00

Sample	Login Comments
L65898-02	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-02MS	ICP Spike
L65898-02MSD	ICP Spike
L65898-07	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-12	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-12MS	ICPMS Spike
L65898-12MSD	ICPMS Spike
WG521102LFB1	ICP LFB
WG521102LFB2	ICPMS LFB

Report Comments: _____

Internal Comments _____

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: GKH
Date: 6/25/21

Approved: CLA
Date: 6-28-21

Analyst: GKH

Workgroup: WG512102

Analysis Date: 6/24/21 - 6/25/21

Sample type used: SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?	✓		
4. Was the proper sub-sample used (as received, client prep, <2000, <500, <250, dry, R&P, RPLL)?	✓		
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	✓		
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?	✓		
8. Is the appropriate spike in the computer-designated line?	✓		
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?	✓		
11. Is your instrument calibration passing (and included in the data package if needed)?	✓		
12. Are any Special Instructions pertaining to the workgroup included in the data package?	✓		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
BUFFER 10	PCN63117	6/30/22
" 7	PCN63116	9/30/22
" 2	PCN63355	3/31/21

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments: _____

Qualtrax ID: 1223
Revision #: 3

WG521102

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # PBS/LFB

Sample # _____

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? N/A

Method of Reduction: ~~N/A~~ GKH 6/25/21 NONE

Extraction

Weight of Sample (100g min)	0
Extraction Fluid Used	OCWD-MOO
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	2.97
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/24/21 3:30P
Time out of Extractor	6/25/21 9:30A
High Temperature (C)	24
Low Temperature (C)	23

18 Hrs ± 2 Hrs

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 521102

Sample # L65898-02 MS/MSD
L65898-07/DUP

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____
Filtrate Container Weight: _____
Sample Weight (100g min): _____
Weight of Filtrate: _____
Weight of Solid _____
Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO
> 3.1 cm² ? N/A
Method of Reduction: NONE

Extraction

Weight of Sample (100g min) 150.0
Extraction Fluid Used COND-MOD
SCN of Extraction Fluid N/A
pH of Extraction Fluid 2.97
Vol. of Extraction Fluid (mL) 600
Time in Extractor 6/24/21 3:30P
Time out of Extractor 6/25/21 9:30A } 18 Hrs ± 2 Hrs
High Temperature (C) 24
Low Temperature (C) 23 } 23° C ± 2° C

Extraction Fluid Determination

Sample Description _____
Sampling Location _____
Testing for Cyanide _____

→ Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 521102

Sample # L65898-12 MS/MSD

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? YES

> 3.1 cm² ? NO

Method of Reduction: SIEVE

Extraction

Weight of Sample (100g min)	150.0
Extraction Fluid Used	OCWD-MOD
SCN of Extraction Fluid	N/A
pH of Extraction Fluid	2.97
Vol. of Extraction Fluid (mL)	600
Time in Extractor	6/24/21 3:30P
Time out of Extractor	6/25/21 9:30A
High Temperature (C)	24
Low Temperature (C)	23

18 Hrs ± 2 Hrs

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

→ Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
5/14/2021	sw		Use a 4:1 liquid to solid ratio. For sample IDs ending in SPLP, use standard solution. For IDs ending in SCVWD, use water labeled SCVWD. For MOW IDs, use MOW water. For OCWD IDs, use OCWD water.

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG521102

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/15/2021 14:20
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG521102CSTD1	NONE						10.04							Post ORP
2	WG521102CSTD2	NONE						6.98							
3	WG521102CSTD3	NONE						2.05							
4	WG521102ICV	PCN63115						4.03							
5	WG521102PBS	NONE						2.97							
6	WG521102LFB1	II210614-2													24.1 mV
7	WG521102LFB2	MS210610-2													↓
8	**L65898-02**	WBA-480-720-OCWD-MOD													97.4 mV
9	L65898-02MS	II210614-2													↓
10	L65898-02MSD	II210614-2													
11	**L65898-07**	WHAT-640-710-OCWD-MO													130.1 mV
12	L65898-07DUP	NONE													123.4 mV
13	**L65898-12**	TLCHT-670-720-OCWD-M													58.7 mV
14	L65898-12MS	MS210610-2													↓
15	WG521102CCV1	PCN63115						4.01							
16	L65898-12MSD	MS210610-2						2.97							58.7mV
17	WG521102CCV2	PCN63115						4.01							

Report Comments: PRE EXTRACTION ORP: -45.9 mV
4:1 LIQUID TO SOLID RATIO USED

Internal Comments: PER CLIENT REQUEST - GKH 6/25/21

6/15/2021 2:21:03 PM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3 SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG521102

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/15/2021 14:20
Start Date/Time:
End Date/Time:

Sample	Login Comments
L65898-02	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-02MS	ICP Spike
L65898-02MSD	ICP Spike
L65898-07	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-12	U,ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will the
L65898-12MS	ICPMS Spike
L65898-12MSD	ICPMS Spike
WG521102LFB1	ICP LFB
WG521102LFB2	ICPMS LFB

Report Comments:

Internal Comments

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG521102

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	6/25/2021 12:47:49 PM
SREV:	CRA	6/28/2021 1:55:08 PM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG521102

Date Reported: 28-Jun-21
Run ID: R1825579
Date Analyzed: 24-Jun-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG521102ICV

Tag:

Measured: 6/24/2021 3:30:03 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.03	1		units	++				N1	
SREV	POST FILTER PH	PREP	3.99	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.98	1		units	++				N1	
SREV	TEMPERATURE	PREP	22.1	1		C	++	0.1	0.1		N1	

WG521102PBS

Tag:

Measured: 6/24/2021 3:30:04 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	2.59	1		units	++				N1	
SREV	PRE FILTER PH	PREP	2.57	1		units	++				N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++				N1	

WG521102LFB1

Tag:

Measured: 6/24/2021 3:30:05 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	2.59	1		units	++				N1	
SREV	PRE FILTER PH	PREP	2.57	1		units	++				N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++				N1	

WG521102LFB2

Tag:

Measured: 6/24/2021 3:30:06 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	2.59	1		units	++				N1	
SREV	PRE FILTER PH	PREP	2.57	1		units	++				N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++				N1	

L65898-02

Tag: Measured: 6/24/2021 3:30:07 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++				N1	
SREV	POST FILTER PH	312-MOD	3.4	1		units	++				N1	
SREV	PRE FILTER PH	312-MOD	3.25	1		units	++				N1	
SREV	TEMPERATURE	312-MOD	21.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	312-MOD		1			++				N1	
SREV	TIME OUT	312-MOD		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++				N1	

L65898-02MS

Tag: Measured: 6/24/2021 3:30:08 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	3.4	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.25	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++				N1	

L65898-02MSD

Tag: Measured: 6/24/2021 3:30:09 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	3.4	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.25	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++				N1	

L65898-07

Tag: Measured: 6/24/2021 3:30:10 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++				N1	
SREV	POST FILTER PH	312-MOD	3.15	1		units	++				N1	
SREV	PRE FILTER PH	312-MOD	3.08	1		units	++				N1	
SREV	TEMPERATURE	312-MOD	21.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	312-MOD		1			++				N1	
SREV	TIME OUT	312-MOD		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++				N1	

L65898-07DUP

Tag: Measured: 6/24/2021 3:30:11 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	3.14	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.07	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++				N1	

L65898-12

Tag: Measured: 6/24/2021 3:30:12 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	312-MOD	1080	1		min	++				N1	
SREV	POST FILTER PH	312-MOD	4.26	1		units	++				N1	
SREV	PRE FILTER PH	312-MOD	4.65	1		units	++				N1	
SREV	TEMPERATURE	312-MOD	21.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	312-MOD		1			++				N1	
SREV	TIME OUT	312-MOD		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++				N1	

L65898-12MS

Tag: Measured: 6/24/2021 3:30:13 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	4.26	1		units	++				N1	
SREV	PRE FILTER PH	PREP	4.65	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++				N1	

WG521102CCV1

Tag: Measured: 6/24/2021 3:30:14 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.01	1		units	++				N1	
SREV	POST FILTER PH	PREP	3.99	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.98	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.7	1		C	++	0.1	0.1		N1	

L65898-12MSD

Tag:

Measured: 6/24/2021 3:30:15 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	2.97	1		units	++				N1	
SREV	EXTRACTION TIME	PREP	1080	1		min	++				N1	
SREV	POST FILTER PH	PREP	4.26	1		units	++				N1	
SREV	PRE FILTER PH	PREP	4.65	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++				N1	
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++				N1	

WG521102CCV2

Tag:

Measured: 6/24/2021 3:30:16 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.01	1		units	++				N1	
SREV	POST FILTER PH	PREP	3.99	1		units	++				N1	
SREV	PRE FILTER PH	PREP	3.98	1		units	++				N1	
SREV	TEMPERATURE	PREP	21.7	1		C	++	0.1	0.1		N1	

WG521102 Extended Qualifiers with Case Narratives

L65898-02	EXTRACTION FLUID PH	N1	site water modified with sodium bisulfite. ORP aprox. -45mV
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-02MS	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-02MSD	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-07	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-07DUP	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-12	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-12MS	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	VOLUME, SOIL EXTRACT		
	WEIGHT, SAMPLE		
L65898-12MSD	EXTRACTION FLUID PH		
	EXTRACTION TIME		
	POST FILTER PH		
	PRE FILTER PH		
	TEMPERATURE		
	TIME IN		

	TIME OUT
	VOLUME, SOIL EXTRACT
	WEIGHT, SAMPLE
WG521102CCV1	EXTRACTION FLUID PH
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
WG521102CCV2	EXTRACTION FLUID PH
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
WG521102ICV	EXTRACTION FLUID PH
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
WG521102LFB1	EXTRACTION FLUID PH
	EXTRACTION TIME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	VOLUME, SOIL EXTRACT
	WEIGHT, SAMPLE
WG521102LFB2	EXTRACTION FLUID PH
	EXTRACTION TIME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	VOLUME, SOIL EXTRACT
	WEIGHT, SAMPLE
WG521102PBS	EXTRACTION FLUID PH
	EXTRACTION TIME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	VOLUME, SOIL EXTRACT
	WEIGHT, SAMPLE

1312

WG521175

ACZ Laboratories, Inc

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/16/2021 10:07
Start Date/Time: 06/14/2021 15:40
End Date/Time: 06/15/2021 11:40

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG521175CSTD1	NONE	As Rec		06/14/21 15:40			10.04		10.03	10.03			21.9	
2	WG521175CSTD2	NONE	As Rec		06/14/21 15:40			7.01		7	7			21.9	
3	WG521175CSTD3	NONE	As Rec		06/14/21 15:40			2.05		2.01	2.01			21.8	
4	WG521175ICV	PCN63115	As Rec		06/14/21 15:40			3.98		3.98	4.02			21.8	
5	WG521175PBS	NONE	As Rec		06/14/21 15:40	0	600	7.46	1200	7.5	7.61	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.3	
6	WG521175LFB1	II210601-2	As Rec		06/14/21 15:40	0	600	7.46	1200	7.5	7.61	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.3	
7	WG521175LFB2	MS210420-3	As Rec		06/14/21 15:40	0	600	7.46	1200	7.5	7.61	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.3	
8	**L65898-05**	WBA-480-720-ARC	As Rec		06/14/21 15:40	150	600	7.46	1200	7.76	7.85	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
9	L65898-05MS	II210601-2	As Rec		06/14/21 15:40	150	600	7.46	1200	7.76	7.85	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
10	L65898-05MSD	II210601-2	As Rec		06/14/21 15:40	150	600	7.46	1200	7.76	7.85	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
11	**L65898-10**	WHAT-640-710-ARC	As Rec		06/14/21 15:40	150	600	7.46	1200	7.89	7.92	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
12	L65898-10DUP	NONE	As Rec		06/14/21 15:40	150	600	7.46	1200	7.93	7.93	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
13	L65898-10MS	MS210420-3	As Rec		06/14/21 15:40	150	600	7.46	1200	7.89	7.92	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
14	L65898-10MSD	MS210420-3	As Rec		06/14/21 15:40	150	600	7.46	1200	7.89	7.92	6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
15	WG521175CCV	PCN63115	As Rec		06/14/21 15:40			4.02		4.02	4			21.3	

Sample	Login Comments
L65898-05	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-05MS	ICP Spike
L65898-05MSD	ICP Spike
L65898-10	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-10MS	ICPMS Spike
L65898-10MSD	ICPMS Spike
WG521175LFB1	ICP LFB
WG521175LFB2	ICPMS LFB

Report Comments: _____

Internal Comments _____

6/16/2021 10:46:48 AM 60421

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: GKH
Date: 6/16/21

Approved: CRA
Date: 6-18-21

Analyst: GKH

Workgroup: WG521175

Analysis Date: 6/14/21 - 6/15/21

Sample type used: SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?	✓		
4. Was the proper sub-sample used (as received, client prep, <2000, <500, <250, dry, R&P, RPLL)?	✓		
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	✓		
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?	✓		
8. Is the appropriate spike in the computer-designated line?	✓		
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?	✓		
11. Is your instrument calibration passing (and included in the data package if needed)?	✓		
12. Are any Special Instructions pertaining to the workgroup included in the data package?	✓		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
BUFFER 10	PCN63117	6/30/22
7	PCN63116	9/30/22
2	PCN63355	3/31/23

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # WG521175

Sample # PBS/LFB

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____

Filtrate Container Weight: _____

Sample Weight (100g min): _____

Weight of Filtrate: _____

Weight of Solid _____

Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO

> 3.1 cm² ? NO

Method of Reduction: N/A

Extraction

Weight of Sample (100g min) 0

Extraction Fluid Used ARC

SCN of Extraction Fluid N/A

pH of Extraction Fluid 7.46

Vol. of Extraction Fluid (mL) 600

Time in Extractor 6/14/21 15:40

Time out of Extractor 6/15/21 11:40

18 Hrs ± 2 Hrs

High Temperature (C) 24

Low Temperature (C) 23

23° C ± 2° C

Extraction Fluid Determination

Sample Description _____

Sampling Location _____

Testing for Cyanide _____

Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

NON-VOLATILE 1312 ANALYSIS

WG # 521175

Sample # L65898-05 MS/MSD
L65898-10 DUP MS/MSD

Preliminary Evaluations

Sample is 100 % Solid → Proceed to Particle Size / Surface Area Determination

Sample is Multiphase → Liquid-Solid Separation

Filter Weight: _____
Filtrate Container Weight: _____
Sample Weight (100g min): _____
Weight of Filtrate: _____
Weight of Solid _____
Percent Solid _____

% Solid = (Weight of Solid / Total Weight of Sample) x 100

Sample is < 0.5% solid → The liquid filtrate is analyzed as the extract.

Sample is > 0.5% solid → Particle Size / Surface Area Determination

> 9.5 mm (sieve) ? NO
> 3.1 cm² ? NO
Method of Reduction: N/A

Extraction

Weight of Sample (100g min) 150.0
Extraction Fluid Used ARC
SCN of Extraction Fluid N/A
pH of Extraction Fluid GKH 6/16/21 ~~7.47~~ 7.46
Vol. of Extraction Fluid (mL) 600
Time in Extractor 6/14/21 15:40
Time out of Extractor 6/15/21 11:40 } 18 Hrs ± 2 Hrs
High Temperature (C) 24
Low Temperature (C) 23 } 23° C ± 2° C

Extraction Fluid Determination

Sample Description _____
Sampling Location _____
Testing for Cyanide _____

→ Proceed to Extraction

Initial liquid phase added back before filtration? _____

Comments: _____

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520819

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/10/2021 14:54
Start Date/Time: 06/14/2021 15:40
End Date/Time: 06/16/2021 9:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520819CSTD1	NONE	As Rec		06/14/21 15:40			10.04	10.03	10.03				21.9	
2	WG520819CSTD2	NONE	As Rec		06/14/21 18:15			7.01	7	7				21.9	
3	WG520819CSTD3	NONE	As Rec		06/14/21 20:50			2.05	2.01	2.01				21.8	
4	WG520819ICV	PCN63115	As Rec		06/14/21 23:25			3.98	3.98	4.02				21.8	
5	WG520819PBS	NONE	As Rec		06/15/21 2:00	0	600	7.46	7.5	7.61		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	1.3	
6	WG520819LFB1	II210601-2	As Rec		06/15/21 4:35	0	600	7.46	7.5	7.61		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.3	
7	WG520819LFB2	MS210420-3	As Rec		06/15/21 7:10	0	600	7.46	7.5	7.61		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.3	
8	**L65898-05**	WBA-480-720-ARC	As Rec		06/15/21 9:45	150	600	7.46	7.76	7.85		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
9	L65898-05MS	II210601-2	As Rec		06/15/21 12:20	150	600	7.46	7.76	7.85		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
10	L65898-05MSD	II210601-2	As Rec		06/15/21 14:55	150	600	7.46	7.76	7.85		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21	
11	**L65898-10**	WHAT-640-710-ARC	As Rec		06/15/21 17:30	150	600	7.46	7.89	7.92		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
12	L65898-10DUP	NONE	As Rec		06/15/21 20:05	150	600	7.46	7.93	7.93		6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM	21.1	
13	**L65898-15**	TLCHT-670-720-ARC	As Rec		06/15/21 22:40	150	600	7.46				6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM		
14	L65898-15MS	MS210420-3	As Rec		06/16/21 1:15	150	600	7.46				6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM		
15	WG520819CCV1	PCN63115	As Rec		06/16/21 3:50			4.01	4.02	4				21.3	
16	L65898-15MSD	MS210420-3	As Rec		06/16/21 6:25	150	600	7.46				6/14/2021 3:40:00 PM	6/15/2021 11:40:00 AM		
17	WG520819CCV2	PCN63115	As Rec		06/16/21 9:00			4.02	4.02	4				21.3	

Report Comments: _____

Internal Comments _____

6/15/2021 2:04:03 PM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520819



ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 06/10/2021 14:54
Start Date/Time: 06/14/2021 15:40
End Date/Time: 06/16/2021 9:00

Sample	Login Comments
L65898-05	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-05MS	ICP Spike
L65898-05MSD	ICP Spike
L65898-10	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-15	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-15MS	ICPMS Spike
L65898-15MSD	ICPMS Spike
WG520819LFB1	ICP LFB
WG520819LFB2	ICPMS LFB

Report Comments: _____

_____

Internal Comments _____

_____

6/15/2021 2:04:03 PM 60421

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
5/14/2021	sw		Use a 4:1 liquid to solid ratio. For sample IDs ending in SPLP, use standard solution. For IDs ending in SCVWD, use water labeled SCVWD. For MOW IDs, use MOW water. For OCWD IDs, use OCWD water.

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520819

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/10/2021 14:54
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	Soil Extract Volume (mL)	Extraction Fluid pH (units)	Extraction Time (min)	Pre Filter pH (units)	Post Filter pH (units)	Time In	Time Out	Temperature (C)	Comments
1	WG520819CSTD1	NONE						10.04							
2	WG520819CSTD2	NONE						7.01							
3	WG520819CSTD3	NONE						2.05							
4	WG520819ICV	PCN63115						3.98							
5	WG520819PBS	NONE						7.46							
6	WG520819LFB1	II210601-2													
7	WG520819LFB2	MS210420-3													
8	**L65898-05**	WBA-480-720-ARC													
9	L65898-05MS	II210601-2													
10	L65898-05MSD	II210601-2													
11	**L65898-10**	WHAT-640-710-ARC													
12	L65898-10DUP	NONE													
13	**L65898-15**	TLCHT-670-720-ARC													
14	L65898-15MS	MS210420-3													
15	WG520819CCV1	PCN63115						4.01							
16	L65898-15MSD	MS210420-3						7.46							
17	WG520819CCV2	PCN63115						4.02							

Report Comments: SX L65898-15 DROPPED ~~FROM~~ FROM GKH 6/15/21
WG DUE TO FILTER APPRATUS MALFUNCTION

Internal Comments WG520819 DISSOLVED -GKH 6/16/21

6/10/2021 2:55:08 PM 60421

1312

QC List Type: I-X-1312
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CL
QC Ref: CSTDX3-SP-1312
Group ID: SP-G-1312-MOD
Method Ref: M1312 (Modified)
SOP Ref: SOPSO013

WG520819

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 06/10/2021 14:54
Start Date/Time:
End Date/Time:

Sample	Login Comments
L65898-05	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-05MS	ICP Spike
L65898-05MSD	ICP Spike
L65898-10	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-15	U(2),ZIPLOCK(2) || Soil samples in orange bucket in soils hallway. Associated water samples also in Soils hallways. See Login if more volume is needed, water samples will
L65898-15MS	ICPMS Spike
L65898-15MSD	ICPMS Spike
WG520819LFB1	ICP LFB
WG520819LFB2	ICPMS LFB

Report Comments:

Internal Comments

6/10/2021 2:55:08 PM 60421

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG521175

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	6/16/2021 12:50:05 PM
SREV:	CRA	6/18/2021 11:02:49 AM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG521175

Date Reported: 18-Jun-21
Run ID: R1824381
Date Analyzed: 14-Jun-21
ICAL Workgroup:
Instrument ID: SOILSPREP

L65898-05

Tag:

Measured: 6/14/2021 3:40:03 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.46	1		units	++					
SREV	EXTRACTION TIME	312-MOD	1200	1		min	++					
SREV	POST FILTER PH	312-MOD	7.85	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.76	1		units	++					
SREV	TEMPERATURE	312-MOD	21.0	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-05MS

Tag:

Measured: 6/14/2021 3:40:04 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.85	1		units	++					
SREV	PRE FILTER PH	PREP	7.76	1		units	++					
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-05MSD

Tag:

Measured: 6/14/2021 3:40:05 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.85	1		units	++					
SREV	PRE FILTER PH	PREP	7.76	1		units	++					
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-10

Tag:

Measured: 6/14/2021 3:40:06 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	312-MOD	7.46	1		units	++					
SREV	EXTRACTION TIME	312-MOD	1200	1		min	++					
SREV	POST FILTER PH	312-MOD	7.92	1		units	++					
SREV	PRE FILTER PH	312-MOD	7.89	1		units	++					
SREV	TEMPERATURE	312-MOD	21.1	1		C	++	0.1	0.1			
SREV	TIME IN	312-MOD		1			++					
SREV	TIME OUT	312-MOD		1			++					
SREV	VOLUME, SOIL EXTRACT	312-MOD	600	1		mL	++					
SREV	WEIGHT, SAMPLE	312-MOD	150	1		g	++					

L65898-10DUP

Tag:

Measured: 6/14/2021 3:40:07 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.93	1		units	++					
SREV	PRE FILTER PH	PREP	7.93	1		units	++					
SREV	TEMPERATURE	PREP	21.1	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-10MS

Tag:

Measured: 6/14/2021 3:40:08 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.92	1		units	++					
SREV	PRE FILTER PH	PREP	7.89	1		units	++					
SREV	TEMPERATURE	PREP	21.1	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

L65898-10MSD

Tag:

Measured: 6/14/2021 3:40:09 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.92	1		units	++					
SREV	PRE FILTER PH	PREP	7.89	1		units	++					
SREV	TEMPERATURE	PREP	21.1	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	150	1		g	++					

WG521175CCV

Tag: Measured: 6/14/2021 3:40:10 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	4.02	1		units	++					
SREV	POST FILTER PH	PREP	4	1		units	++					
SREV	PRE FILTER PH	PREP	4.02	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			

WG521175ICV

Tag: Measured: 6/14/2021 3:40:14 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	3.98	1		units	++					
SREV	POST FILTER PH	PREP	4.02	1		units	++					
SREV	PRE FILTER PH	PREP	3.98	1		units	++					
SREV	TEMPERATURE	PREP	21.8	1		C	++	0.1	0.1			

WG521175LFB1

Tag: Measured: 6/14/2021 3:40:15 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.61	1		units	++					
SREV	PRE FILTER PH	PREP	7.5	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG521175LFB2

Tag: Measured: 6/14/2021 3:40:16 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.61	1		units	++					
SREV	PRE FILTER PH	PREP	7.5	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

WG521175PBS

Tag: Measured: 6/14/2021 3:40:17 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION FLUID PH	PREP	7.46	1		units	++					
SREV	EXTRACTION TIME	PREP	1200	1		min	++					
SREV	POST FILTER PH	PREP	7.61	1		units	++					
SREV	PRE FILTER PH	PREP	7.5	1		units	++					
SREV	TEMPERATURE	PREP	21.3	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	VOLUME, SOIL EXTRACT	PREP	600	1		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	1		g	++					

Modified Meteoric Water Mobility Procedure

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

November 15, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L68094

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on August 26, 2021. This project has been assigned to ACZ's project number, L68094. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L68094. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after December 15, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

November 15, 2021

Project ID:
ACZ Project ID: L68094

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 7 miscellaneous samples from Brown and Caldwell on August 26, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L68094. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for analyses flagged with an "H1" or an "HD". Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to analysis.

Mercury (H3) - samples received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

This project reflects an MWMP Column test using two types of client supplied water. The first 5 weeks, MOW water was used. The fifth week was not changed to Tannery II water per instructions. This sample was analyzed free of charge. The remaining two weeks, Tannery II water was used.

1. Metals, Wet Chemistry (B1) - Client supplied extraction fluid contained some metals detected in the PBS and/or LFB.

2. MWMP Extraction WG527796 (N1) - No PBS analyzed with the workgroup. Samples extracted using site water provided by client, which was analyzed in week 1.

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 1

ACZ Sample ID: ***L68094-01***
Date Sampled: *05/03/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/16/21 11:36	jlw
ICPMS MWMT Prep	M6020B ICP-MS								09/17/21 8:30	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								09/16/21 10:55	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	09/18/21 2:24	jlw
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/05/21 18:43	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00138			mg/L	0.0002	0.001	10/05/21 18:43	mfm
Barium (MWMT)	M6010D ICP	1	0.0183	B	*	mg/L	0.007	0.035	09/18/21 2:24	jlw
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/05/21 18:43	mfm
Boron (MWMT)	M6010D ICP	1	2.04		*	mg/L	0.03	0.1	09/18/21 2:24	jlw
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/07/21 16:35	bsu
Calcium (MWMT)	M6010D ICP	1	206		*	mg/L	0.1	0.5	09/18/21 2:24	jlw
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/05/21 18:43	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	09/18/21 2:24	jlw
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	09/18/21 2:24	jlw
Lead (MWMT)	M6020B ICP-MS	1	0.00101			mg/L	0.0001	0.0005	10/05/21 18:43	mfm
Magnesium (MWMT)	M6010D ICP	1	30.9		*	mg/L	0.2	1	09/18/21 2:24	jlw
Manganese (MWMT)	M6010D ICP	1	0.011	B		mg/L	0.01	0.05	09/18/21 2:24	jlw
Mercury (MWMT)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	09/20/21 12:35	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	09/18/21 2:24	jlw
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	09/18/21 2:24	jlw
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	09/18/21 2:24	jlw
Potassium (MWMT)	M6010D ICP	1	12.0		*	mg/L	0.2	1	09/18/21 2:24	jlw
Selenium (MWMT)	M6020B ICP-MS	1	0.00013	B		mg/L	0.0001	0.00025	10/05/21 18:43	mfm
Silica (MWMT)	M6010D ICP	1	24.0		*	mg/L	0.2	1	09/18/21 2:24	jlw
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 18:43	mfm
Sodium (MWMT)	M6010D ICP	1	180		*	mg/L	0.2	1	09/18/21 2:24	jlw
Strontium (MWMT)	M6010D ICP	1	1.11		*	mg/L	0.009	0.045	09/18/21 2:24	jlw
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/07/21 16:35	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00120			mg/L	0.0001	0.0005	10/05/21 18:43	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U	*	mg/L	0.02	0.05	09/18/21 2:24	jlw

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 1

ACZ Sample ID: ***L68094-01***
Date Sampled: *05/03/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/08/21 0:00	gkh
Extraction pH		1	7.56			units			09/08/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/08/21 0:00	gkh
Extraction Time		1	168			hrs			09/08/21 0:00	gkh
Leachate Volume		1	1621.7			mL			09/08/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/08/21 0:00	gkh
Post Filter pH		1	8.07			units			09/08/21 0:00	gkh
Pre Filter pH		1	8.04			units			09/08/21 0:00	gkh
Retained Moisture		1	n/a			%			09/08/21 0:00	gkh
Temperature		1	20.8			C	0.1	0.1	09/08/21 0:00	gkh
Time In		1							09/08/21 0:00	gkh
Time Out		1							09/08/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	52.1		*	mg/L	2	20	09/16/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	09/16/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	09/16/21 0:00	eep
Total Alkalinity		1	52.1		*	mg/L	2	20	09/16/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	41.8		*	mg/L	0.5	2	09/24/21 11:11	md
Fluoride (MWMT)	SM4500F-C	1	0.64		*	mg/L	0.15	0.35	09/16/21 17:09	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		2.03	H		mg/L	0.06	0.3	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	3	2.58	H	*	mg/L	0.06	0.3	09/18/21 23:12	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.547	H	*	mg/L	0.01	0.05	09/18/21 23:07	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	0.107	B	*	mg/L	0.05	0.2	10/04/21 14:53	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.53		*	mg/L	0.2	0.5	09/17/21 0:32	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.015	BH	*	mg/L	0.01	0.05	09/19/21 0:15	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	50	898		*	mg/L	50	250	10/06/21 16:05	syw

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 2

ACZ Sample ID: ***L68094-02***
Date Sampled: *09/22/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/24/21 13:05	jlw
ICPMS MWMT Prep	M6020B ICP-MS								09/23/21 9:00	bsu
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								09/30/21 9:00	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	09/26/21 18:29	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	09/28/21 14:32	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00155		*	mg/L	0.0002	0.001	09/28/21 14:32	mfm
Barium (MWMT)	M6010D ICP	1	0.0141	B		mg/L	0.007	0.035	09/26/21 18:29	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	09/28/21 14:32	mfm
Boron (MWMT)	M6010D ICP	1	1.79			mg/L	0.03	0.1	09/26/21 18:29	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	09/28/21 14:32	mfm
Calcium (MWMT)	M6010D ICP	1	147			mg/L	0.1	0.5	09/26/21 18:29	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	09/28/21 14:32	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	09/26/21 18:29	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	09/26/21 18:29	kja
Lead (MWMT)	M6020B ICP-MS	1	0.00043	B		mg/L	0.0001	0.0005	10/05/21 14:16	mfm
Magnesium (MWMT)	M6010D ICP	1	18.2			mg/L	0.2	1	09/26/21 18:29	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	09/26/21 18:29	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	09/28/21 9:12	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	09/26/21 18:29	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	09/26/21 18:29	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	09/26/21 18:29	kja
Potassium (MWMT)	M6010D ICP	1	7.61			mg/L	0.2	1	09/26/21 18:29	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00011	B		mg/L	0.0001	0.00025	09/28/21 14:32	mfm
Silica (MWMT)	M6010D ICP	1	22.0		*	mg/L	0.2	1	09/26/21 18:29	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	09/28/21 14:32	mfm
Sodium (MWMT)	M6010D ICP	1	87.6			mg/L	0.2	1	09/26/21 18:29	kja
Strontium (MWMT)	M6010D ICP	1	0.706			mg/L	0.009	0.045	09/26/21 18:29	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 14:16	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00081			mg/L	0.0001	0.0005	10/05/21 14:16	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	09/26/21 18:29	kja

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 2

ACZ Sample ID: ***L68094-02***
Date Sampled: *09/22/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			09/15/21 0:00	gkh
Extraction pH		1	7.56		*	units			09/15/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	09/15/21 0:00	gkh
Extraction Time		1	168		*	hrs			09/15/21 0:00	gkh
Leachate Volume		1	1980.3		*	mL			09/15/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			09/15/21 0:00	gkh
Post Filter pH		1	8.26		*	units			09/15/21 0:00	gkh
Pre Filter pH		1	8.19		*	units			09/15/21 0:00	gkh
Retained Moisture		1	n/a		*	%			09/15/21 0:00	gkh
Temperature		1	20.5		*	C	0.1	0.1	09/15/21 0:00	gkh
Time In		1			*				09/15/21 0:00	gkh
Time Out		1			*				09/15/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	43.7		*	mg/L	2	20	10/06/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Total Alkalinity		1	43.7		*	mg/L	2	20	10/06/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	36.7		*	mg/L	0.5	2	09/24/21 11:13	md
Fluoride (MWMT)	SM4500F-C	1	0.80		*	mg/L	0.15	0.35	10/06/21 13:15	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		1.36	H		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	1.71	H	*	mg/L	0.02	0.1	09/25/21 2:56	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.355	H	*	mg/L	0.01	0.05	09/25/21 2:56	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	0.076	B	*	mg/L	0.05	0.2	10/04/21 14:56	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.56		*	mg/L	0.2	0.5	10/02/21 3:25	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	UH	*	mg/L	0.01	0.05	09/25/21 2:54	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	20	496		*	mg/L	20	100	10/06/21 15:59	syw

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 3

ACZ Sample ID: ***L68094-03***
Date Sampled: *09/29/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/30/21 10:14	kja
ICPMS MWMT Prep	M6020B ICP-MS								09/30/21 10:00	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								09/30/21 11:49	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/12/21 21:41	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/05/21 18:57	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00145			mg/L	0.0002	0.001	10/05/21 18:57	mfm
Barium (MWMT)	M6010D ICP	1	0.0157	B		mg/L	0.007	0.035	10/12/21 21:41	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/05/21 18:57	mfm
Boron (MWMT)	M6010D ICP	1	1.85			mg/L	0.03	0.1	10/12/21 21:41	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/07/21 16:48	bsu
Calcium (MWMT)	M6010D ICP	1	98.3			mg/L	0.1	0.5	10/12/21 21:41	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/05/21 18:57	mfm
Copper (MWMT)	M6010D ICP	1	0.014	B		mg/L	0.01	0.05	10/12/21 21:41	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/12/21 21:41	kja
Lead (MWMT)	M6020B ICP-MS	1	0.00028	B		mg/L	0.0001	0.0005	10/05/21 18:57	mfm
Magnesium (MWMT)	M6010D ICP	1	10.8			mg/L	0.2	1	10/12/21 21:41	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 21:41	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	09/30/21 13:43	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/12/21 21:41	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/12/21 21:41	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/12/21 21:41	kja
Potassium (MWMT)	M6010D ICP	1	5.47			mg/L	0.2	1	10/12/21 21:41	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00014	B		mg/L	0.0001	0.00025	10/05/21 18:57	mfm
Silica (MWMT)	M6010D ICP	1	24.7			mg/L	0.2	1	10/12/21 21:41	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 18:57	mfm
Sodium (MWMT)	M6010D ICP	1	51.5			mg/L	0.2	1	10/12/21 21:41	kja
Strontium (MWMT)	M6010D ICP	1	0.463			mg/L	0.009	0.045	10/12/21 21:41	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/07/21 16:48	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00050	B		mg/L	0.0001	0.0005	10/05/21 18:57	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/12/21 21:41	kja

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 3

ACZ Sample ID: ***L68094-03***
Date Sampled: *09/29/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/22/21 0:00	gkh
Extraction pH		1	7.56			units			09/22/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/22/21 0:00	gkh
Extraction Time		1	168			hrs			09/22/21 0:00	gkh
Leachate Volume		1	1985.6			mL			09/22/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/22/21 0:00	gkh
Post Filter pH		1	8.22			units			09/22/21 0:00	gkh
Pre Filter pH		1	8.23			units			09/22/21 0:00	gkh
Retained Moisture		1	n/a			%			09/22/21 0:00	gkh
Temperature		1	21.4			C	0.1	0.1	09/22/21 0:00	gkh
Time In		1							09/22/21 0:00	gkh
Time Out		1							09/22/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	38.5		*	mg/L	2	20	10/06/21 0:00	eep
Carbonate as CaCO3		1	5.7	B	*	mg/L	2	20	10/06/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Total Alkalinity		1	44.2		*	mg/L	2	20	10/06/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	42.4		*	mg/L	0.5	2	10/05/21 15:58	md
Fluoride (MWMT)	SM4500F-C	1	0.87		*	mg/L	0.15	0.35	10/06/21 13:47	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		1.74			mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	1.84		*	mg/L	0.02	0.1	09/30/21 3:03	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.097		*	mg/L	0.01	0.05	09/30/21 3:03	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	10/20/21 12:04	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.38	B	*	mg/L	0.2	0.5	10/02/21 3:28	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.011	B	*	mg/L	0.01	0.05	09/29/21 22:18	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	10	279		*	mg/L	10	50	10/18/21 18:54	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 4

ACZ Sample ID: ***L68094-04***
Date Sampled: *10/06/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/11/21 11:40	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/11/21 6:30	bsu
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/08/21 1:34	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/12/21 21:52	jlw
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/20/21 16:10	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00184			mg/L	0.0002	0.001	10/20/21 16:10	mfm
Barium (MWMT)	M6010D ICP	1	0.0100	B		mg/L	0.007	0.035	10/12/21 21:52	jlw
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/02/21 12:17	mfm
Boron (MWMT)	M6010D ICP	1	1.74			mg/L	0.03	0.1	10/12/21 21:52	jlw
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/26/21 16:00	mfm
Calcium (MWMT)	M6010D ICP	1	52.1			mg/L	0.1	0.5	10/12/21 21:52	jlw
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/20/21 16:10	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 21:52	jlw
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/12/21 21:52	jlw
Lead (MWMT)	M6020B ICP-MS	1	0.00017	B		mg/L	0.0001	0.0005	10/26/21 16:00	mfm
Magnesium (MWMT)	M6010D ICP	1	5.41			mg/L	0.2	1	10/12/21 21:52	jlw
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 21:52	jlw
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/12/21 15:15	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/12/21 21:52	jlw
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/12/21 21:52	jlw
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/12/21 21:52	jlw
Potassium (MWMT)	M6010D ICP	1	3.93			mg/L	0.2	1	10/12/21 21:52	jlw
Selenium (MWMT)	M6020B ICP-MS	1	0.00012	B		mg/L	0.0001	0.00025	10/26/21 16:00	mfm
Silica (MWMT)	M6010D ICP	1	22.2		*	mg/L	0.2	1	10/12/21 21:52	jlw
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/26/21 16:00	mfm
Sodium (MWMT)	M6010D ICP	1	36.0			mg/L	0.2	1	10/12/21 21:52	jlw
Strontium (MWMT)	M6010D ICP	1	0.253			mg/L	0.009	0.045	10/12/21 21:52	jlw
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/02/21 12:17	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00043	B		mg/L	0.0001	0.0005	10/26/21 16:00	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/12/21 21:52	jlw

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 4

ACZ Sample ID: ***L68094-04***
Date Sampled: *10/06/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/29/21 0:00	gkh
Extraction pH		1	7.56			units			09/29/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/29/21 0:00	gkh
Extraction Time		1	168			hrs			09/29/21 0:00	gkh
Leachate Volume		1	1977.5			mL			09/29/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/29/21 0:00	gkh
Post Filter pH		1	8.85			units			09/29/21 0:00	gkh
Pre Filter pH		1	8.55			units			09/29/21 0:00	gkh
Retained Moisture		1	n/a			%			09/29/21 0:00	gkh
Temperature		1	20.7			C	0.1	0.1	09/29/21 0:00	gkh
Time In		1							09/29/21 0:00	gkh
Time Out		1							09/29/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	46.6		*	mg/L	2	20	10/09/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/09/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/09/21 0:00	eep
Total Alkalinity		1	46.6		*	mg/L	2	20	10/09/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	43.2		*	mg/L	0.5	2	10/18/21 14:12	md
Fluoride (MWMT)	SM4500F-C	1	1.11		*	mg/L	0.15	0.35	10/09/21 11:56	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		2.17	H		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	2.17	H	*	mg/L	0.02	0.1	10/09/21 12:54	wtc
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	UH	*	mg/L	0.01	0.05	10/09/21 12:54	wtc
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	10/20/21 12:06	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	10/23/21 23:02	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	U	*	mg/L	0.01	0.05	10/08/21 0:13	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	107		*	mg/L	5	25	10/18/21 14:05	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 5

ACZ Sample ID: ***L68094-05***
Date Sampled: *10/13/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP				*				10/20/21 12:40	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/15/21 11:00	scp
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/14/21 12:03	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/19/21 2:25	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/18/21 15:29	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00232			mg/L	0.0002	0.001	10/18/21 15:29	mfm
Barium (MWMT)	M6010D ICP	1	0.0074	B		mg/L	0.007	0.035	10/19/21 2:25	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/20/21 13:14	mfm
Boron (MWMT)	M6010D ICP	1	1.80			mg/L	0.03	0.1	10/19/21 2:25	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/20/21 13:14	mfm
Calcium (MWMT)	M6010D ICP	1	31.7			mg/L	0.1	0.5	10/19/21 2:25	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/18/21 15:29	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/19/21 2:25	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/19/21 2:25	kja
Lead (MWMT)	M6020B ICP-MS	1	0.00012	B		mg/L	0.0001	0.0005	10/18/21 15:29	mfm
Magnesium (MWMT)	M6010D ICP	1	3.15			mg/L	0.2	1	10/19/21 2:25	kja
Manganese (MWMT)	M6010D ICP	1	0.033	B		mg/L	0.01	0.05	10/19/21 2:25	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/20/21 15:21	aeh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/19/21 2:25	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/19/21 2:25	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/19/21 2:25	kja
Potassium (MWMT)	M6010D ICP	1	3.32			mg/L	0.2	1	10/19/21 2:25	kja
Selenium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.00025	10/18/21 15:29	mfm
Silica (MWMT)	M6010D ICP	2	22.3		*	mg/L	0.4	2	10/22/21 4:15	jlw
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/18/21 15:29	mfm
Sodium (MWMT)	M6010D ICP	1	31.9			mg/L	0.2	1	10/19/21 2:25	kja
Strontium (MWMT)	M6010D ICP	1	0.169			mg/L	0.009	0.045	10/19/21 2:25	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/18/21 15:29	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00036	B		mg/L	0.0001	0.0005	10/18/21 15:29	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/19/21 2:25	kja

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 5

ACZ Sample ID: ***L68094-05***
Date Sampled: *10/13/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/06/21 0:00	gkh
Extraction pH		1	7.56		*	units			10/06/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/06/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/06/21 0:00	gkh
Leachate Volume		1	1981.5		*	mL			10/06/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/06/21 0:00	gkh
Post Filter pH		1	8.67		*	units			10/06/21 0:00	gkh
Pre Filter pH		1	8.59		*	units			10/06/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/06/21 0:00	gkh
Temperature		1	19.6		*	C	0.1	0.1	10/06/21 0:00	gkh
Time In		1			*				10/06/21 0:00	gkh
Time Out		1			*				10/06/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	23.2		*	mg/L	2	20	10/18/21 0:00	emk
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/18/21 0:00	emk
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/18/21 0:00	emk
Total Alkalinity		1	23.2		*	mg/L	2	20	10/18/21 0:00	emk
Chloride (MWMT)	SM4500Cl-E	1	43.0		*	mg/L	0.5	2	10/18/21 14:15	md
Fluoride (MWMT)	SM4500F-C	1	1.04		*	mg/L	0.15	0.35	10/21/21 15:50	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		2.12			mg/L	0.06	0.3	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	3	2.12		*	mg/L	0.06	0.3	10/15/21 1:12	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/15/21 1:06	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/01/21 17:42	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	10/23/21 23:09	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	U	*	mg/L	0.01	0.05	10/14/21 23:03	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	1	35.6		*	mg/L	1	5	10/18/21 13:59	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 6

ACZ Sample ID: ***L68094-06***
Date Sampled: *10/20/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/22/21 15:39	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/20/21 16:20	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/21/21 11:38	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/27/21 11:20	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/26/21 16:12	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00294			mg/L	0.0002	0.001	10/26/21 16:12	mfm
Barium (MWMT)	M6010D ICP	1	0.0201	B	*	mg/L	0.007	0.035	10/27/21 11:20	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/02/21 12:31	mfm
Boron (MWMT)	M6010D ICP	1	1.69		*	mg/L	0.03	0.1	10/27/21 11:20	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/26/21 16:12	mfm
Calcium (MWMT)	M6010D ICP	1	67.5		*	mg/L	0.1	0.5	10/27/21 11:20	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/26/21 16:12	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/27/21 11:20	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/27/21 11:20	kja
Lead (MWMT)	M6020B ICP-MS	1	0.00042	B		mg/L	0.0001	0.0005	10/26/21 16:12	mfm
Magnesium (MWMT)	M6010D ICP	1	9.88		*	mg/L	0.2	1	10/27/21 11:20	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/27/21 11:20	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/26/21 16:17	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/27/21 11:20	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/27/21 11:20	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/27/21 11:20	kja
Potassium (MWMT)	M6010D ICP	1	5.66		*	mg/L	0.2	1	10/27/21 11:20	kja
Selenium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.00025	10/26/21 16:12	mfm
Silica (MWMT)	M6010D ICP	1	54.9		*	mg/L	0.2	1	10/27/21 11:20	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/26/21 16:12	mfm
Sodium (MWMT)	M6010D ICP	1	58.3		*	mg/L	0.2	1	10/27/21 11:20	kja
Strontium (MWMT)	M6010D ICP	1	0.406		*	mg/L	0.009	0.045	10/27/21 11:20	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/02/21 12:31	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00138			mg/L	0.0001	0.0005	10/26/21 16:12	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/27/21 11:20	kja

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 6

ACZ Sample ID: ***L68094-06***
Date Sampled: *10/20/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/13/21 0:00	gkh
Extraction pH		1	7.5		*	units			10/13/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/13/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/13/21 0:00	gkh
Leachate Volume		1	1980		*	mL			10/13/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/13/21 0:00	gkh
Post Filter pH		1	8.21		*	units			10/13/21 0:00	gkh
Pre Filter pH		1	8.19		*	units			10/13/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/13/21 0:00	gkh
Temperature		1	20.4		*	C	0.1	0.1	10/13/21 0:00	gkh
Time In		1			*				10/13/21 0:00	gkh
Time Out		1			*				10/13/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	134		*	mg/L	2	20	10/21/21 0:00	eep
Carbonate as CaCO3		1	28.6		*	mg/L	2	20	10/21/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/21/21 0:00	eep
Total Alkalinity		1	162		*	mg/L	2	20	10/21/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	55.4		*	mg/L	0.5	2	10/26/21 15:53	md
Fluoride (MWMT)	SM4500F-C	1	1.17		*	mg/L	0.15	0.35	10/21/21 16:25	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.604			mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.604		*	mg/L	0.02	0.1	10/21/21 0:06	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/21/21 0:06	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/04/21 14:53	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.37	B	*	mg/L	0.2	0.5	11/05/21 0:42	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.084		*	mg/L	0.01	0.05	10/21/21 0:02	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	88.6		*	mg/L	5	25	10/21/21 13:52	wtc

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 7

ACZ Sample ID: ***L68094-07***
Date Sampled: *10/27/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/28/21 10:05	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/28/21 8:10	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								11/01/21 11:53	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	11/01/21 1:35	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	11/04/21 16:10	bsu
Arsenic (MWMT)	M6020B ICP-MS	1	0.00237		*	mg/L	0.0002	0.001	11/04/21 16:10	bsu
Barium (MWMT)	M6010D ICP	1	0.0169	B		mg/L	0.007	0.035	11/01/21 1:35	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/04/21 16:10	bsu
Boron (MWMT)	M6010D ICP	1	1.62			mg/L	0.03	0.1	11/01/21 1:35	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	11/04/21 16:10	bsu
Calcium (MWMT)	M6010D ICP	1	64.4			mg/L	0.1	0.5	11/01/21 1:35	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	11/04/21 16:10	bsu
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	11/01/21 1:35	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	11/01/21 1:35	kja
Lead (MWMT)	M6020B ICP-MS	1	0.00039	B		mg/L	0.0001	0.0005	11/04/21 16:10	bsu
Magnesium (MWMT)	M6010D ICP	1	12.2			mg/L	0.2	1	11/01/21 1:35	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	11/01/21 1:35	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/29/21 7:24	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	11/01/21 1:35	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	11/01/21 1:35	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	11/01/21 1:35	kja
Potassium (MWMT)	M6010D ICP	1	6.41			mg/L	0.2	1	11/01/21 1:35	kja
Selenium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.00025	11/04/21 16:10	bsu
Silica (MWMT)	M6010D ICP	1	59.9		*	mg/L	0.2	1	11/01/21 1:35	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/08/21 14:25	bsu
Sodium (MWMT)	M6010D ICP	1	66.8			mg/L	0.2	1	11/01/21 1:35	kja
Strontium (MWMT)	M6010D ICP	1	0.423			mg/L	0.009	0.045	11/01/21 1:35	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/04/21 16:10	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00123			mg/L	0.0001	0.0005	11/04/21 16:10	bsu
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	11/01/21 1:35	kja

Brown and Caldwell
Project ID:
Sample ID: WHAT-640-710-WEEK 7

ACZ Sample ID: ***L68094-07***
Date Sampled: *10/27/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/20/21 0:00	gkh
Extraction pH		1	7.5		*	units			10/20/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/20/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/20/21 0:00	gkh
Leachate Volume		1	1988.7		*	mL			10/20/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/20/21 0:00	gkh
Post Filter pH		1	7.95		*	units			10/20/21 0:00	gkh
Pre Filter pH		1	7.91		*	units			10/20/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/20/21 0:00	gkh
Temperature		1	20.6		*	C	0.1	0.1	10/20/21 0:00	gkh
Time In		1			*				10/20/21 0:00	gkh
Time Out		1			*				10/20/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	136		*	mg/L	2	20	11/03/21 0:00	eep
Carbonate as CaCO3		1	9.9	B	*	mg/L	2	20	11/03/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	11/03/21 0:00	eep
Total Alkalinity		1	146		*	mg/L	2	20	11/03/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	61.8		*	mg/L	0.5	2	11/02/21 13:00	md
Fluoride (MWMT)	SM4500F-C	1	1.17		*	mg/L	0.15	0.35	11/03/21 20:16	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.081	B		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.081	B	*	mg/L	0.02	0.1	10/28/21 1:10	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/28/21 1:10	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/04/21 14:56	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	11/05/21 0:49	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.022	B	*	mg/L	0.01	0.05	10/28/21 2:19	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	115		*	mg/L	5	25	10/28/21 13:13	wtc

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527409													
WG527409PBW	PBW	09/16/21 16:27				3.5	mg/L		-20	20			
WG527409LCSW1	LCSW	09/16/21 16:38	WC210908-1	820.0001		786.8	mg/L	96	90	110			
WG526640PBS	PBS	09/16/21 16:46				34.1	mg/L		-20	20			B4
L68094-01DUP	DUP	09/16/21 16:59			52.1	51.9	mg/L				0	20	
WG527183PBS	PBS	09/16/21 17:14				2.5	mg/L		-20	20			
WG527409LCSW2	LCSW	09/16/21 17:32	WC210908-1	820.0001		805.5	mg/L	98	90	110			
WG528817													
WG528817PBW	PBW	10/06/21 13:41				4.2	mg/L		-20	20			
WG528817LCSW1	LCSW	10/06/21 13:54	WC210930-12	820.0001		809.8	mg/L	99	90	110			
L68094-03DUP	DUP	10/06/21 14:27			44.2	45.4	mg/L				3	20	
WG528817LCSW2	LCSW	10/06/21 14:48	WC210930-12	820.0001		810.8	mg/L	99	90	110			
WG529057													
WG529057PBW	PBW	10/09/21 11:45				U	mg/L		-20	20			
WG529057LCSW1	LCSW	10/09/21 11:57	WC210930-12	820.0001		798	mg/L	97	90	110			
L68095-04DUP	DUP	10/09/21 12:21			47.5	47.9	mg/L				1	20	
WG529057LCSW2	LCSW	10/09/21 12:34	WC210930-12	820.0001		813.6	mg/L	99	90	110			
WG529732													
WG529732PBW	PBW	10/18/21 17:21				2.2	mg/L		-20	20			
WG529732LCSW2	LCSW	10/18/21 17:36	WC211018-1	820.0001		801	mg/L	98	90	110			
WG528948PBS	PBS	10/18/21 17:43				7.1	mg/L		-20	20			
L68949-01DUP	DUP	10/18/21 17:53			U	U	mg/L				0	20	RA
WG529732LCSW4	LCSW	10/18/21 18:20	WC211018-1	820.0001		785.3	mg/L	96	90	110			
WG530024													
WG530024PBW	PBW	10/21/21 13:33				4.9	mg/L		-20	20			
WG530024LCSW2	LCSW	10/21/21 13:46	WC211018-1	820.0001		789.8	mg/L	96	90	110			
WG529117PBS	PBS	10/21/21 13:52				4.9	mg/L		-20	20			
L68817-02DUP	DUP	10/21/21 14:14			22.2	30.5	mg/L				31	20	RD
WG529897PBS	PBS	10/21/21 14:39				208.9	mg/L		-20	20			B4
WG530024LCSW4	LCSW	10/21/21 15:11	WC211018-1	820.0001		798.4	mg/L	97	90	110			
WG530906													
WG530906PBW	PBW	11/03/21 12:31				8.7	mg/L		-20	20			
WG530906LCSW2	LCSW	11/03/21 12:45	WC211028-8	820.0001		794	mg/L	97	90	110			
WG530691PBS	PBS	11/03/21 13:10				U	mg/L		-20	20			
L69466-01DUP	DUP	11/03/21 13:28			61.7	63.2	mg/L				2	20	
WG530906LCSW4	LCSW	11/03/21 14:21	WC211028-8	820.0001		790.9	mg/L	96	90	110			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.024	mg/L	101	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.15	0.15			
WG526640PBS	PBS	09/18/21 2:17				.059	mg/L		-0.15	0.15			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.0008		1.007	mg/L	101	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.0008	U	1.077	mg/L	108	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.0008	U	1.057	mg/L	106	75	125	2	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.952	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.15	0.15			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.15	0.15			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.0008		1.017	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.0008	U	1.014	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.0008	U	1.029	mg/L	103	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.964	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.15	0.15			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.15	0.15			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.0008		1	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.0008	U	1.009	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.0008	U	1.03	mg/L	103	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.968	mg/L	98	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.15	0.15			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.15	0.15			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.0008		1.007	mg/L	101	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.0008	U	1.014	mg/L	101	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.0008	U	1.009	mg/L	101	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.003	mg/L	100	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.15	0.15			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.15	0.15			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.0008		1.061	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.0008	U	1.059	mg/L	106	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.0008	U	1.07	mg/L	107	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.015	mg/L	101	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.15	0.15			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.15	0.15			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.0008		1.056	mg/L	106	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.0008	U	1.071	mg/L	107	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.0008	U	1.048	mg/L	105	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.011	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.15	0.15			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.15	0.15			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.0008		1.014	mg/L	101	80	120			

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.0008	U	1.031	mg/L	103	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.0008	U	1.051	mg/L	105	75	125	2	20

Antimony (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.0201		.02102	mg/L	105	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0012	0.0012			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.01		.00977	mg/L	98	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.01	U	.01038	mg/L	104	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.01	U	.0102	mg/L	102	75	125	2	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.0201		.01982	mg/L	99	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0012	0.0012			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0012	0.0012			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.01	U	.00985	mg/L	99	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.01	U	.00986	mg/L	99	75	125	0	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.01		.00972	mg/L	97	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.01		.00975	mg/L	98	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.01	U	.01004	mg/L	100	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.01	U	.00995	mg/L	100	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.0201		.02051	mg/L	102	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0012	0.0012			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.01		.00988	mg/L	99	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.01	U	.01067	mg/L	107	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.01	U	.0107	mg/L	107	75	125	0	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.0201		.0207	mg/L	103	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0012	0.0012			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.01		.01031	mg/L	103	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.01	U	.01084	mg/L	108	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.01	U	.01093	mg/L	109	75	125	1	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.0201		.02107	mg/L	105	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0012	0.0012			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.01		.01018	mg/L	102	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.01	U	.01057	mg/L	106	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.01	U	.01059	mg/L	106	75	125	0	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0012	0.0012			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.01	.00044	.01073	mg/L	103	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.01	.00044	.01085	mg/L	104	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.01		.00918	mg/L	92	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.0201		.0198	mg/L	99	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0012	0.0012			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.01		.00968	mg/L	97	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.01	U	.01032	mg/L	103	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.01	U	.01039	mg/L	104	75	125	1	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Arsenic (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05305	mg/L	106	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0006	0.0006			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.04602	mg/L	92	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	.00114	.05172	mg/L	101	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	.00114	.05164	mg/L	101	75	125	0	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05192	mg/L	104	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0006	0.0006			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0006	0.0006			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	.00124	.04032	mg/L	78	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	.00124	.03969	mg/L	77	75	125	2	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.04494	mg/L	90	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.0455	mg/L	91	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	.00114	.04507	mg/L	88	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	.00114	.0432	mg/L	84	75	125	4	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05187	mg/L	104	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0006	0.0006			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05005		.04973	mg/L	99	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05005	.0018	.04802	mg/L	92	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05005	.0018	.05048	mg/L	97	75	125	5	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.05		.05081	mg/L	102	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0006	0.0006			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.05005		.04912	mg/L	98	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.05005	.0014	.05119	mg/L	99	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.05005	.0014	.05117	mg/L	99	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.0521	mg/L	104	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0006	0.0006			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.04784	mg/L	96	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	.00159	.05093	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	.00159	.04983	mg/L	96	75	125	2	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0006	0.0006			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	.00208	.04992	mg/L	96	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	.00208	.05099	mg/L	98	75	125	2	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.0498	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.04988	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0006	0.0006			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.0473	mg/L	95	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	.00203	.04963	mg/L	95	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	.00203	.04906	mg/L	94	75	125	1	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Barium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.045	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.021	0.021			
WG526640PBS	PBS	09/18/21 2:17				.0076	mg/L		-0.021	0.021			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.4845	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	.0183	.5184	mg/L	100	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	.0183	.5164	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.006	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.021	0.021			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.021	0.021			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.5045	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	.0141	.5132	mg/L	100	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	.0141	.5186	mg/L	101	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.002	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.021	0.021			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.021	0.021			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.4844	mg/L	97	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	.0157	.5137	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	.0157	.5198	mg/L	101	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.977	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.021	0.021			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.021	0.021			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.4876	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	.01	.5001	mg/L	98	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	.01	.5003	mg/L	98	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.008	mg/L	100	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.021	0.021			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.021	0.021			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.5047	mg/L	101	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	.0074	.5121	mg/L	101	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	.0074	.5161	mg/L	102	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.011	mg/L	101	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.021	0.021			
WG529897PBS	PBS	10/27/21 11:13				.041	mg/L		-0.021	0.021			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.5513	mg/L	110	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	.0201	.5324	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	.0201	.5206	mg/L	100	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.013	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.021	0.021			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.021	0.021			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.4877	mg/L	98	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	.0169	.5184	mg/L	100	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	.0169	.525	mg/L	102	75	125	1	20	

Beryllium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.054126	mg/L	108	90	110			
WG528195ICB	ICB	09/28/21 14:19				.00009	mg/L		-0.00024	0.00024			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.047804	mg/L	96	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	U	.02699	mg/L	54	75	125			M2
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	U	.026358	mg/L	53	75	125	2	20	M2
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.052766	mg/L	106	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.00024	0.00024			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.00024	0.00024			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	U	.046292	mg/L	92	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	U	.045972	mg/L	92	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.048845	mg/L	98	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.049346	mg/L	99	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	U	.04642	mg/L	93	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	U	.045071	mg/L	90	75	125	3	20	
WG529903													
WG529903ICV	ICV	10/20/21 13:00	MS211013-2	.05		.052605	mg/L	105	90	110			
WG529903ICB	ICB	10/20/21 13:02				U	mg/L		-0.00024	0.00024			
WG529558LFB	LFB	10/20/21 13:12	MS210927-3	.05005		.05227	mg/L	104	80	120			
L68095-05MS	MS	10/20/21 13:20	MS210927-3	.05005	U	.045892	mg/L	92	75	125			
L68095-05MSD	MSD	10/20/21 13:21	MS210927-3	.05005	U	.048302	mg/L	97	75	125	5	20	
WG530803													
WG530803ICV	ICV	11/02/21 12:02	MS211013-2	.05		.05136	mg/L	103	90	110			
WG530803ICB	ICB	11/02/21 12:04				U	mg/L		-0.00024	0.00024			
WG529085LFB	LFB	11/02/21 12:15	MS210927-3	.05005		.049991	mg/L	100	80	120			
L68095-04MS	MS	11/02/21 12:22	MS210927-3	.05005	U	.048731	mg/L	97	75	125			
L68095-04MSD	MSD	11/02/21 12:24	MS210927-3	.05005	U	.048858	mg/L	98	75	125	0	20	
WG529897PBS	PBS	11/02/21 12:29				U	mg/L		-0.00024	0.00024			
L68095-06MS	MS	11/02/21 12:34	MS210927-3	.05005	U	.046781	mg/L	93	75	125			
L68095-06MSD	MSD	11/02/21 12:36	MS210927-3	.05005	U	.046588	mg/L	93	75	125	0	20	
WG529897LFB2	LFB	11/02/21 12:38	MS210927-3	.05005		.050004	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.050002	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				.000101	mg/L		-0.00024	0.00024			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.045384	mg/L	91	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.043472	mg/L	87	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.043767	mg/L	87	75	125	1	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.033	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.09	0.09			
WG526640PBS	PBS	09/18/21 2:17				.313	mg/L		-0.09	0.09			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.796	mg/L	159	80	120			B1
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	2.04	2.516	mg/L	95	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	2.04	2.501	mg/L	92	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.004	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.09	0.09			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.09	0.09			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.53	mg/L	106	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	1.79	2.271	mg/L	96	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	1.79	2.323	mg/L	106	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.032	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.09	0.09			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.09	0.09			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.511	mg/L	102	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	1.85	2.355	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	1.85	2.376	mg/L	105	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		2.005	mg/L	100	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.09	0.09			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.09	0.09			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.512	mg/L	102	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	1.74	2.217	mg/L	95	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	1.74	2.206	mg/L	93	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.021	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.09	0.09			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.09	0.09			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.531	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	1.8	2.322	mg/L	104	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	1.8	2.358	mg/L	111	75	125	2	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.067	mg/L	103	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.09	0.09			
WG529897PBS	PBS	10/27/21 11:13				.197	mg/L		-0.09	0.09			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		.73	mg/L	146	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	1.69	2.264	mg/L	115	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	1.69	2.217	mg/L	105	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.996	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.09	0.09			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.09	0.09			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.498	mg/L	100	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	1.62	2.143	mg/L	104	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	1.62	2.171	mg/L	110	75	125	1	20

Cadmium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.055199	mg/L	110	90	110			
WG528195ICB	ICB	09/28/21 14:19				.000115	mg/L		-0.00015	0.00015			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.047018	mg/L	94	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	.000067	.047871	mg/L	96	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	.000067	.046436	mg/L	93	75	125	3	20	
WG528919													
WG528919ICV	ICV	10/07/21 16:22	MS211001-2	.05		.051506	mg/L	103	90	110			
WG528919ICB	ICB	10/07/21 16:24				U	mg/L		-0.00015	0.00015			
WG526640PBS	PBS	10/07/21 16:32				U	mg/L		-0.00015	0.00015			
WG526640LFB2	LFB	10/07/21 16:34	MS210827-2	.05005		.046601	mg/L	93	80	120			
L68095-01MS	MS	10/07/21 16:40	MS210827-2	.05005	.000295	.045749	mg/L	91	75	125			
L68095-01MSD	MSD	10/07/21 16:42	MS210827-2	.05005	.000295	.046472	mg/L	92	75	125	2	20	
WG528369LFB	LFB	10/07/21 16:47	MS210927-3	.05005		.047783	mg/L	95	80	120			
L68095-03MS	MS	10/07/21 16:51	MS210927-3	.05005	U	.046139	mg/L	92	75	125			
L68095-03MSD	MSD	10/07/21 16:53	MS210927-3	.05005	U	.047618	mg/L	95	75	125	3	20	
WG529903													
WG529903ICV	ICV	10/20/21 13:00	MS211013-2	.05		.051124	mg/L	102	90	110			
WG529903ICB	ICB	10/20/21 13:02				U	mg/L		-0.00015	0.00015			
WG529558LFB	LFB	10/20/21 13:12	MS210927-3	.05005		.050875	mg/L	102	80	120			
L68095-05MS	MS	10/20/21 13:20	MS210927-3	.05005	U	.045913	mg/L	92	75	125			
L68095-05MSD	MSD	10/20/21 13:21	MS210927-3	.05005	U	.048567	mg/L	97	75	125	6	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.054366	mg/L	109	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.00015	0.00015			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.048367	mg/L	97	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	U	.048165	mg/L	96	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	U	.047928	mg/L	96	75	125	0	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.00015	0.00015			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	U	.048348	mg/L	97	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	U	.048438	mg/L	97	75	125	0	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.048754	mg/L	97	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.049865	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.00015	0.00015			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.044889	mg/L	90	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.044989	mg/L	90	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.045466	mg/L	91	75	125	1	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Calcium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		98.45	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.3	0.3			
WG526640PBS	PBS	09/18/21 2:17				16.49	mg/L		-0.3	0.3			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	67.98972		80.43	mg/L	118	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	67.98972	206	272.4	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	67.98972	206	269.4	mg/L	93	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		100.1	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.3	0.3			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.3	0.3			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	67.98972		71.05	mg/L	105	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	67.98972	147	214.5	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	67.98972	147	218.6	mg/L	105	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		101.5	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.3	0.3			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.3	0.3			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	67.98972		69.89	mg/L	103	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	67.98972	98.3	167.6	mg/L	102	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	67.98972	98.3	169.3	mg/L	104	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		100.5	mg/L	101	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.3	0.3			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.3	0.3			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	67.98972		68.73	mg/L	101	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	67.98972	52.1	120.8	mg/L	101	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	67.98972	52.1	120.4	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		101.4	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.3	0.3			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.3	0.3			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	67.98972		72.23	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	67.98972	31.7	103	mg/L	105	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	67.98972	31.7	104.2	mg/L	107	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		100.3	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.3	0.3			
WG529897PBS	PBS	10/27/21 11:13				75.3	mg/L		-0.3	0.3			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	67.98972		146.9	mg/L	216	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	67.98972	67.5	138.4	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	67.98972	67.5	135.2	mg/L	100	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		100.5	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.3	0.3			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.3	0.3			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	67.98972		69.1	mg/L	102	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	67.98972	64.4	133.8	mg/L	102	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	67.98972	64.4	135.2	mg/L	104	75	125	1	20	

Chloride (MWMT) SM4500Cl-E

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527931													
WG527931ICV	ICV	09/24/21 11:09	WI210503-1	54.89		53.49	mg/L	97	90	110			
WG527931ICB	ICB	09/24/21 11:09				U	mg/L		-1.5	1.5			
WG527931LFB	LFB	09/24/21 11:10	WI210908-11	29.97		28.03	mg/L	94	90	110			
WG526640PBS	PBS	09/24/21 11:10				36.22	mg/L		-1.5	1.5			B1
L68094-01AS	AS	09/24/21 11:11	WI210908-11	29.97	41.8	66.66	mg/L	83	90	110			M2
WG527183PBS	PBS	09/24/21 11:27				U	mg/L		-1.5	1.5			
WG528710													
WG528710ICV	ICV	10/05/21 15:57	WI210503-1	54.89		53.43	mg/L	97	90	110			
WG528710ICB	ICB	10/05/21 15:58				U	mg/L		-1.5	1.5			
WG528710LFB	LFB	10/05/21 15:58	WI210908-11	29.97		31.24	mg/L	104	90	110			
L68094-03AS	AS	10/05/21 15:59	WI210908-11	29.97	42.4	69.68	mg/L	91	90	110			
WG529573													
WG529573ICV	ICV	10/18/21 14:11	WI210503-1	54.89		53.24	mg/L	97	90	110			
WG529573ICB	ICB	10/18/21 14:12				U	mg/L		-1.5	1.5			
WG529573LFB	LFB	10/18/21 14:12	WI210908-11	29.97		29.84	mg/L	100	90	110			
L68094-04AS	AS	10/18/21 14:13	WI210908-11	29.97	43.2	70.95	mg/L	93	90	110			
WG528948PBS	PBS	10/18/21 14:14				U	mg/L		-1.5	1.5			
WG530304													
WG530304ICV	ICV	10/26/21 15:44	WI210503-1	54.89		52.91	mg/L	96	90	110			
WG530304ICB	ICB	10/26/21 15:45				.67	mg/L		-1.5	1.5			
WG530304LFB	LFB	10/26/21 15:45	WI210908-11	29.97		28.04	mg/L	94	90	110			
WG529117PBS	PBS	10/26/21 15:46				1.12	mg/L		-1.5	1.5			
WG529753PBS	PBS	10/26/21 15:49				U	mg/L		-1.5	1.5			
WG529897PBS	PBS	10/26/21 15:53				60.54	mg/L		-1.5	1.5			B1
L68095-06AS	AS	10/26/21 15:54	WI210908-11	29.97	57	83.89	mg/L	90	90	110			
L69249-01DUP	DUP	10/26/21 16:19			1530	1461.83	mg/L				5	20	
WG530823													
WG530823ICV	ICV	11/02/21 12:56	WI210503-1	54.89		53.82	mg/L	98	90	110			
WG530823ICB	ICB	11/02/21 12:56				U	mg/L		-1.5	1.5			
WG530823LFB	LFB	11/02/21 12:57	WI210908-11	29.97		29.41	mg/L	98	90	110			
WG529753PBS	PBS	11/02/21 12:57				U	mg/L		-1.5	1.5			
L69249-03AS	AS	11/02/21 13:14	5XCL	30	179	198.23	mg/L	64	90	110			M2
L69249-01DUP	DUP	11/02/21 13:25			1550	1525.75	mg/L				2	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Chromium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05483	mg/L	110	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0015	0.0015			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05		.04642	mg/L	93	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05	U	.05193	mg/L	104	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05	U	.05124	mg/L	102	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05354	mg/L	107	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0015	0.0015			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0015	0.0015			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	U	.04194	mg/L	84	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	U	.04111	mg/L	82	75	125	2	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04531	mg/L	91	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04599	mg/L	92	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	U	.04433	mg/L	89	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	U	.04262	mg/L	85	75	125	4	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05506	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0015	0.0015			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.05075	mg/L	102	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	U	.04574	mg/L	91	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	U	.04833	mg/L	97	75	125	6	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.05		.05303	mg/L	106	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0015	0.0015			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.05		.04962	mg/L	99	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.05	U	.04957	mg/L	99	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.05	U	.04969	mg/L	99	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05514	mg/L	110	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0015	0.0015			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.05096	mg/L	102	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	U	.05035	mg/L	101	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	U	.04969	mg/L	99	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0015	0.0015			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	U	.05029	mg/L	101	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	U	.05057	mg/L	101	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.05129	mg/L	103	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05036	mg/L	101	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0015	0.0015			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04642	mg/L	93	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	U	.04562	mg/L	91	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	U	.04534	mg/L	91	75	125	1	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Copper (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.964	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.03	0.03			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.03	0.03			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.48	mg/L	96	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	U	.503	mg/L	101	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	U	.501	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.939	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.03	0.03			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.03	0.03			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.504	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	U	.503	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	U	.509	mg/L	102	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.964	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.03	0.03			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.03	0.03			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.496	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	.014	.507	mg/L	99	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	.014	.52	mg/L	101	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.929	mg/L	96	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.03	0.03			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.03	0.03			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.494	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	U	.5	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	U	.496	mg/L	99	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.97	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.03	0.03			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.03	0.03			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.516	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	U	.516	mg/L	103	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	U	.518	mg/L	104	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.987	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.03	0.03			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.03	0.03			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.524	mg/L	105	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	U	.526	mg/L	105	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	U	.512	mg/L	102	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.988	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.03	0.03			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.03	0.03			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.498	mg/L	100	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	U	.51	mg/L	102	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	U	.517	mg/L	103	75	125	1	20	

Fluoride (MWMT) SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527353													
WG527353ICV	ICV	09/16/21 10:51	WC210903-1	2.002		2.1	mg/L	105	90	110			
WG527353ICB	ICB	09/16/21 10:56				U	mg/L		-0.3	0.3			
WG527413													
WG527413ICV	ICV	09/16/21 16:35	WC210903-1	2.002		2.12	mg/L	106	90	110			
WG527413ICB	ICB	09/16/21 16:43				U	mg/L		-0.3	0.3			
WG527413LFB	LFB	09/16/21 16:55	WC210803-9	5.02		4.53	mg/L	90	90	110			
WG526640PBS	PBS	09/16/21 17:01				U	mg/L		-0.3	0.3			
L68094-01AS	AS	09/16/21 17:17	WC210803-9	5.02	.64	5.28	mg/L	92	90	110			
L68094-01ASD	ASD	09/16/21 17:25	WC210803-9	5.02	.64	5.28	mg/L	92	90	110	0	20	
WG528795													
WG528795ICV	ICV	10/06/21 12:55	WC210920-1	2.002		2.12	mg/L	106	90	110			
WG528795ICB	ICB	10/06/21 13:00				U	mg/L		-0.3	0.3			
WG528795LFB	LFB	10/06/21 13:07	WC210803-9	5.02		4.89	mg/L	97	90	110			
L68094-02AS	AS	10/06/21 13:23	WC210803-9	5.02	.8	5.64	mg/L	96	90	110			
L68094-02ASD	ASD	10/06/21 13:31	WC210803-9	5.02	.8	5.56	mg/L	95	90	110	1	20	
WG529059													
WG529059ICV	ICV	10/09/21 11:35	WC211007-1	2.002		2.18	mg/L	109	90	110			
WG529059ICB	ICB	10/09/21 11:40				U	mg/L		-0.3	0.3			
WG529059LFB	LFB	10/09/21 11:48	WC210803-9	5.02		5.28	mg/L	105	90	110			
L68094-04AS	AS	10/09/21 12:04	WC210803-9	5.02	1.11	6.14	mg/L	100	90	110			
L68094-04ASD	ASD	10/09/21 12:12	WC210803-9	5.02	1.11	6.03	mg/L	98	90	110	2	20	
WG530030													
WG530030ICV	ICV	10/21/21 14:13	WC211019-3	2.002		2.07	mg/L	103	90	110			
WG530030ICB	ICB	10/21/21 14:17				U	mg/L		-0.3	0.3			
WG530030LFB	LFB	10/21/21 14:24	WC210803-9	5.02		5.21	mg/L	104	90	110			
WG528948PBS	PBS	10/21/21 14:28				U	mg/L		-0.3	0.3			
WG529117PBS	PBS	10/21/21 14:54				U	mg/L		-0.3	0.3			
L68817-02AS	AS	10/21/21 15:18	WC210803-9	5.02	1.39	6.22	mg/L	96	90	110			
L68817-02DUP	DUP	10/21/21 15:26			1.39	1.83	mg/L				27	20	RA
WG529897PBS	PBS	10/21/21 16:17				.28	mg/L		-0.3	0.3			
WG530907													
WG530907ICV	ICV	11/03/21 15:16	WC211030-1	2.002		2.07	mg/L	103	90	110			
WG530907ICB	ICB	11/03/21 15:21				U	mg/L		-0.3	0.3			
WG530976													
WG530976ICV	ICV	11/03/21 19:52	WC211030-1	2.002		2.17	mg/L	108	90	110			
WG530976ICB	ICB	11/03/21 19:59				U	mg/L		-0.3	0.3			
WG530976LFB	LFB	11/03/21 20:08	WC210803-9	5.02		5.24	mg/L	104	90	110			
WG530691PBS	PBS	11/03/21 20:32				U	mg/L		-0.3	0.3			
L69466-01AS	AS	11/03/21 20:48	WC210803-9	5.02	1.11	6.38	mg/L	105	90	110			
L69466-01DUP	DUP	11/03/21 20:56			1.11	1.18	mg/L				6	20	RA

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.976	mg/L	99	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.18	0.18			
WG526640PBS	PBS	09/18/21 2:17				.078	mg/L		-0.18	0.18			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.0001		.99	mg/L	99	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.0001	U	.998	mg/L	100	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.0001	U	.998	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.967	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.18	0.18			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.18	0.18			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.0001		1.033	mg/L	103	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.0001	U	1.003	mg/L	100	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.0001	U	1.01	mg/L	101	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.993	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.18	0.18			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.18	0.18			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.0001		.998	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.0001	U	1.007	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.0001	U	1.048	mg/L	105	75	125	4	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.939	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.18	0.18			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.18	0.18			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.0001		.997	mg/L	100	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.0001	U	1.005	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.0001	U	1.005	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.956	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.18	0.18			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.18	0.18			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.0001		1.02	mg/L	102	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.0001	U	1.037	mg/L	104	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.0001	U	1.036	mg/L	104	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.999	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.18	0.18			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.18	0.18			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.0001		1.047	mg/L	105	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.0001	U	1.042	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.0001	U	1.015	mg/L	101	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.005	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.18	0.18			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.18	0.18			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.0001		1.011	mg/L	101	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.0001	U	1.017	mg/L	102	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.0001	U	1.022	mg/L	102	75	125	0	20

Lead (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.05014	mg/L	100	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05005		.05122	mg/L	102	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05005	U	.05195	mg/L	104	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05005	U	.05268	mg/L	105	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05399	mg/L	108	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	U	.04775	mg/L	95	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	U	.04707	mg/L	94	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.04597	mg/L	92	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.04773	mg/L	95	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	U	.045	mg/L	90	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	U	.04451	mg/L	89	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.0551	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05005		.0501	mg/L	100	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05005	U	.04519	mg/L	90	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05005	U	.04704	mg/L	94	75	125	4	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05462	mg/L	109	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.04765	mg/L	95	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	U	.04952	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	U	.04924	mg/L	98	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	U	.04949	mg/L	99	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	U	.04967	mg/L	99	75	125	0	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.04898	mg/L	98	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05122	mg/L	102	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.04846	mg/L	97	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.04827	mg/L	96	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.04815	mg/L	96	75	125	0	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Magnesium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		95.5	mg/L	96	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				.71	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	49.99828		46.25	mg/L	93	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	49.99828	30.9	79.01	mg/L	96	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	49.99828	30.9	78.11	mg/L	94	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		95.29	mg/L	95	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	49.99828		49.65	mg/L	99	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	49.99828	18.2	66.41	mg/L	96	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	49.99828	18.2	67.6	mg/L	99	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		96.58	mg/L	97	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	49.99828		48.71	mg/L	97	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	49.99828	10.8	59.09	mg/L	97	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	49.99828	10.8	60.13	mg/L	99	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		96.1	mg/L	96	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	49.99828		47.71	mg/L	95	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	49.99828	5.41	53.48	mg/L	96	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	49.99828	5.41	53.21	mg/L	96	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		96.09	mg/L	96	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	49.99828		49.68	mg/L	99	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	49.99828	3.15	52.07	mg/L	98	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	49.99828	3.15	52.67	mg/L	99	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		96.2	mg/L	96	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				19.56	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	49.99828		69.18	mg/L	138	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	49.99828	9.88	59.3	mg/L	99	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	49.99828	9.88	57.74	mg/L	96	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		96.45	mg/L	96	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	49.99828		47.92	mg/L	96	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	49.99828	12.2	60.79	mg/L	97	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	49.99828	12.2	61.43	mg/L	98	75	125	1	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Manganese (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.962	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.03	0.03			
WG526640PBS	PBS	09/18/21 2:17				.017	mg/L		-0.03	0.03			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.484	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	.011	.506	mg/L	99	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	.011	.503	mg/L	98	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.935	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.03	0.03			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.03	0.03			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.506	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	U	.497	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	U	.503	mg/L	100	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.945	mg/L	97	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.03	0.03			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.03	0.03			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.496	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	U	.498	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	U	.506	mg/L	101	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.935	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.03	0.03			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.03	0.03			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.495	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	U	.5	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	U	.495	mg/L	99	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.929	mg/L	96	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.03	0.03			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.03	0.03			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.514	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	.033	.51	mg/L	95	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	.033	.512	mg/L	96	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.956	mg/L	98	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.03	0.03			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.03	0.03			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		.513	mg/L	102	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	U	.519	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	U	.504	mg/L	101	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.965	mg/L	98	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.03	0.03			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.03	0.03			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.496	mg/L	99	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	U	.506	mg/L	101	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	U	.512	mg/L	102	75	125	1	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury (MWMT) M7470A CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527527													
WG527527ICV	ICV	09/20/21 11:56	HG210913-3	.00501		.00506	mg/L	101	95	105			
WG527527ICB	ICB	09/20/21 11:57				U	mg/L		-0.0002	0.0002			
WG527528													
WG527528PBW	PBW	09/20/21 12:32				U	mg/L		-0.00044	0.00044			
WG527528LCSW	LCSW	09/20/21 12:33	HG210913-6	.002002		.00173	mg/L	86	85	115			
WG526640PBS	PBS	09/20/21 12:34				U	mg/L		-0.0006	0.0006			
L68094-01MS	MS	09/20/21 12:36	HG210913-6	.002002	U	.00174	mg/L	87	85	115			
L68094-01MSD	MSD	09/20/21 12:37	HG210913-6	.002002	U	.00195	mg/L	97	85	115	11	20	
WG526640LFB1	LFB	09/20/21 12:39	HG210913-6	.002002		.0018	mg/L	90	85	115			
WG527183PBS	PBS	09/20/21 12:40				U	mg/L		-0.0006	0.0006			
WG527183LFB1	LFB	09/20/21 12:45	HG210913-6	.002002		.00194	mg/L	97	85	115			
WG528073													
WG528073ICV	ICV	09/28/21 8:27	HG210927-3	.00501		.00514	mg/L	103	95	105			
WG528073ICB	ICB	09/28/21 8:28				U	mg/L		-0.0002	0.0002			
WG528080													
WG528080PBW	PBW	09/28/21 9:10				U	mg/L		-0.00044	0.00044			
WG528080LCSW	LCSW	09/28/21 9:11	HG210927-6	.002002		.00192	mg/L	96	85	115			
L68094-02MS	MS	09/28/21 9:13	HG210927-6	.002002	U	.00196	mg/L	98	85	115			
L68094-02MSD	MSD	09/28/21 9:14	HG210927-6	.002002	U	.00194	mg/L	97	85	115	1	20	
WG528379													
WG528379ICV	ICV	09/30/21 13:38	HG210927-3	.00501		.00511	mg/L	102	90	110			
WG528379ICB	ICB	09/30/21 13:39				U	mg/L		-0.0006	0.0006			
WG528379PBW	PBW	09/30/21 13:41				U	mg/L		-0.00044	0.00044			
WG528379LCSW	LCSW	09/30/21 13:42	HG210927-6	.002002		.00199	mg/L	99	85	115			
L68094-03MS	MS	09/30/21 13:44	HG210927-6	.002002	U	.00195	mg/L	97	85	115			
L68094-03MSD	MSD	09/30/21 13:45	HG210927-6	.002002	U	.00206	mg/L	103	85	115	5	20	
WG529213													
WG529213ICV1	ICV	10/12/21 14:26	HG211004-3	.00501		.00524	mg/L	105	95	105			
WG529213ICB	ICB	10/12/21 14:27				U	mg/L		-0.0002	0.0002			
WG529221													
WG529221PBW	PBW	10/12/21 15:13				U	mg/L		-0.00044	0.00044			
WG529221LCSW	LCSW	10/12/21 15:14	HG211004-6	.002002		.00203	mg/L	101	85	115			
L68094-04MS	MS	10/12/21 15:16	HG211004-6	.002002	U	.00196	mg/L	98	85	115			
L68094-04MSD	MSD	10/12/21 15:17	HG211004-6	.002002	U	.00199	mg/L	99	85	115	2	20	
WG529855													
WG529855ICV	ICV	10/20/21 13:52	HG211004-3	.00501		.0049	mg/L	98	90	110			
WG529855ICB	ICB	10/20/21 13:53				U	mg/L		-0.0006	0.0006			
WG529858													
WG529858PBW	PBW	10/20/21 15:19				U	mg/L		-0.00044	0.00044			
WG529858LCSW	LCSW	10/20/21 15:20	HG211015-3	.002002		.00187	mg/L	93	85	115			
L68094-05MS	MS	10/20/21 15:22	HG211015-3	.002002	U	.00186	mg/L	93	85	115			
L68094-05MSD	MSD	10/20/21 15:23	HG211015-3	.002002	U	.00191	mg/L	95	85	115	3	20	
WG530259													
WG530259ICV	ICV	10/26/21 14:33	HG211004-3	.00501		.00501	mg/L	100	95	105			
WG530259ICB	ICB	10/26/21 14:34				U	mg/L		-0.0002	0.0002			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG530296

WG530296PBW	PBW	10/26/21 16:15				U	mg/L		-0.00044	0.00044		
WG530296LCSW	LCSW	10/26/21 16:16	HG211015-3	.002002		.00206	mg/L	103	85	115		
WG529897PBS	PBS	10/26/21 16:16				U	mg/L		-0.0006	0.0006		
L68094-06MS	MS	10/26/21 16:18	HG211015-3	.002002	U	.002	mg/L	100	85	115		
L68094-06MSD	MSD	10/26/21 16:19	HG211015-3	.002002	U	.00203	mg/L	101	85	115	1	20
WG529897LFB1	LFB	10/26/21 16:21	HG211015-3	.002002		.00208	mg/L	104	85	115		

WG530504

WG530504ICV	ICV	10/29/21 7:19	HG211004-3	.00501		.00491	mg/L	98	90	110		
WG530504ICB	ICB	10/29/21 7:20				U	mg/L		-0.0006	0.0006		
WG530504PBW	PBW	10/29/21 7:22				U	mg/L		-0.00044	0.00044		
WG530504LCSW	LCSW	10/29/21 7:23	HG211015-3	.002002		.00183	mg/L	91	85	115		
L68095-07MS	MS	10/29/21 7:25	HG211015-3	.002002	U	.00178	mg/L	89	85	115		
L68095-07MSD	MSD	10/29/21 7:26	HG211015-3	.002002	U	.00183	mg/L	91	85	115	3	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.019	mg/L	101	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.06	0.06			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.06	0.06			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.501		.483	mg/L	96	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.501	U	.507	mg/L	101	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.501	U	.506	mg/L	101	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.97	mg/L	99	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.06	0.06			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.06	0.06			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.501		.502	mg/L	100	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.501	U	.497	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.501	U	.506	mg/L	101	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.005	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.06	0.06			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.06	0.06			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.501		.497	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.501	U	.503	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.501	U	.514	mg/L	103	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.989	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.06	0.06			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.06	0.06			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.501		.489	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.501	U	.49	mg/L	98	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.501	U	.487	mg/L	97	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.981	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.06	0.06			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.06	0.06			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.501		.513	mg/L	102	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.501	U	.509	mg/L	102	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.501	U	.515	mg/L	103	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.975	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.06	0.06			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.06	0.06			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.501		.505	mg/L	101	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.501	U	.51	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.501	U	.498	mg/L	99	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.976	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.06	0.06			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.06	0.06			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.501		.489	mg/L	98	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.501	U	.499	mg/L	100	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.501	U	.503	mg/L	100	75	125	1	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nickel (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.969	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.024	0.024			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.024	0.024			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.4756	mg/L	95	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	U	.492	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	U	.4912	mg/L	98	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.124	mg/L	106	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.024	0.024			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.024	0.024			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.5455	mg/L	109	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	U	.5316	mg/L	106	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	U	.5393	mg/L	108	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.106	mg/L	105	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.024	0.024			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.024	0.024			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.5305	mg/L	106	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	U	.5285	mg/L	106	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	U	.5425	mg/L	109	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		2.087	mg/L	104	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.024	0.024			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.024	0.024			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.5296	mg/L	106	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	U	.5318	mg/L	106	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	U	.5273	mg/L	105	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.102	mg/L	105	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.024	0.024			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.024	0.024			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.5441	mg/L	109	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	U	.5395	mg/L	108	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	U	.5441	mg/L	109	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.059	mg/L	103	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.024	0.024			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.024	0.024			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.5327	mg/L	107	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	U	.5337	mg/L	107	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	U	.5205	mg/L	104	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.068	mg/L	103	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.024	0.024			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.024	0.024			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.5229	mg/L	105	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	U	.5288	mg/L	106	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	U	.5308	mg/L	106	75	125	0	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrate/Nitrite as N (MWMT) M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527508													
WG527508ICV	ICV	09/18/21 20:53	WI210904-1	2.4161		2.335	mg/L	97	90	110			
WG527508ICB	ICB	09/18/21 20:55				U	mg/L		-0.02	0.02			
WG527510													
WG527510LFB	LFB	09/18/21 23:04	WI210331-13	2		1.916	mg/L	96	90	110			
WG526640PBS	PBS	09/18/21 23:06				.333	mg/L		-0.02	0.02			B1
L68094-01AS	AS	09/18/21 23:13	WI210331-13	6	2.58	8.157	mg/L	93	90	110			
WG527991													
WG527991ICV	ICV	09/24/21 23:07	WI210904-1	2.4161		2.365	mg/L	98	90	110			
WG527991ICB	ICB	09/24/21 23:08				U	mg/L		-0.02	0.02			
WG527998													
WG527998LFB	LFB	09/25/21 2:54	WI210331-13	2		1.967	mg/L	98	90	110			
L68094-02AS	AS	09/25/21 2:57	WI210331-13	2	1.71	3.669	mg/L	98	90	110			
WG528346													
WG528346ICV	ICV	09/29/21 23:41	WI210904-1	2.4161		2.411	mg/L	100	90	110			
WG528346ICB	ICB	09/29/21 23:42				U	mg/L		-0.02	0.02			
WG528350													
WG528350LFB	LFB	09/30/21 3:01	WI210331-13	2		2.02	mg/L	101	90	110			
L68094-03AS	AS	09/30/21 3:04	WI210331-13	2	1.84	3.755	mg/L	96	90	110			
WG529043													
WG529043ICV	ICV	10/08/21 17:06	WI210904-1	2.4161		2.402	mg/L	99	90	110			
WG529043ICB	ICB	10/08/21 17:07				U	mg/L		-0.02	0.02			
WG529043ICV1	ICV	10/08/21 17:45	WI210904-1	2.4161		2.381	mg/L	99	90	110			
WG529043ICB1	ICB	10/08/21 17:46				U	mg/L		-0.02	0.02			
WG529043ICV2	ICV	10/09/21 10:37	WI210904-1	2.4161		2.367	mg/L	98	90	110			
WG529043ICB2	ICB	10/09/21 10:38				U	mg/L		-0.02	0.02			
WG529043ICV3	ICV	10/09/21 11:58	WI210904-1	2.4161		2.352	mg/L	97	90	110			
WG529043ICB3	ICB	10/09/21 12:00				U	mg/L		-0.02	0.02			
WG529047													
WG529047ICV	ICV	10/09/21 12:50	WI210904-1	2.4161		2.355	mg/L	97	90	110			
WG529047ICB	ICB	10/09/21 12:51				U	mg/L		-0.02	0.02			
L68095-04AS	AS	10/09/21 12:57	WI211001-5	2	2.13	3.989	mg/L	93	90	110			
WG529047LFB	LFB	10/09/21 13:01	WI211001-5	2		1.961	mg/L	98	90	110			
WG529516													
WG529516ICV	ICV	10/14/21 22:34	WI210904-1	2.4161		2.376	mg/L	98	90	110			
WG529516ICB	ICB	10/14/21 22:36				U	mg/L		-0.02	0.02			
WG529518													
WG529518LFB	LFB	10/15/21 1:05	WI211001-5	2		2.033	mg/L	102	90	110			
L68094-05AS	AS	10/15/21 1:14	WI211001-5	6	2.12	8.196	mg/L	101	90	110			
WG529972													
WG529972ICV	ICV	10/20/21 22:24	WI210904-1	2.4161		2.352	mg/L	97	90	110			
WG529972ICB	ICB	10/20/21 22:25				U	mg/L		-0.02	0.02			
WG529974													
WG529974LFB	LFB	10/21/21 0:04	WI211001-5	2		1.999	mg/L	100	90	110			
WG529897PBS	PBS	10/21/21 0:05				U	mg/L		-0.02	0.02			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-06AS	AS	10/21/21 0:07	WI211001-5	2	.604	2.713	mg/L	105	90	110
WG530441										
WG530441ICV	ICV	10/27/21 23:38	WI210904-1	2.4161		2.356	mg/L	98	90	110
WG530441ICB	ICB	10/27/21 23:39				U	mg/L		-0.02	0.02
WG530447										
WG530447LFB	LFB	10/28/21 1:09	WI211001-5	2		2.045	mg/L	102	90	110
L68094-07AS	AS	10/28/21 1:12	WI211001-5	2	.081	2.174	mg/L	105	90	110

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrite as N (MWMT) M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527508													
WG527508ICV	ICV	09/18/21 20:53	WI210904-1	.6089		.597	mg/L	98	90	110			
WG527508ICB	ICB	09/18/21 20:55				U	mg/L		-0.01	0.01			
WG527510													
WG527510LFB	LFB	09/18/21 23:04	WI210331-13	1		1.009	mg/L	101	90	110			
WG526640PBS	PBS	09/18/21 23:06				U	mg/L		-0.01	0.01			
L68094-01AS	AS	09/18/21 23:08	WI210331-13	1	.547	1.496	mg/L	95	90	110			
WG527991													
WG527991ICV	ICV	09/24/21 23:07	WI210904-1	.6089		.6	mg/L	99	90	110			
WG527991ICB	ICB	09/24/21 23:08				U	mg/L		-0.01	0.01			
WG527998													
WG527998LFB	LFB	09/25/21 2:54	WI210331-13	1		.975	mg/L	98	90	110			
L68094-02AS	AS	09/25/21 2:57	WI210331-13	1	.355	1.357	mg/L	100	90	110			
WG528346													
WG528346ICV	ICV	09/29/21 23:41	WI210904-1	.6089		.61	mg/L	100	90	110			
WG528346ICB	ICB	09/29/21 23:42				U	mg/L		-0.01	0.01			
WG528350													
WG528350LFB	LFB	09/30/21 3:01	WI210331-13	1		1.019	mg/L	102	90	110			
L68094-03AS	AS	09/30/21 3:04	WI210331-13	1	.097	1.148	mg/L	105	90	110			
WG529043													
WG529043ICV	ICV	10/08/21 17:06	WI210904-1	.6089		.614	mg/L	101	90	110			
WG529043ICB	ICB	10/08/21 17:07				U	mg/L		-0.01	0.01			
WG529043ICV1	ICV	10/08/21 17:45	WI210904-1	.6089		.623	mg/L	102	90	110			
WG529043ICB1	ICB	10/08/21 17:46				U	mg/L		-0.01	0.01			
WG529047													
WG529047ICV	ICV	10/09/21 12:50	WI210904-1	.6089		.615	mg/L	101	90	110			
WG529047ICB	ICB	10/09/21 12:51				U	mg/L		-0.01	0.01			
L68095-04AS	AS	10/09/21 12:57	WI211001-5	1	U	.989	mg/L	99	90	110			
WG529047LFB	LFB	10/09/21 13:01	WI211001-5	1		.963	mg/L	96	90	110			
WG529516													
WG529516ICV	ICV	10/14/21 22:34	WI210904-1	.6089		.583	mg/L	96	90	110			
WG529516ICB	ICB	10/14/21 22:36				U	mg/L		-0.01	0.01			
WG529518													
WG529518LFB	LFB	10/15/21 1:05	WI211001-5	1		.964	mg/L	96	90	110			
L68094-05AS	AS	10/15/21 1:08	WI211001-5	1	U	.987	mg/L	99	90	110			
WG529972													
WG529972ICV	ICV	10/20/21 22:24	WI210904-1	.6089		.59	mg/L	97	90	110			
WG529972ICB	ICB	10/20/21 22:25				U	mg/L		-0.01	0.01			
WG529974													
WG529974LFB	LFB	10/21/21 0:04	WI211001-5	1		.966	mg/L	97	90	110			
WG529897PBS	PBS	10/21/21 0:05				U	mg/L		-0.01	0.01			
L68094-06AS	AS	10/21/21 0:07	WI211001-5	1	U	1.047	mg/L	105	90	110			
WG530441													
WG530441ICV	ICV	10/27/21 23:38	WI210904-1	.6089		.602	mg/L	99	90	110			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG530441ICB	ICB	10/27/21 23:39				U	mg/L		-0.01	0.01			
WG530447													
WG530447LFB	LFB	10/28/21 1:09	WI211001-5	1		1.024	mg/L	102	90	110			
L68094-07AS	AS	10/28/21 1:12	WI211001-5	1	U	1.035	mg/L	104	90	110			

Nitrogen, ammonia (MWMT) M350.1 Auto Salicylate w/gas diffusion

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528086													
WG528086ICV	ICV	10/04/21 14:47	WI210713-1	11.988		11.119	mg/L	93	90	110			
WG528086ICB	ICB	10/04/21 14:49				U	mg/L		-0.05	0.05			
WG528086LFB	LFB	10/04/21 14:50	WI210901-5	10		10.566	mg/L	106	90	110			
WG526640PBS	PBS	10/04/21 14:52				1.476	mg/Kg		-0.05	0.05			B1
L68094-01AS	AS	10/04/21 14:55	WI210901-5	10	.107	9.086	mg/Kg	90	75	125			
WG529893													
WG529893LFB	LFB	10/20/21 11:46	WI210901-4	10		10.376	mg/L	104	90	110			
WG528948PBS	PBS	10/20/21 11:47				U	mg/Kg		-0.05	0.05			
WG529117PBS	PBS	10/20/21 11:49				U	mg/Kg		-0.05	0.05			
L68817-02DUP	DUP	10/20/21 11:55			U	U	mg/Kg				0	20	RA
L68817-03AS	AS	10/20/21 11:58	WI210901-4	10	U	9.364	mg/Kg	94	75	125			
WG530926													
WG530926ICV	ICV	11/03/21 15:39	WI211005-1	12		12.577	mg/L	105	90	110			
WG530926ICB	ICB	11/03/21 15:41				U	mg/L		-0.05	0.05			
WG531047													
WG531047LFB	LFB	11/04/21 14:50	WI210901-4	10		10.405	mg/L	104	90	110			
WG529897PBS	PBS	11/04/21 14:52				U	mg/Kg		-0.05	0.05			
L68094-07AS	AS	11/04/21 14:58	WI210901-4	10	U	11.567	mg/Kg	116	75	125			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrogen, total Kjeldahl (MWMT) M351.2 - Block Digestor

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527424													
WG527424ICV	ICV	09/16/21 23:39	WI210816-9	4		4.04	mg/L	101	90	110			
WG527424ICB	ICB	09/16/21 23:40				U	mg/L		-0.2	0.2			
WG527426													
WG527321PBS	PBS	09/17/21 0:30				U	%		-0.2	0.2			
WG527321LFB	LFB	09/17/21 0:31	WI210714-5	2.5		2.58	mg/L	103	90	110			
L68094-01MS	MS	09/17/21 0:34	WI210714-5	2.5	.53	2.93	mg/L	96	90	110			
L68095-01DUP	DUP	09/17/21 0:36			.53	.54	mg/L				2	20	RA
WG528519													
WG528519ICV	ICV	10/02/21 2:25	WI210922-8	4		3.89	mg/L	97	90	110			
WG528519ICB	ICB	10/02/21 2:26				U	mg/L		-0.2	0.2			
WG528521													
WG528301PBS	PBS	10/02/21 3:22				U	%		-0.2	0.2			
WG528301LFB	LFB	10/02/21 3:24	WI210714-5	2.5		2.43	mg/L	97	90	110			
L68094-02MS	MS	10/02/21 3:26	WI210714-5	2.5	.56	2.76	mg/L	88	90	110			M2
L68094-03DUP	DUP	10/02/21 3:29			.38	.36	mg/L				5	20	RA
WG530132													
WG530132ICV	ICV	10/23/21 21:55	WI211022-3	4		4.06	mg/L	102	90	110			
WG530132ICB	ICB	10/23/21 21:56				U	mg/L		-0.2	0.2			
WG530134													
WG528954PBS	PBS	10/23/21 23:00				U	%		-0.2	0.2			
WG528954LFB	LFB	10/23/21 23:01	WI210714-5	2.5		2.53	mg/L	101	90	110			
L68094-04MS	MS	10/23/21 23:03	WI210714-5	2.5	U	2.72	mg/L	109	90	110			
L68095-04DUP	DUP	10/23/21 23:05			U	U	mg/L				0	20	RA
WG529429PBS	PBS	10/23/21 23:07				U	%		-0.2	0.2			
WG529429LFB	LFB	10/23/21 23:08	WI211014-3	2.5		2.56	mg/L	102	90	110			
L68094-05MS	MS	10/23/21 23:10	WI211014-3	2.5	U	2.74	mg/L	110	90	110			
L68095-05DUP	DUP	10/23/21 23:14			U	U	mg/L				0	20	RA
WG531073													
WG531073ICV	ICV	11/04/21 22:52	WI211022-3	4		3.77	mg/L	94	90	110			
WG531073ICB	ICB	11/04/21 22:53				U	mg/L		-0.2	0.2			
WG531077													
WG529988PBS	PBS	11/05/21 0:40				U	%		-0.2	0.2			
WG529988LFB	LFB	11/05/21 0:41	WI211014-3	2.5		2.63	mg/L	105	90	110			
L68094-06MS	MS	11/05/21 0:43	WI211014-3	2.5	.37	2.63	mg/L	90	90	110			
L68095-06DUP	DUP	11/05/21 0:46			.2	U	mg/L				200	20	RA
WG530681PBS	PBS	11/05/21 0:47				U	%		-0.2	0.2			
WG530681LFB	LFB	11/05/21 0:48	WI211014-3	2.5		2.32	mg/L	93	90	110			
L68094-07MS	MS	11/05/21 0:50	WI211014-3	2.5	U	2.51	mg/L	100	90	110			
L68095-07DUP	DUP	11/05/21 0:55			U	U	mg/L				0	20	RA

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Phosphorus (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	5.0075		5.13	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.3	0.3			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.3	0.3			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.001		1.01	mg/L	101	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.001	U	1.07	mg/L	107	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.001	U	1.05	mg/L	105	75	125	2	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	5.0075		5.12	mg/L	102	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.3	0.3			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.3	0.3			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.001		1.1	mg/L	110	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.001	U	1.04	mg/L	104	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	5.0075		5.1	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.3	0.3			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.3	0.3			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.001		1.03	mg/L	103	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.001	U	1.04	mg/L	104	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	5.0075		5.02	mg/L	100	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.3	0.3			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.3	0.3			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.001		1.04	mg/L	104	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.001	U	1.06	mg/L	106	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.001	U	1.03	mg/L	103	75	125	3	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	5.0075		5.04	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.3	0.3			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.3	0.3			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.001		1.07	mg/L	107	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.001	U	1.08	mg/L	108	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.001	U	1.08	mg/L	108	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	5.0075		5.1	mg/L	102	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.3	0.3			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.3	0.3			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.001		1.09	mg/L	109	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.001	U	1.1	mg/L	110	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	5.0075		5.07	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.3	0.3			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.3	0.3			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.001		1.05	mg/L	105	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.001	U	1.08	mg/L	108	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.001	U	1.08	mg/L	108	75	125	0	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Phosphorus, ortho dissolved (MWMT) M365.1 - Automated Ascorbic Acid

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527512													
WG527512ICV	ICV	09/19/21 0:10	WI210401-4	.65228		.674	mg/L	103	90	110			
WG527512ICB	ICB	09/19/21 0:11				U	mg/L		-0.01	0.01			
WG527512LFB	LFB	09/19/21 0:13	WI210907-2	.5		.496	mg/L	99	90	110			
WG526640PBS	PBS	09/19/21 0:14				.014	mg/L		-0.01	0.01			B1
L68094-01AS	AS	09/19/21 0:17	WI210907-2	.5	.015	.494	mg/L	96	90	110			
WG527997													
WG527997ICV	ICV	09/25/21 1:50	WI210401-4	.65228		.663	mg/L	102	90	110			
WG527997ICB	ICB	09/25/21 1:51				U	mg/L		-0.01	0.01			
WG527999													
WG527999LFB	LFB	09/25/21 2:53	WI210921-12	.5		.48	mg/L	96	90	110			
L68094-02AS	AS	09/25/21 2:55	WI210921-12	.5	U	.484	mg/L	97	90	110			
WG528344													
WG528344ICV	ICV	09/29/21 21:31	WI210401-4	.65228		.68	mg/L	104	90	110			
WG528344ICB	ICB	09/29/21 21:32				U	mg/L		-0.01	0.01			
WG528345													
WG528345LFB	LFB	09/29/21 22:17	WI210921-12	.5		.496	mg/L	99	90	110			
L68094-03AS	AS	09/29/21 22:19	WI210921-12	.5	.011	.49	mg/L	96	90	110			
WG528964													
WG528964ICV	ICV	10/07/21 22:56	WI210401-4	.65228		.697	mg/L	107	90	110			
WG528964ICB	ICB	10/07/21 22:57				U	mg/L		-0.01	0.01			
WG528966													
WG528966LFB	LFB	10/08/21 0:12	WI211001-2	.5		.502	mg/L	100	90	110			
L68094-04AS	AS	10/08/21 0:14	WI211001-2	.5	U	.508	mg/L	102	90	110			
WG529514													
WG529514ICV	ICV	10/14/21 21:48	WI210401-4	.65228		.695	mg/L	107	90	110			
WG529514ICB	ICB	10/14/21 21:50				U	mg/L		-0.01	0.01			
WG529517													
WG529517LFB	LFB	10/14/21 23:02	WI211001-2	.5		.521	mg/L	104	90	110			
L68094-05AS	AS	10/14/21 23:04	WI211001-2	.5	U	.514	mg/L	103	90	110			
WG529973													
WG529973ICV	ICV	10/20/21 23:38	WI210401-4	.65228		.701	mg/L	107	90	110			
WG529973ICB	ICB	10/20/21 23:39				U	mg/L		-0.01	0.01			
WG529975													
WG529975LFB	LFB	10/20/21 23:59	WI211015-3	.5		.548	mg/L	110	90	110			
WG529897PBS	PBS	10/21/21 0:00				U	mg/L		-0.01	0.01			
L68094-06AS	AS	10/21/21 0:03	WI211015-3	.5	.084	.634	mg/L	110	90	110			
WG530449													
WG530449ICV	ICV	10/28/21 1:44	WI210401-4	.65228		.699	mg/L	107	90	110			
WG530449ICB	ICB	10/28/21 1:45				U	mg/L		-0.01	0.01			
WG530450													
WG530450LFB	LFB	10/28/21 2:18	WI211015-3	.5		.535	mg/L	107	90	110			
L68094-07AS	AS	10/28/21 2:20	WI211015-3	.5	.022	.523	mg/L	100	90	110			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Potassium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	20		19.8	mg/L	99	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				1.92	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	99.96008		94.97	mg/L	95	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	99.96008	12	111.3	mg/L	99	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	99.96008	12	110.6	mg/L	99	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	20		19.6	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	99.96008		101.2	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	99.96008	7.61	108.1	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	99.96008	7.61	109.9	mg/L	102	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	20		19.74	mg/L	99	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	99.96008		99.52	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	99.96008	5.47	106.9	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	99.96008	5.47	108.2	mg/L	103	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	20		19.87	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	99.96008		97.93	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	99.96008	3.93	102.9	mg/L	99	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	99.96008	3.93	102.6	mg/L	99	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	20		19.84	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	99.96008		102.7	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	99.96008	3.32	105.3	mg/L	102	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	99.96008	3.32	106.3	mg/L	103	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	20		19.98	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				7.99	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	99.96008		111.5	mg/L	112	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	99.96008	5.66	109.8	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	99.96008	5.66	107.2	mg/L	102	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	20		20.02	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	99.96008		99.92	mg/L	100	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	99.96008	6.41	108.4	mg/L	102	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	99.96008	6.41	110.2	mg/L	104	75	125	2	20

Selenium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05366	mg/L	107	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05		.04778	mg/L	96	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05	.00018	.04888	mg/L	97	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05	.00018	.04673	mg/L	93	75	125	4	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05363	mg/L	107	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	.00019	.04741	mg/L	94	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	.00019	.04533	mg/L	90	75	125	4	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04768	mg/L	95	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04672	mg/L	93	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	.00014	.04604	mg/L	92	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	.00014	.04469	mg/L	89	75	125	3	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05289	mg/L	106	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.05023	mg/L	100	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	.00015	.04587	mg/L	91	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	.00015	.04873	mg/L	97	75	125	6	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05331	mg/L	107	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.04832	mg/L	97	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	U	.04939	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	U	.04848	mg/L	97	75	125	2	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	.0002	.04677	mg/L	93	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	.0002	.04871	mg/L	97	75	125	4	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.04996	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.04998	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				.00012	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04589	mg/L	92	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	.00021	.04618	mg/L	92	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	.00021	.04603	mg/L	92	75	125	0	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	42.8		43.56	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				.77	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	21.404		20.86	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	21.404	24	40.12	mg/L	75	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	21.404	24	39.52	mg/L	73	75	125	2	20	MA
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	42.8		43.73	mg/L	102	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	21.404		21.81	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	21.404	22	30.81	mg/L	41	75	125			M2
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	21.404	22	29.47	mg/L	35	75	125	4	20	M2
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	42.8		44.14	mg/L	103	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	21.404		20.07	mg/L	94	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	21.404	24.7	45.77	mg/L	98	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	21.404	24.7	45.45	mg/L	97	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	42.8		43.57	mg/L	102	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	21.404		19.19	mg/L	90	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	21.404	22.2	32.45	mg/L	48	75	125			M2
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	21.404	22.2	20.17	mg/L	-9	75	125	47	20	M2 RS
WG530007													
WG530007ICV	ICV	10/22/21 3:39	II211013-1	42.8		44.15	mg/L	103	90	110			
WG530007ICB	ICB	10/22/21 3:42				U	mg/L		-0.6	0.6			
WG529375PBS	PBS	10/22/21 4:07				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/22/21 4:11	II210930-2	21.404		20.32	mg/L	95	80	120			
L68094-05MS	MS	10/22/21 4:19	II2XWATER	42.83	22.3	52.92	mg/L	71	75	125			M2
L68094-05MSD	MSD	10/22/21 4:22	II2XWATER	42.83	22.3	52.5	mg/L	71	75	125	1	20	M2
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	42.8		44.66	mg/L	104	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				64.95	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	21.404		18.18	mg/L	85	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	21.404	54.9	21.47	mg/L	-156	75	125			M2
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	21.404	54.9	20.56	mg/L	-160	75	125	4	20	M2
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	42.8		44.45	mg/L	104	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	21.404		20.74	mg/L	97	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	21.404	59.9	29.31	mg/L	-143	75	125			M2
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	21.404	59.9	26.19	mg/L	-157	75	125	11	20	M2

Silver (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.02		.02037	mg/L	102	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.01002		.01028	mg/L	103	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.01002	U	.00946	mg/L	94	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.01002	U	.00934	mg/L	93	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.02		.02022	mg/L	101	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.01002	U	.00872	mg/L	87	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.01002	U	.00872	mg/L	87	75	125	0	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.01002		.0094	mg/L	94	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.01		.00869	mg/L	87	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.01	U	.00798	mg/L	80	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.01	U	.00787	mg/L	79	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.02		.02143	mg/L	107	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.01		.00908	mg/L	91	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.01	U	.00879	mg/L	88	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.01	U	.00878	mg/L	88	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.02		.02142	mg/L	107	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.01		.00938	mg/L	94	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.01	U	.00882	mg/L	88	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.01	U	.00871	mg/L	87	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.01	U	.00849	mg/L	85	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.01	U	.00855	mg/L	86	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.01		.00862	mg/L	86	80	120			
WG531225													
WG531225ICV	ICV	11/08/21 14:14	MS211013-2	.02		.01924	mg/L	96	90	110			
WG531225ICB	ICB	11/08/21 14:16				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/08/21 14:24	MS210927-3	.01		.00928	mg/L	93	80	120			
L68095-07MS	MS	11/08/21 14:30	MS210927-3	.01	U	.00897	mg/L	90	75	125			
L68095-07MSD	MSD	11/08/21 14:32	MS210927-3	.01	U	.00877	mg/L	88	75	125	2	20	

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sodium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		99.98	mg/L	100	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				18.69	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	100.007		113.1	mg/L	113	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	100.007	180	277.6	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	100.007	180	276.4	mg/L	96	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		99.93	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	100.007		102	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	100.007	87.6	185.3	mg/L	98	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	100.007	87.6	188.6	mg/L	101	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		101.3	mg/L	101	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	100.007		99.98	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	100.007	51.5	151.6	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	100.007	51.5	153.2	mg/L	102	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		100.9	mg/L	101	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	100.007		99.09	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	100.007	36	136	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	100.007	36	136.2	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		101.7	mg/L	102	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	100.007		103.6	mg/L	104	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	100.007	31.9	132	mg/L	100	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	100.007	31.9	134.1	mg/L	102	75	125	2	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		99.76	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				62.59	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	100.007		165.2	mg/L	165	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	100.007	58.3	160.2	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	100.007	58.3	156.9	mg/L	99	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		100.1	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	100.007		99.04	mg/L	99	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	100.007	66.8	164.7	mg/L	98	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	100.007	66.8	168.2	mg/L	101	75	125	2	20

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Strontium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.969	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.027	0.027			
WG526640PBS	PBS	09/18/21 2:17				.2907	mg/L		-0.027	0.027			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.7979	mg/L	159	80	120			B1
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	1.11	1.635	mg/L	105	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	1.11	1.624	mg/L	103	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.932	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.027	0.027			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.027	0.027			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.5394	mg/L	108	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	.706	1.234	mg/L	105	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	.706	1.259	mg/L	110	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.957	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.027	0.027			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.027	0.027			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.5265	mg/L	105	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	.463	1.007	mg/L	109	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	.463	1.014	mg/L	110	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.933	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.027	0.027			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.027	0.027			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.5228	mg/L	104	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	.253	.7782	mg/L	105	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	.253	.778	mg/L	105	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.957	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.027	0.027			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.027	0.027			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.5468	mg/L	109	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	.169	.7136	mg/L	109	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	.169	.7235	mg/L	111	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.973	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.027	0.027			
WG529897PBS	PBS	10/27/21 11:13				.52	mg/L		-0.027	0.027			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		1.084	mg/L	217	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	.406	.9679	mg/L	112	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	.406	.9472	mg/L	108	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.972	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.027	0.027			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.027	0.027			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.5325	mg/L	106	80	120			

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	.423	.9666	mg/L	109	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	.423	.9793	mg/L	111	75	125	1	20

Sulfate (MWMT) D516-07 - Turbidimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528808													
WG528808ICB	ICB	10/06/21 11:02				U	mg/L		-3	3			
WG528808ICV	ICV	10/06/21 11:02	WI210923-1	20.46		19.4	mg/L	95	90	110			
WG528808LFB	LFB	10/06/21 15:49	WI210105-3	10		10.1	mg/L	101	90	110			
WG526640PBS	PBS	10/06/21 15:49				U	mg/L		-3	3			
L68094-01DUP	DUP	10/06/21 16:05			898	914.4	mg/L				2	20	
WG527183PBS	PBS	10/06/21 16:06				U	mg/L		-3	3			
WG529610													
WG529610ICB1	ICB	10/18/21 11:53				U	mg/L		-3	3			
WG529610ICB	ICB	10/18/21 11:53				U	mg/L		-3	3			
WG529610ICV	ICV	10/18/21 11:53	WI211012-1	20.46		19	mg/L	93	90	110			
WG529610ICV1	ICV	10/18/21 11:53	WI211012-1	20.46		19	mg/L	93	90	110			
WG529610LFB	LFB	10/18/21 13:58	WI210105-3	10		9.8	mg/L	98	90	110			
L68094-03DUP	DUP	10/18/21 18:54			279	285	mg/L				2	20	
WG530017													
WG530017ICB	ICB	10/21/21 9:14				U	mg/L		-3	3			
WG530017ICV	ICV	10/21/21 9:14	WI211012-1	20.46		19	mg/L	93	90	110			
WG530017LFB	LFB	10/21/21 12:29	WI210105-3	10		9.1	mg/L	91	90	110			
WG529117PBS	PBS	10/21/21 12:29				U	mg/L		-3	3			
L68817-02DUP	DUP	10/21/21 13:51			67.5	61.5	mg/L				9	20	
WG529897PBS	PBS	10/21/21 13:51				102.4	mg/L		-15	15			B1
L68094-06AS	AS	10/21/21 13:52	SO4TURB5X	10	88.6	97	mg/L	84	90	110			M3
WG530510													
WG530510ICB	ICB	10/28/21 9:40				U	mg/L		-3	3			
WG530510ICV	ICV	10/28/21 9:40	WI211027-1	20.46		19.4	mg/L	95	90	110			
WG530510LFB	LFB	10/28/21 12:45	WI210105-3	10		9.4	mg/L	94	90	110			
WG529753PBS	PBS	10/28/21 12:45				U	mg/L		-3	3			
L69249-01DUP	DUP	10/28/21 13:15			332	395.1	mg/L				17	20	
L69249-02AS	AS	10/28/21 13:15	SO4TURB10X	10	220	231.5	mg/L	115	90	110			M3

BAC

ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.05068	mg/L	101	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05		.04943	mg/L	99	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05	U	.05116	mg/L	102	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05	U	.0516	mg/L	103	75	125	1	20	
WG528919													
WG528919ICV	ICV	10/07/21 16:22	MS211001-2	.05		.05069	mg/L	101	90	110			
WG528919ICB	ICB	10/07/21 16:24				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/07/21 16:32				U	mg/L		-0.0003	0.0003			
WG526640LFB2	LFB	10/07/21 16:34	MS210827-2	.05		.04485	mg/L	90	80	120			
L68095-01MS	MS	10/07/21 16:40	MS210827-2	.05	U	.04595	mg/L	92	75	125			
L68095-01MSD	MSD	10/07/21 16:42	MS210827-2	.05	U	.046	mg/L	92	75	125	0	20	
WG528369LFB	LFB	10/07/21 16:47	MS210927-3	.05		.04759	mg/L	95	80	120			
L68095-03MS	MS	10/07/21 16:51	MS210927-3	.05	U	.04714	mg/L	94	75	125			
L68095-03MSD	MSD	10/07/21 16:53	MS210927-3	.05	U	.04639	mg/L	93	75	125	2	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05475	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.04758	mg/L	95	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	U	.04193	mg/L	84	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	U	.04427	mg/L	89	75	125	5	20	
WG530803													
WG530803ICV	ICV	11/02/21 12:02	MS211013-2	.05		.05417	mg/L	108	90	110			
WG530803ICB	ICB	11/02/21 12:04				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	11/02/21 12:15	MS210927-3	.05		.05036	mg/L	101	80	120			
L68095-04MS	MS	11/02/21 12:22	MS210927-3	.05	U	.05133	mg/L	103	75	125			
L68095-04MSD	MSD	11/02/21 12:24	MS210927-3	.05	U	.05083	mg/L	102	75	125	1	20	
WG529897PBS	PBS	11/02/21 12:29				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	11/02/21 12:34	MS210927-3	.05	U	.05313	mg/L	106	75	125			
L68095-06MSD	MSD	11/02/21 12:36	MS210927-3	.05	U	.05215	mg/L	104	75	125	2	20	
WG529897LFB2	LFB	11/02/21 12:38	MS210927-3	.05		.05314	mg/L	106	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.0523	mg/L	105	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04627	mg/L	93	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	U	.0465	mg/L	93	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	U	.04627	mg/L	93	75	125	0	20	

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ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.04978	mg/L	100	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05		.05058	mg/L	101	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05	.00085	.05704	mg/L	112	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05	.00085	.05745	mg/L	113	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05305	mg/L	106	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	.00164	.05068	mg/L	98	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	.00164	.04997	mg/L	97	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04616	mg/L	92	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04615	mg/L	92	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	.00043	.04825	mg/L	96	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	.00043	.04746	mg/L	94	75	125	2	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05328	mg/L	107	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.04705	mg/L	94	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	.00039	.04463	mg/L	88	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	.00039	.0477	mg/L	95	75	125	7	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05399	mg/L	108	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.04541	mg/L	91	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	.00037	.05013	mg/L	100	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	.00037	.04967	mg/L	99	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	.0017	.05314	mg/L	103	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	.0017	.05347	mg/L	104	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.05203	mg/L	104	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05097	mg/L	102	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04799	mg/L	96	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	.00138	.05038	mg/L	98	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	.00138	.05149	mg/L	100	75	125	2	20	

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ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Zinc (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2	mg/L	100	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.06	0.06			
WG526640PBS	PBS	09/18/21 2:17				.024	mg/L		-0.06	0.06			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.50045		.51	mg/L	102	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.50045	U	.534	mg/L	107	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.50045	U	.529	mg/L	106	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.971	mg/L	99	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.06	0.06			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.06	0.06			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.50045		.535	mg/L	107	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.50045	U	.525	mg/L	105	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.50045	U	.542	mg/L	108	75	125	3	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.009	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.06	0.06			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.06	0.06			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.50045		.523	mg/L	105	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.50045	U	.525	mg/L	105	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.50045	U	.54	mg/L	108	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.96	mg/L	98	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.06	0.06			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.06	0.06			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.50045		.511	mg/L	102	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.50045	U	.514	mg/L	103	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.50045	U	.51	mg/L	102	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.953	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.06	0.06			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.06	0.06			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.50045		.532	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.50045	U	.526	mg/L	105	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.50045	U	.54	mg/L	108	75	125	3	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.046	mg/L	102	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.06	0.06			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.06	0.06			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.50045		.553	mg/L	111	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.50045	U	.546	mg/L	109	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.50045	U	.536	mg/L	107	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.013	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.06	0.06			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.06	0.06			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.50045		.527	mg/L	105	80	120			

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ACZ Project ID: ***L68094***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.50045	U	.53	mg/L	106	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.50045	U	.527	mg/L	105	75	125	1	20

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-01	WG527490	Barium (MWMT)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Boron (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Calcium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG527931	Chloride (MWMT)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527490	Magnesium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG527528	Mercury (MWMT)	M7470A CVAA	H3	Sample was received and analyzed past holding time.
	WG527510	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
	WG528086	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG527426	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527512	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527490	Potassium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Silica (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Sodium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG528808	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527409	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
	WG527490	Zinc (MWMT)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-02	WG528195	Arsenic (MWMT)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Beryllium (MWMT)	M6020B ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
			M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527931	Chloride (MWMT)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527796	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
		Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG527998	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
	WG528086	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG528521	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527796	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG527999	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	H1	Sample prep or analysis performed past holding time. See case narrative.
	WG527796	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG528020	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG528808	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527796	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-03	WG528710	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG528350	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528521	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528345	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell

ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-04	WG529573	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529047	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
			M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
			M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530134	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528966	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529216	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	RS	RPD of matrix spikes for total or total recoverable silica is outside acceptance limits. Acceptable precision for other metals indicates silica RPD failure may be attributed to digestion-triggered silica polymerization and precipitation.
			M6010D ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-05	WG529573	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529375	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530030	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529888	ICP MWMT Prep	M6010D ICP	DJ	Sample dilution required due to insufficient sample.
	WG529375	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG529518	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530134	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529375	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG529517	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529375	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG530007	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS

Brown and Caldwell

ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					or LFB) was acceptable.
	WG529375	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.
	WG529732	Total Alkalinity	SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell

ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-06	WG530143	Barium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Boron (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Calcium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG530304	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529897	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530030	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG530143	Magnesium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG529974	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG531047	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531077	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG529975	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
	WG530143	Potassium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG529897	Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.

Brown and Caldwell

ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG530143	Silica (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG530017	Sulfate (MWMT)	D516-07 - Turbidimetric	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG529897	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.
	WG530024	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
			SM2320B - Titration	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68094-07	WG531057	Arsenic (MWMT)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG530823	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530401	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530976	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG530447	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG531047	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531077	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG530450	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG530669	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530510	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike

Brown and Caldwell ACZ Project ID: ***L68094***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530401	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bicarbonate as CaCO3	SM2320B - Titration
Carbonate as CaCO3	SM2320B - Titration
Chloride (MWMT)	SM4500Cl-E
Fluoride (MWMT)	SM4500F-C
Hydroxide as CaCO3	SM2320B - Titration
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid
Sulfate (MWMT)	D516-07 - Turbidimetric
Total Alkalinity	SM2320B - Titration

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L68094
Date Received: 08/26/2021 15:59
Received By:
Date Printed: 8/27/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L68094
Date Received: 08/26/2021 15:59
Received By:
Date Printed: 8/27/2021

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 68094

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue
Company: Brown and Caldwell
E-mail: kdonahue@brwncald.com
Address: 1527 Cole Blvd, Suite 300
Lakewood, CO 80401
Telephone: 575-418-7069

Copy of Report to:

Name:
Company:
E-mail:
Telephone:

Invoice to:

Name: Same as above
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: MWMP-COLUMN-MOD
PO#:
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	MWMP-COLUMN-MOD ☒							
WHAT-640-710	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

See special instructions with quote.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			8/26/21 1400

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L68094 Chain of Custod

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: special MWMT project crm 9-16-21

9/15/2021 3:30:06 PM 91321

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

Sample	Login Comments
L68094-01	ZIPLOCK -- RELOG OF L66672-01 || Sample will be in an Orange bucket with L65898 and L66671-73
L68094-01MS	ICP Spike
L68094-01MSD	ICP Spike
L68095-01	ZIPLOCK -- RELOG OF L66673-01 || Sample will be in an Orange bucket with L65898 and L66671-73
L68095-01MS	ICPMS Spike
L68095-01MSD	ICPMS Spike
WG526640CCV	pH QC
WG526640CSTD1	pH QC
WG526640CSTD2	pH QC
WG526640CSTD3	pH QC
WG526640ICV	pH QC
WG526640LFB1	ICP LFB
WG526640LFB2	ICPMS LFB

Report Comments: _____

Internal Comments _____

METEORIC WATER MOBILITY TEST

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Analyst: **GKH**
Date:
Start Time: 9/8/21 11a
End Time: 9/15/21 3p

Workgroup Number: WG526640

Feed Moisture

Sx Number	Pan Weight (g)	Wet Sx + Pan Weight (g)	Dry Sx + Pan Weight (g)	% Solid	% Feed Moisture
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!

Screening-Particle Size

Sx Number	Sx Weight (g)	Sx > 5 cm (g)	Sx < 5 cm (g)	%Sx > 5cm	%Sx < 5cm
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!

Residual Moisture

Sx Number	Pan Weight (g)	Wet Sx + Pan Weight (g)	Dry Sx + Pan Weight (g)	% Solid	% Res. Moisture
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!

Time and Temperature for Residual Moisture: n/a
Sample Description: sand/rock
Centrifuge or pre-filter? no
Observation of changes: none
Storage Conditions of "as rec" sample: Room

METEORIC WATER MOBILITY TEST

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Analyst: GKH
Date:
Start Time: 9/8/21 11a
End Time: 9/15/21 3p

Workgroup Number: WG526640

Loaded Sample Wet Weight

Sx Number	Sx Wet Weight (g)
L68094-01	2000
L68094-01	2000
0	
0	
0	
0	
0	

H2O rate start:
H2O rate finish:

Filter Type/pore size: .45um
Special Comments:

Dry Weight Calculations

Sx Number	Sx Weight (g) (From above)	(x)	% Solid	=	Dry Sx Weight (g)	+	Cubetainer Weight (g)	=	Target Leachate & Cubtainer Wt (g)
L68094-01	2000	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
L68094-01	2000	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
		x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
		x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!

Final Leachate Weight

Sx Number	Actual Leachate & Cubetainer Weight (g)	-	Cubetainer Wt (g)	=	Final Leachate Volume (mL)
L68094-01		-	0	=	0
L68094-01		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
		-	0	=	0
		-	0	=	0

Comments:

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:25	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:20	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG526640

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	9/15/2021 3:59:38 PM
SREV:	CRA	9/16/2021 11:28:24 AM

WG526640

Date Reported: 16-Sep-21
Run ID: R1835360
Date Analyzed: 08-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG526640ICV

Tag:

Measured: 9/8/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.02		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.05		
SREV	TEMPERATURE	PREP	21.7	1		C	NEED	0.1	0.1			

WG526640PBS

Tag:

Measured: 9/8/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

L68094-01

Tag:

Measured: 9/8/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.07		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.04		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68094-01MS

Tag:

Measured: 9/8/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.07		
SREV	PRE FILTER PH	TEXT		1		units	++			8.04		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-01MSD

Tag:

Measured: 9/8/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.07		
SREV	PRE FILTER PH	TEXT		1		units	++			8.04		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-01

Tag:

Measured: 9/8/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.01		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			7.99		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68095-01MS

Tag: Measured: 9/8/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.01		
SREV	PRE FILTER PH	TEXT		1		units	++			7.99		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-01MSD

Tag: Measured: 9/8/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.01		
SREV	PRE FILTER PH	TEXT		1		units	++			7.99		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG526640LFB1

Tag: Measured: 9/8/2021 11:00:11 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

WG526640LFB2

Tag:

Measured: 9/8/2021 11:00:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

WG526640CCV

Tag:

Measured: 9/8/2021 11:00:13 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.01		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.02		
SREV	TEMPERATURE	PREP	21.4	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG526640
SAMPLE TYPE: SO

ANALYSIS DATE : 9/15/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☑	☐	☐
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG527796

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/22/2021 13:24
Start Date/Time: 09/15/2021 11:00
End Date/Time: 09/22/2021 14:45

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG527796CSTD1	NONE	As Rec		09/15/21 11:00		10.04		10.01	10.01							21.6
2	WG527796CSTD2	NONE	As Rec		09/15/21 11:00		7.03		6.97	6.97							21.8
3	WG527796CSTD3	NONE	As Rec		09/15/21 11:00		2.06		2.01	2.01							21.5
4	WG527796ICV	PCN63115	As Rec		09/15/21 11:00		3.99		4.04	4.07							21.9
5	**L68094-02**	WHAT-640-710-WEEK 2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
6	L68094-02MS	II210910-2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
7	L68094-02MSD	II210910-2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
8	**L68095-02**	TLCHT-670-720-WEEK 2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
9	L68095-02MS	MS210827-2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
10	L68095-02MSD	MS210827-2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
11	WG527796CCV	PCN63115	As Rec		09/15/21 11:00		4.02		4.07	4.03							21.6

Sample	Login Comments
L68094-02MS	ICP Spike
L68094-02MSD	ICP Spike
L68095-02MS	ICPMS Spike
L68095-02MSD	ICPMS Spike
WG527796CCV	pH QC
WG527796CSTD1	pH QC
WG527796CSTD2	pH QC
WG527796CSTD3	pH QC
WG527796ICV	pH QC

Report Comments: _____

Internal Comments _____

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: SPECIAL MWMT PROJECT CRM 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG527796

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	9/22/2021 3:04:36 PM
SREV:	CRA	9/23/2021 10:59:22 AM

WG527796

Date Reported: 23-Sep-21
Run ID: R1836390
Date Analyzed: 15-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG527796ICV

Tag:

Measured: 9/15/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.07		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.04		
SREV	TEMPERATURE	PREP	21.9	1		C	NEED	0.1	0.1			

L68094-02

Tag:

Measured: 9/15/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.26		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.19		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-02MS

Tag:

Measured: 9/15/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.26		
SREV	PRE FILTER PH	TEXT		1		units	++			8.19		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-02MSD

Tag:

Measured: 9/15/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.26		
SREV	PRE FILTER PH	TEXT		1		units	++			8.19		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-02

Tag:

Measured: 9/15/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.99		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.97		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-02MS

Tag:

Measured: 9/15/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.99		
SREV	PRE FILTER PH	TEXT		1		units	++			7.97		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-02MSD

Tag: Measured: 9/15/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.99		
SREV	PRE FILTER PH	TEXT		1		units	++			7.97		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG527796CCV

Tag: Measured: 9/15/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.03		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.07		
SREV	TEMPERATURE	PREP	21.6	1		C	NEED	0.1	0.1			

WG527796 Extended Qualifiers with Case Narratives

L68094-02	EXTRACTION PH EXTRACTION TEMPERATURE EXTRACTION TIME LEACHATE VOLUME PARTICLE SIZE OVER 5 CM POST FILTER PH PRE FILTER PH RETAINED MOISTURE TEMPERATURE TIME IN TIME OUT WEIGHT, DRY	N1	No PBS analyzed with WG. Samples extracted in site water provided by client, which was analyzed in week 1.
L68095-02	EXTRACTION PH EXTRACTION TEMPERATURE EXTRACTION TIME LEACHATE VOLUME PARTICLE SIZE OVER 5 CM POST FILTER PH PRE FILTER PH RETAINED MOISTURE TEMPERATURE TIME IN TIME OUT WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG527796
SAMPLE TYPE: SO

ANALYSIS DATE : 9/22/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG528253

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/29/2021 9:14
Start Date/Time: 09/22/2021 11:00
End Date/Time: 09/29/2021 11:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG528253CSTD1	NONE	As Rec		09/22/21 11:00		10.04		10.01								21.4
2	WG528253CSTD2	NONE	As Rec		09/22/21 11:00		7.03		7.06								21.5
3	WG528253CSTD3	NONE	As Rec		09/22/21 11:00		2.06		2.07								21.5
4	WG528253ICV	PCN63115	As Rec		09/22/21 11:00		3.99		4	4.06							21.5
5	**L68094-03**	WHAT-640-710-WEEK 3	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
6	L68094-03MS	II210910-2	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
7	L68094-03MSD	II210910-2	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
8	**L68095-03**	TLCHT-670-720-WEEK 3	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
9	L68095-03MS	MS210927-2	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
10	L68095-03MSD	MS210927-2	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
11	WG528253CCV	PCN63115	As Rec		09/22/21 11:00		4.02		4.06	4.03							21.3

Sample	Login Comments
L68094-03MS	ICP Spike
L68094-03MSD	ICP Spike
L68095-03MS	ICPMS Spike
L68095-03MSD	ICPMS Spike
WG528253CCV	pH QC
WG528253CSTD1	pH QC
WG528253CSTD2	pH QC
WG528253CSTD3	pH QC
WG528253ICV	pH QC

Report Comments: special mwmt extended soak. pbs analyzed on week 1

Internal Comments: extraction fluid provided by client from site. cra 10-1-21

cra 10-1-21

9/29/2021 11:46:07 AM 91021

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: special MWMT project crm 9-16-21

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG528253

Instrument: SOILSPREP

	Initials	Date		Initials	Date
AREV:	GKH	9/29/2021 12:36:54 PM	SREV:	CRA	10/1/2021 10:19:16 AM

WG528253

Date Reported: 01-Oct-21
Run ID: R1837208
Date Analyzed: 22-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

L68094-03

Tag:

Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[-96-MOD	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[-96-MOD		1		units	++			8.22		
SREV	PRE FILTER PH	[-96-MOD		1		units	++			8.23		
SREV	RETAINED MOISTURE	[-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[-96-MOD	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	[-96-MOD		1			++					
SREV	TIME OUT	[-96-MOD		1			++					
SREV	WEIGHT, DRY	[-96-MOD	2000	1		g	++					

L68094-03MS

Tag:

Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.22		
SREV	PRE FILTER PH	TEXT		1		units	++			8.23		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-03MSD

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.22		
SREV	PRE FILTER PH	TEXT		1		units	++			8.23		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-03

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.97		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.01		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++					

L68095-03MS

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.97		
SREV	PRE FILTER PH	TEXT		1		units	++			8.01		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-03MSD

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.97		
SREV	PRE FILTER PH	TEXT		1		units	++			8.01		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG528253CCV

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.03		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.06		
SREV	TEMPERATURE	PREP	21.3	1		C	NEED	0.1	0.1			

WG528253ICV

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.06		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4		
SREV	TEMPERATURE	PREP	21.5	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG528253
SAMPLE TYPE: SO

ANALYSIS DATE : 9/29/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG528832

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/06/2021 14:19
Start Date/Time: 09/29/2021 11:00
End Date/Time: 10/06/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG528832CSTD1	NONE	As Rec		09/29/21 11:00		10.04		9.99	9.99							21.8
2	WG528832CSTD2	NONE	As Rec		09/29/21 11:00		7.03		6.99	6.99							21.8
3	WG528832CSTD3	NONE	As Rec		09/29/21 11:00		2.06		2.04	2.04							21.8
4	WG528832ICV	PCN63115	As Rec		09/29/21 11:00		3.99		3.95	4.01							21.7
5	**L68094-04**	WHAT-640-710-WEEK 4	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
6	L68094-04MS	II210930-2	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
7	L68094-04MSD	II210930-2	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
8	**L68095-04**	TLCHT-670-720-WEEK 4	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
9	L68095-04MS	MS210927-3	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
10	L68095-04MSD	MS210927-3	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
11	WG528832CCV	PCN63115	As Rec		09/29/21 11:00		4.02		4.01	3.99							21.5

Sample	Login Comments
L68094-04MS	ICP Spike
L68094-04MSD	ICP Spike
L68095-04MS	ICPMS Spike
L68095-04MSD	ICPMS Spike
WG528832CCV	pH QC
WG528832CSTD1	pH QC
WG528832CSTD2	pH QC
WG528832CSTD3	pH QC
WG528832ICV	pH QC

Report Comments: SPECIAL MWMT PROJECT, NO PBS/LFB - GKH 10/6/21

Internal Comments

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments ~~special MWMT project~~ crm 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG528832

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/6/2021 3:42:41 PM
SREV:	CRA		10/7/2021 11:32:58 AM

WG528832

Date Reported: 07-Oct-21
Run ID: R1838042
Date Analyzed: 29-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG528832ICV

Tag:

Measured: 9/29/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.01		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.95		
SREV	TEMPERATURE	PREP	21.7	1		C	NEED	0.1	0.1			

L68094-04

Tag:

Measured: 9/29/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.85		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.55		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68094-04MS

Tag:

Measured: 9/29/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.85		
SREV	PRE FILTER PH	TEXT		1		units	++			8.55		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-04MSD

Tag:

Measured: 9/29/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.85		
SREV	PRE FILTER PH	TEXT		1		units	++			8.55		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-04

Tag:

Measured: 9/29/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.32		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.34		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	21.0	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++					

L68095-04MS

Tag:

Measured: 9/29/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.32		
SREV	PRE FILTER PH	TEXT		1		units	++			8.34		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-04MSD

Tag:

Measured: 9/29/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.32		
SREV	PRE FILTER PH	TEXT		1		units	++			8.34		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG528832CCV

Tag:

Measured: 9/29/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.01		
SREV	TEMPERATURE	PREP	21.5	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG528832
SAMPLE TYPE: SO

ANALYSIS DATE : 10/6/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☐	☐	☑
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH2100929-1	9/29/22
SULFURIC ACID	SH210929-2	9/29/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529375

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/13/2021 14:42
Start Date/Time: 10/06/2021 11:00
End Date/Time: 10/13/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG529375CSTD1	NONE	As Rec		10/06/21 11:00		10.04		9.95	9.95							20.6
2	WG529375CSTD2	NONE	As Rec		10/06/21 11:00		7.03		6.94	6.94							20.7
3	WG529375CSTD3	NONE	As Rec		10/06/21 11:00		2.06		2.06	2.06							20.7
4	WG529375ICV	PCN63115	As Rec		10/06/21 11:00		3.99		3.97	3.99							20.7
5	**L68094-05**	WHAT-640-710-WEEK 5	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
6	L68094-05MS	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
7	L68094-05MSD	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
8	**L68095-05**	TLCHT-670-720-WEEK 5	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
9	L68095-05MS	MS210927-3	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
10	L68095-05MSD	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
11	WG529375CCV	PCN63115	As Rec		10/06/21 11:00		4.02		3.99	3.96							20.4

Sample	Login Comments
L68094-05MS	ICP Spike
L68094-05MSD	ICP Spike
L68095-05MS	ICPMS Spike
L68095-05MSD	ICPMS Spike
WG529375CCV	pH QC
WG529375CSTD1	pH QC
WG529375CSTD2	pH QC
WG529375CSTD3	pH QC
WG529375ICV	pH QC

Report Comments: SPECIAL MWMT PROJECT, NO PBS/LFB -GKH 10/13/21

Internal Comments

10/13/2021 2:52:22 PM 91021

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: SPECIAL MWMT PROJECT CRM 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), 9-8-9-15
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), 9-15-22
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), 9-22-29
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), 9-29-10-6
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG529375

Instrument: SOILSPREP

AREV:	GKH	10/13/2021 3:43:58 PM	SREV:	CRA	10/18/2021 2:37:30 PM
	Initials	Date		Initials	Date

WG529375

Date Reported: 18-Oct-21
Run ID: R1839317
Date Analyzed: 06-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG529375ICV

Tag:

Measured: 10/6/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.97		
SREV	TEMPERATURE	PREP	20.7	1		C	NEED	0.1	0.1			

L68094-05

Tag:

Measured: 10/6/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56	N1	
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	Γ-96-MOD	1981.5	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.67	N1	
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.59	N1	
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	Γ-96-MOD	19.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	Γ-96-MOD		1			++				N1	
SREV	TIME OUT	Γ-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-05MS

Tag:

Measured: 10/6/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1981.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.67		
SREV	PRE FILTER PH	TEXT		1		units	++			8.59		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	19.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-05MSD

Tag:

Measured: 10/6/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1981.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.67		
SREV	PRE FILTER PH	TEXT		1		units	++			8.59		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	19.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-05

Tag:

Measured: 10/6/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56	N1	
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	Γ-96-MOD	1986.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.39	N1	
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.35	N1	
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	Γ-96-MOD	20.0	1		C	++	0.1	0.1		N1	
SREV	TIME IN	Γ-96-MOD		1			++				N1	
SREV	TIME OUT	Γ-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-05MS

Tag:

Measured: 10/6/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1986.9	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.39		
SREV	PRE FILTER PH	TEXT		1		units	++			8.35		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-05MSD

Tag: Measured: 10/6/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1986.9	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.39		
SREV	PRE FILTER PH	TEXT		1		units	++			8.35		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG529375CCV

Tag: Measured: 10/6/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.99		
SREV	TEMPERATURE	PREP	20.4	1		C	NEED	0.1	0.1			

WG529375 Extended Qualifiers with Case Narratives

L68094-05	EXTRACTION PH	N1	"MOW" water used for leach
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-05	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG529375
SAMPLE TYPE: SO

ANALYSIS DATE : 10/13/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH210929-2	9/29/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm	Extraction pH	Extraction Temperature	Pre Filter pH	Post Filter pH	Dry Weight	Leachate Volume	Retained Moisture	Time In	Time Out	Extraction Time	Temperature
						(%)	(units)	(C)	(units)	(units)	(g)	(mL)	(%)			(hrs)	(C)
1	WG529897CSTD1	NONE	As Rec		10/13/21 11:00		9.97		9.96	9.96							21.1
2	WG529897CSTD2	NONE	As Rec		10/13/21 11:00		6.98		6.96	6.96							21.1
3	WG529897CSTD3	NONE	As Rec		10/13/21 11:00		1.99		1.97	1.97							21.1
4	WG529897ICV	PCN63115	As Rec		10/13/21 11:00		3.94		3.93	3.98							21.2
5	WG529897PBS	NONE	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
6	**L68094-06**	WHAT-640-710-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
7	L68094-06MS	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
8	L68094-06MSD	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
9	**L68095-06**	TLCHT-670-720-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
10	L68095-06MS	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
11	L68095-06MSD	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
12	WG529897LFB1	II211018-2	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
13	WG529897LFB2	MS210927-3	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
14	WG529897CCV	PCN63115	As Rec		10/13/21 11:00		3.95		3.98	3.96							20.9

Report Comments: PBS IS TANNERY II WATER THAT WAS NOT PUT THROUGH COLUMN

Internal Comments: SPECIAL MWMT PROJECT -GKH 10/20/21

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

Sample	Login Comments
L68094-06MS	ICP Spike
L68094-06MSD	ICP Spike
L68095-06MS	ICPMS Spike
L68095-06MSD	ICPMS Spike
WG529897CCV	pH QC
WG529897CSTD1	pH QC
WG529897CSTD2	pH QC
WG529897CSTD3	pH QC
WG529897ICV	pH QC
WG529897LFB1	ICP LFB
WG529897LFB2	ICPMS LFB

Report Comments: _____

Internal Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
8/25/2021	sw	Dept:25	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)
8/25/2021	sw	Dept:20	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG529897

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/20/2021 2:51:09 PM
SREV:	CRA		10/21/2021 10:59:20 AM

WG529897

Date Reported: 21-Oct-21
Run ID: R1840275
Date Analyzed: 13-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG529897ICV

Tag:

Measured: 10/13/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.94		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.98		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.93		
SREV	TEMPERATURE	PREP	21.2	1		C	NEED	0.1	0.1			

WG529897PBS

Tag:

Measured: 10/13/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

L68094-06

Tag:

Measured: 10/13/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.21	N1	
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	[illegible]-96-MOD	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	[illegible]-96-MOD		1			++				N1	
SREV	TIME OUT	[illegible]-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++				N1	

L68094-06MS

Tag: Measured: 10/13/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			8.21	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68094-06MSD

Tag: Measured: 10/13/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			8.21	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68095-06

Tag: Measured: 10/13/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			7.73	N1	
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	[illegible]-96-MOD	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	[illegible]-96-MOD		1			++				N1	
SREV	TIME OUT	[illegible]-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++				N1	

L68095-06MS

Tag: Measured: 10/13/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.73	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68095-06MSD

Tag: Measured: 10/13/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.73	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

WG529897LFB1

Tag: Measured: 10/13/2021 11:00:11 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

WG529897LFB2

Tag:

Measured: 10/13/2021 11:00:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

WG529897CCV

Tag:

Measured: 10/13/2021 11:00:13 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.95		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.98		
SREV	TEMPERATURE	PREP	20.9	1		C	NEED	0.1	0.1			

WG529897 Extended Qualifiers with Case Narratives

L68094-06	EXTRACTION PH	N1	first week of "Tannery II" water
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68094-06MS	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68094-06MSD	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06MS	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06MSD	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		

	RETAINED MOISTURE
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897LFB1	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897LFB2	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897PBS	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG529897
SAMPLE TYPE: SO

ANALYSIS DATE : 10/20/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH211012-1	10/12/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG530401

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/27/2021 13:10
Start Date/Time: 10/20/2021 11:00
End Date/Time: 10/27/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG530401CSTD1	NONE	As Rec		10/20/21 11:00		9.97		10.03	10.03							20.6
2	WG530401CSTD2	NONE	As Rec		10/20/21 11:00		6.98		6.98	6.98							20.7
3	WG530401CSTD3	NONE	As Rec		10/20/21 11:00		1.99		2.03	2.03							20.7
4	WG530401ICV	PCN63115	As Rec		10/20/21 11:00		3.94		3.95	3.99							20.8
5	**L68094-07**	WHAT-640-710-WEEK 7	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
6	L68094-07MS	II211024-2	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
7	L68094-07MSD	II211024-2	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
8	**L68095-07**	TLCHT-670-720-WEEK 7	As Rec		10/20/21 11:00	0	7.5	23	7.72	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	2.7
9	L68095-07MS	MS210927-3	As Rec		10/20/21 11:00	0	7.5	23	7.72	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.7
10	L68095-07MSD	MS210927-3	As Rec		10/20/21 11:00	0	7.5	23	7.73	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.7
11	WG530401CCV	PCN63115	As Rec		10/20/21 11:00		3.95		3.99	3.96							20.3

Sample	Login Comments
L68094-07MS	ICP Spike
L68094-07MSD	ICP Spike
L68095-07MS	ICPMS Spike
L68095-07MSD	ICPMS Spike
WG530401CCV	pH QC
WG530401CSTD1	pH QC
WG530401CSTD2	pH QC
WG530401CSTD3	pH QC
WG530401ICV	pH QC

Report Comments: Special project no PBS
CRA 11-1-21

Internal Comments:

10/27/2021 2:58:12 PM 91021

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:25

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG529897CSTD1	NONE	As Rec		10/13/21 11:00		9.97		9.96	9.96							21.1
2	WG529897CSTD2	NONE	As Rec		10/13/21 11:00		6.98		6.96	6.96							21.1
3	WG529897CSTD3	NONE	As Rec		10/13/21 11:00		1.99		1.97	1.97							21.1
4	WG529897ICV	PCN63115	As Rec		10/13/21 11:00		3.94		3.93	3.98							21.2
5	WG529897PBS	NONE	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000					20.6
6	**L68094-06**	WHAT-640-710-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
7	L68094-06MS	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
8	L68094-06MSD	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
9	**L68095-06**	TLCHT-670-720-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
10	L68095-06MS	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
11	L68095-06MSD	MS210927-3	As Rec		10/13/21 11:00		7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
12	WG529897LFB1	II211018-2	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
13	WG529897LFB2	MS210927-3	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
14	WG529897CCV	PCN63115	As Rec		10/13/21 11:00		3.95		3.98	3.96							20.9

Report Comments: PBS IS TANNERY II WATER THAT WAS NOT PUT THROUGH COLUMN

Internal Comments: SPECIAL MWMT PROJECT - GKH 10/20/21

10/20/2021 1:07:56 PM 91021

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG530401

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/27/2021 4:30:08 PM
SREV:	CRA		11/1/2021 11:58:22 AM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG530401

Date Reported: 01-Nov-21
Run ID: R1841126
Date Analyzed: 20-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG530401ICV

Tag: Measured: 10/20/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.94		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.95		
SREV	TEMPERATURE	PREP	20.8	1		C	NEED	0.1	0.1			

L68094-07

Tag: Measured: 10/20/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.95		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.91		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-07MS

Tag: Measured: 10/20/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.95		
SREV	PRE FILTER PH	TEXT		1		units	++			7.91		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-07MSD

Tag: Measured: 10/20/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.95		
SREV	PRE FILTER PH	TEXT		1		units	++			7.91		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-07

Tag: Measured: 10/20/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.7		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.72		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	2.7	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-07MS

Tag: Measured: 10/20/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.7		
SREV	PRE FILTER PH	TEXT		1		units	++			7.72		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-07MSD

Tag: Measured: 10/20/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.7		
SREV	PRE FILTER PH	TEXT		1		units	++			7.73		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG530401CCV

Tag: Measured: 10/20/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.95		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.99		
SREV	TEMPERATURE	PREP	20.3	1		C	NEED	0.1	0.1			

WG530401 Extended Qualifiers with Case Narratives

L68094-07	EXTRACTION PH	N1	Second week of "Tannery II" water
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-07	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG530401
SAMPLE TYPE: SO

ANALYSIS DATE : 10/27/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH211012-1	10/12/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

November 15, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L68095

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on August 26, 2021. This project has been assigned to ACZ's project number, L68095. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L68095. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after December 15, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

November 15, 2021

Project ID:
ACZ Project ID: L68095

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 7 miscellaneous samples from Brown and Caldwell on August 26, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L68095. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for analyses flagged with an "H1" or an "HD". Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to analysis.

Mercury (H3) - samples received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

This project reflects an MWMP Column test using two types of client supplied water. The first 5 weeks, MOW water was used. The fifth week was not changed to Tannery II water per instructions. This sample was analyzed free of charge. The remaining two weeks, Tannery II water was used.

1. Metals, Wet Chemistry (B1) - Client supplied extraction fluid contained some metals detected in the PBS and/or LFB.

2. MWMP Extraction WG527796 (N1) - No PBS analyzed with the workgroup. Samples extracted using site water provided by client, which was analyzed in week 1.

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 1

ACZ Sample ID: ***L68095-01***
Date Sampled: *05/03/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/16/21 15:05	jlw
ICPMS MWMT Prep	M6020B ICP-MS								09/17/21 8:30	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								09/16/21 13:15	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	09/18/21 2:36	jlw
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/05/21 18:45	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00124			mg/L	0.0002	0.001	10/05/21 18:45	mfm
Barium (MWMT)	M6010D ICP	1	0.0296	B	*	mg/L	0.007	0.035	09/18/21 2:36	jlw
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/05/21 18:45	mfm
Boron (MWMT)	M6010D ICP	1	1.30		*	mg/L	0.03	0.1	09/18/21 2:36	jlw
Cadmium (MWMT)	M6020B ICP-MS	1	0.000295			mg/L	0.00005	0.00025	10/07/21 16:39	bsu
Calcium (MWMT)	M6010D ICP	1	257		*	mg/L	0.1	0.5	09/18/21 2:36	jlw
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/05/21 18:45	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	09/18/21 2:36	jlw
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	09/18/21 2:36	jlw
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 18:45	mfm
Magnesium (MWMT)	M6010D ICP	1	29.9		*	mg/L	0.2	1	09/18/21 2:36	jlw
Manganese (MWMT)	M6010D ICP	1	0.168			mg/L	0.01	0.05	09/18/21 2:36	jlw
Mercury (MWMT)	M7470A CVAA	1	<0.0002	UH	*	mg/L	0.0002	0.001	09/20/21 12:38	mlh
Molybdenum (MWMT)	M6010D ICP	1	0.031	B		mg/L	0.02	0.1	09/18/21 2:36	jlw
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	09/18/21 2:36	jlw
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	09/18/21 2:36	jlw
Potassium (MWMT)	M6010D ICP	1	12.8		*	mg/L	0.2	1	09/18/21 2:36	jlw
Selenium (MWMT)	M6020B ICP-MS	1	0.00019	B		mg/L	0.0001	0.00025	10/05/21 18:45	mfm
Silica (MWMT)	M6010D ICP	1	25.0		*	mg/L	0.2	1	09/18/21 2:36	jlw
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 18:45	mfm
Sodium (MWMT)	M6010D ICP	1	98.5		*	mg/L	0.2	1	09/18/21 2:36	jlw
Strontium (MWMT)	M6010D ICP	1	1.35		*	mg/L	0.009	0.045	09/18/21 2:36	jlw
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/07/21 16:39	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00164			mg/L	0.0001	0.0005	10/05/21 18:45	mfm
Zinc (MWMT)	M6010D ICP	1	0.029	B	*	mg/L	0.02	0.05	09/18/21 2:36	jlw

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 1

ACZ Sample ID: ***L68095-01***
Date Sampled: *05/03/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/08/21 0:00	gkh
Extraction pH		1	7.56			units			09/08/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/08/21 0:00	gkh
Extraction Time		1	168			hrs			09/08/21 0:00	gkh
Leachate Volume		1	1698.7			mL			09/08/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/08/21 0:00	gkh
Post Filter pH		1	8.01			units			09/08/21 0:00	gkh
Pre Filter pH		1	7.99			units			09/08/21 0:00	gkh
Retained Moisture		1	n/a			%			09/08/21 0:00	gkh
Temperature		1	20.7			C	0.1	0.1	09/08/21 0:00	gkh
Time In		1							09/08/21 0:00	gkh
Time Out		1							09/08/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	54.4		*	mg/L	2	20	09/16/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	09/16/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	09/16/21 0:00	eep
Total Alkalinity		1	54.4		*	mg/L	2	20	09/16/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	48.2		*	mg/L	0.5	2	09/24/21 11:12	md
Fluoride (MWMT)	SM4500F-C	1	0.55		*	mg/L	0.15	0.35	09/16/21 17:33	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.256	H		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.323	H	*	mg/L	0.02	0.1	09/18/21 23:10	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.067	H	*	mg/L	0.01	0.05	09/18/21 23:10	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	0.353		*	mg/L	0.05	0.2	10/04/21 14:57	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.53		*	mg/L	0.2	0.5	09/17/21 0:35	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.013	BH	*	mg/L	0.01	0.05	09/19/21 0:18	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	50	856		*	mg/L	50	250	10/06/21 16:05	syw

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 2

ACZ Sample ID: ***L68095-02***
Date Sampled: *09/22/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/24/21 18:51	jlw
ICPMS MWMT Prep	M6020B ICP-MS								09/23/21 11:05	bsu
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor				*				09/30/21 10:53	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	09/26/21 18:41	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	09/28/21 14:35	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00114		*	mg/L	0.0002	0.001	09/28/21 14:35	mfm
Barium (MWMT)	M6010D ICP	1	0.0240	B		mg/L	0.007	0.035	09/26/21 18:41	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	09/28/21 14:35	mfm
Boron (MWMT)	M6010D ICP	1	1.29			mg/L	0.03	0.1	09/26/21 18:41	kja
Cadmium (MWMT)	M6020B ICP-MS	1	0.000067	B		mg/L	0.00005	0.00025	09/28/21 14:35	mfm
Calcium (MWMT)	M6010D ICP	1	140			mg/L	0.1	0.5	09/26/21 18:41	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	09/28/21 14:35	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	09/26/21 18:41	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	09/26/21 18:41	kja
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 14:20	mfm
Magnesium (MWMT)	M6010D ICP	1	14.2			mg/L	0.2	1	09/26/21 18:41	kja
Manganese (MWMT)	M6010D ICP	1	0.045	B		mg/L	0.01	0.05	09/26/21 18:41	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	09/28/21 9:15	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	09/26/21 18:41	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	09/26/21 18:41	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	09/26/21 18:41	kja
Potassium (MWMT)	M6010D ICP	1	7.66			mg/L	0.2	1	09/26/21 18:41	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00018	B		mg/L	0.0001	0.00025	09/28/21 14:35	mfm
Silica (MWMT)	M6010D ICP	1	20.8		*	mg/L	0.2	1	09/26/21 18:41	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	09/28/21 14:35	mfm
Sodium (MWMT)	M6010D ICP	1	53.2			mg/L	0.2	1	09/26/21 18:41	kja
Strontium (MWMT)	M6010D ICP	1	0.726			mg/L	0.009	0.045	09/26/21 18:41	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 14:20	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00085			mg/L	0.0001	0.0005	10/05/21 14:20	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	09/26/21 18:41	kja

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 2

ACZ Sample ID: ***L68095-02***
Date Sampled: *09/22/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			09/15/21 0:00	gkh
Extraction pH		1	7.56		*	units			09/15/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	09/15/21 0:00	gkh
Extraction Time		1	168		*	hrs			09/15/21 0:00	gkh
Leachate Volume		1	1980.6		*	mL			09/15/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			09/15/21 0:00	gkh
Post Filter pH		1	7.99		*	units			09/15/21 0:00	gkh
Pre Filter pH		1	7.97		*	units			09/15/21 0:00	gkh
Retained Moisture		1	n/a		*	%			09/15/21 0:00	gkh
Temperature		1	20.4		*	C	0.1	0.1	09/15/21 0:00	gkh
Time In		1			*				09/15/21 0:00	gkh
Time Out		1			*				09/15/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	48.0		*	mg/L	2	20	10/06/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Total Alkalinity		1	48.0		*	mg/L	2	20	10/06/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	39.8		*	mg/L	0.5	2	09/24/21 11:13	md
Fluoride (MWMT)	SM4500F-C	1	0.61		*	mg/L	0.15	0.35	10/06/21 13:39	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.892	H		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	1.33	H	*	mg/L	0.02	0.1	09/25/21 2:58	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.438	H	*	mg/L	0.01	0.05	09/25/21 2:58	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	10/04/21 15:00	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	2	<0.4	U	*	mg/L	0.4	1	10/02/21 3:27	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	UH	*	mg/L	0.01	0.05	09/25/21 2:57	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	10	385		*	mg/L	10	50	10/06/21 16:02	syw

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 3

ACZ Sample ID: ***L68095-03***
Date Sampled: *09/29/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								09/30/21 16:05	kja
ICPMS MWMT Prep	M6020B ICP-MS								09/30/21 10:00	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								09/30/21 13:41	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/12/21 21:52	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/05/21 19:01	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00114			mg/L	0.0002	0.001	10/05/21 19:01	mfm
Barium (MWMT)	M6010D ICP	1	0.0206	B		mg/L	0.007	0.035	10/12/21 21:52	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/05/21 19:01	mfm
Boron (MWMT)	M6010D ICP	1	1.48			mg/L	0.03	0.1	10/12/21 21:52	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/07/21 16:50	bsu
Calcium (MWMT)	M6010D ICP	1	85.5			mg/L	0.1	0.5	10/12/21 21:52	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/05/21 19:01	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 21:52	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/12/21 21:52	kja
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 19:01	mfm
Magnesium (MWMT)	M6010D ICP	1	8.11			mg/L	0.2	1	10/12/21 21:52	kja
Manganese (MWMT)	M6010D ICP	1	0.012	B		mg/L	0.01	0.05	10/12/21 21:52	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	09/30/21 13:46	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/12/21 21:52	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/12/21 21:52	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/12/21 21:52	kja
Potassium (MWMT)	M6010D ICP	1	5.57			mg/L	0.2	1	10/12/21 21:52	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00014	B		mg/L	0.0001	0.00025	10/05/21 19:01	mfm
Silica (MWMT)	M6010D ICP	1	22.6			mg/L	0.2	1	10/12/21 21:52	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/05/21 19:01	mfm
Sodium (MWMT)	M6010D ICP	1	38.6			mg/L	0.2	1	10/12/21 21:52	kja
Strontium (MWMT)	M6010D ICP	1	0.466			mg/L	0.009	0.045	10/12/21 21:52	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/07/21 16:50	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00043	B		mg/L	0.0001	0.0005	10/05/21 19:01	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/12/21 21:52	kja

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 3

ACZ Sample ID: ***L68095-03***
Date Sampled: *09/29/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/22/21 0:00	gkh
Extraction pH		1	7.56			units			09/22/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/22/21 0:00	gkh
Extraction Time		1	168			hrs			09/22/21 0:00	gkh
Leachate Volume		1	1989.6			mL			09/22/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/22/21 0:00	gkh
Post Filter pH		1	7.97			units			09/22/21 0:00	gkh
Pre Filter pH		1	8.01			units			09/22/21 0:00	gkh
Retained Moisture		1	n/a			%			09/22/21 0:00	gkh
Temperature		1	21.5			C	0.1	0.1	09/22/21 0:00	gkh
Time In		1							09/22/21 0:00	gkh
Time Out		1							09/22/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	46.5		*	mg/L	2	20	10/06/21 0:00	eep
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/06/21 0:00	eep
Total Alkalinity		1	46.8		*	mg/L	2	20	10/06/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	42.4		*	mg/L	0.5	2	10/05/21 15:59	md
Fluoride (MWMT)	SM4500F-C	1	0.72		*	mg/L	0.15	0.35	10/06/21 13:55	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		1.50			mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	1.50		*	mg/L	0.02	0.1	09/30/21 3:05	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	09/30/21 3:05	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	10/20/21 12:05	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	10/02/21 3:30	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.010	B	*	mg/L	0.01	0.05	09/29/21 22:20	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	198		*	mg/L	5	25	10/18/21 14:05	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 4

ACZ Sample ID: ***L68095-04***
Date Sampled: *10/06/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/11/21 17:32	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/11/21 9:20	bsu
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/08/21 10:52	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/12/21 22:04	jlw
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/20/21 16:14	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00140			mg/L	0.0002	0.001	10/20/21 16:14	mfm
Barium (MWMT)	M6010D ICP	1	0.0161	B		mg/L	0.007	0.035	10/12/21 22:04	jlw
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/02/21 12:20	mfm
Boron (MWMT)	M6010D ICP	1	1.52			mg/L	0.03	0.1	10/12/21 22:04	jlw
Cadmium (MWMT)	M6020B ICP-MS	2	<0.0001	U	*	mg/L	0.0001	0.0005	10/26/21 16:01	mfm
Calcium (MWMT)	M6010D ICP	1	59.4			mg/L	0.1	0.5	10/12/21 22:04	jlw
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/20/21 16:14	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 22:04	jlw
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/12/21 22:04	jlw
Lead (MWMT)	M6020B ICP-MS	2	<0.0002	U	*	mg/L	0.0002	0.001	10/26/21 16:01	mfm
Magnesium (MWMT)	M6010D ICP	1	5.45			mg/L	0.2	1	10/12/21 22:04	jlw
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/12/21 22:04	jlw
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/12/21 15:18	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/12/21 22:04	jlw
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/12/21 22:04	jlw
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/12/21 22:04	jlw
Potassium (MWMT)	M6010D ICP	1	4.57			mg/L	0.2	1	10/12/21 22:04	jlw
Selenium (MWMT)	M6020B ICP-MS	2	<0.0002	U	*	mg/L	0.0002	0.0005	10/26/21 16:01	mfm
Silica (MWMT)	M6010D ICP	1	21.7		*	mg/L	0.2	1	10/12/21 22:04	jlw
Silver (MWMT)	M6020B ICP-MS	2	<0.0002	U	*	mg/L	0.0002	0.001	10/26/21 16:01	mfm
Sodium (MWMT)	M6010D ICP	1	32.6			mg/L	0.2	1	10/12/21 22:04	jlw
Strontium (MWMT)	M6010D ICP	1	0.341			mg/L	0.009	0.045	10/12/21 22:04	jlw
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/02/21 12:20	mfm
Uranium (MWMT)	M6020B ICP-MS	2	0.00037	B	*	mg/L	0.0002	0.001	10/26/21 16:01	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/12/21 22:04	jlw

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 4

ACZ Sample ID: ***L68095-04***
Date Sampled: *10/06/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000			g			09/29/21 0:00	gkh
Extraction pH		1	7.56			units			09/29/21 0:00	gkh
Extraction Temperature		1	23.0			C	0.1	0.1	09/29/21 0:00	gkh
Extraction Time		1	168			hrs			09/29/21 0:00	gkh
Leachate Volume		1	1978.6			mL			09/29/21 0:00	gkh
Particle Size over 5 cm		1	0			%			09/29/21 0:00	gkh
Post Filter pH		1	8.32			units			09/29/21 0:00	gkh
Pre Filter pH		1	8.34			units			09/29/21 0:00	gkh
Retained Moisture		1	n/a			%			09/29/21 0:00	gkh
Temperature		1	21.0			C	0.1	0.1	09/29/21 0:00	gkh
Time In		1							09/29/21 0:00	gkh
Time Out		1							09/29/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	44.8		*	mg/L	2	20	10/09/21 0:00	eep
Carbonate as CaCO3		1	2.8	B	*	mg/L	2	20	10/09/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/09/21 0:00	eep
Total Alkalinity		1	47.5		*	mg/L	2	20	10/09/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	41.8		*	mg/L	0.5	2	10/18/21 14:13	md
Fluoride (MWMT)	SM4500F-C	1	1.07		*	mg/L	0.15	0.35	10/09/21 12:20	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		2.13	H		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	2.13	H	*	mg/L	0.02	0.1	10/09/21 12:56	wtc
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	UH	*	mg/L	0.01	0.05	10/09/21 12:56	wtc
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	10/20/21 12:08	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	10/23/21 23:04	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	U	*	mg/L	0.01	0.05	10/08/21 0:16	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	124		*	mg/L	5	25	10/18/21 14:05	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 5

ACZ Sample ID: ***L68095-05***
Date Sampled: *10/13/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/20/21 18:28	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/15/21 12:40	scp
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/14/21 14:30	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/19/21 2:37	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	10/18/21 15:32	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00180			mg/L	0.0002	0.001	10/18/21 15:32	mfm
Barium (MWMT)	M6010D ICP	1	0.0140	B		mg/L	0.007	0.035	10/19/21 2:37	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	10/20/21 13:18	mfm
Boron (MWMT)	M6010D ICP	1	1.66			mg/L	0.03	0.1	10/19/21 2:37	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/20/21 13:18	mfm
Calcium (MWMT)	M6010D ICP	1	50.3			mg/L	0.1	0.5	10/19/21 2:37	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/18/21 15:32	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/19/21 2:37	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/19/21 2:37	kja
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/18/21 15:32	mfm
Magnesium (MWMT)	M6010D ICP	1	4.43			mg/L	0.2	1	10/19/21 2:37	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/19/21 2:37	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/20/21 15:24	aeh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/19/21 2:37	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/19/21 2:37	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/19/21 2:37	kja
Potassium (MWMT)	M6010D ICP	1	4.37			mg/L	0.2	1	10/19/21 2:37	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00015	B		mg/L	0.0001	0.00025	10/18/21 15:32	mfm
Silica (MWMT)	M6010D ICP	1	23.9		*	mg/L	0.2	1	10/22/21 4:26	jlw
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/18/21 15:32	mfm
Sodium (MWMT)	M6010D ICP	1	31.7			mg/L	0.2	1	10/19/21 2:37	kja
Strontium (MWMT)	M6010D ICP	1	0.288			mg/L	0.009	0.045	10/19/21 2:37	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/18/21 15:32	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00039	B		mg/L	0.0001	0.0005	10/18/21 15:32	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/19/21 2:37	kja

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 5

ACZ Sample ID: ***L68095-05***
Date Sampled: *10/13/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/06/21 0:00	gkh
Extraction pH		1	7.56		*	units			10/06/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/06/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/06/21 0:00	gkh
Leachate Volume		1	1986.9		*	mL			10/06/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/06/21 0:00	gkh
Post Filter pH		1	8.39		*	units			10/06/21 0:00	gkh
Pre Filter pH		1	8.35		*	units			10/06/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/06/21 0:00	gkh
Temperature		1	20.0		*	C	0.1	0.1	10/06/21 0:00	gkh
Time In		1			*				10/06/21 0:00	gkh
Time Out		1			*				10/06/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	58.3		*	mg/L	2	20	10/18/21 0:00	emk
Carbonate as CaCO3		1	<2	U	*	mg/L	2	20	10/18/21 0:00	emk
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/18/21 0:00	emk
Total Alkalinity		1	58.3		*	mg/L	2	20	10/18/21 0:00	emk
Chloride (MWMT)	SM4500Cl-E	1	43.3		*	mg/L	0.5	2	10/18/21 14:15	md
Fluoride (MWMT)	SM4500F-C	1	0.84		*	mg/L	0.15	0.35	10/21/21 16:03	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		1.71			mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	1.71		*	mg/L	0.02	0.1	10/15/21 1:09	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/15/21 1:09	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/01/21 17:43	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	10/23/21 23:13	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	<0.01	U	*	mg/L	0.01	0.05	10/14/21 23:05	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	78.7		*	mg/L	5	25	10/18/21 14:06	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 6

ACZ Sample ID: ***L68095-06***
Date Sampled: *10/20/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/22/21 19:08	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/20/21 16:20	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								10/21/21 14:05	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	10/27/21 11:31	kja
Antimony (MWMT)	M6020B ICP-MS	1	0.00044	B		mg/L	0.0004	0.002	10/26/21 16:16	mfm
Arsenic (MWMT)	M6020B ICP-MS	1	0.00208			mg/L	0.0002	0.001	10/26/21 16:16	mfm
Barium (MWMT)	M6010D ICP	1	0.0319	B	*	mg/L	0.007	0.035	10/27/21 11:31	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/02/21 12:33	mfm
Boron (MWMT)	M6010D ICP	1	1.62		*	mg/L	0.03	0.1	10/27/21 11:31	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	10/26/21 16:16	mfm
Calcium (MWMT)	M6010D ICP	1	74.8		*	mg/L	0.1	0.5	10/27/21 11:31	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	10/26/21 16:16	mfm
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/27/21 11:31	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	10/27/21 11:31	kja
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/26/21 16:16	mfm
Magnesium (MWMT)	M6010D ICP	1	11.5		*	mg/L	0.2	1	10/27/21 11:31	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	10/27/21 11:31	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/26/21 16:20	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	10/27/21 11:31	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	10/27/21 11:31	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	10/27/21 11:31	kja
Potassium (MWMT)	M6010D ICP	1	7.16		*	mg/L	0.2	1	10/27/21 11:31	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00020	B		mg/L	0.0001	0.00025	10/26/21 16:16	mfm
Silica (MWMT)	M6010D ICP	1	51.5		*	mg/L	0.2	1	10/27/21 11:31	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	10/26/21 16:16	mfm
Sodium (MWMT)	M6010D ICP	1	59.2		*	mg/L	0.2	1	10/27/21 11:31	kja
Strontium (MWMT)	M6010D ICP	1	0.492		*	mg/L	0.009	0.045	10/27/21 11:31	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/02/21 12:33	mfm
Uranium (MWMT)	M6020B ICP-MS	1	0.00170			mg/L	0.0001	0.0005	10/26/21 16:16	mfm
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	10/27/21 11:31	kja

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 6

ACZ Sample ID: ***L68095-06***
Date Sampled: *10/20/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/13/21 0:00	gkh
Extraction pH		1	7.5		*	units			10/13/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/13/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/13/21 0:00	gkh
Leachate Volume		1	1826.9		*	mL			10/13/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/13/21 0:00	gkh
Post Filter pH		1	7.73		*	units			10/13/21 0:00	gkh
Pre Filter pH		1	7.71		*	units			10/13/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/13/21 0:00	gkh
Temperature		1	20.2		*	C	0.1	0.1	10/13/21 0:00	gkh
Time In		1			*				10/13/21 0:00	gkh
Time Out		1			*				10/13/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	110		*	mg/L	2	20	10/21/21 0:00	eep
Carbonate as CaCO3		1	9.0	B	*	mg/L	2	20	10/21/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	10/21/21 0:00	eep
Total Alkalinity		1	119		*	mg/L	2	20	10/21/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	57.0		*	mg/L	0.5	2	10/26/21 15:54	md
Fluoride (MWMT)	SM4500F-C	1	0.98		*	mg/L	0.15	0.35	10/21/21 16:39	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.319			mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.319		*	mg/L	0.02	0.1	10/21/21 0:09	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/21/21 0:09	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/04/21 14:55	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	0.20	B	*	mg/L	0.2	0.5	11/05/21 0:44	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.029	B	*	mg/L	0.01	0.05	10/21/21 0:04	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	145		*	mg/L	5	25	10/21/21 13:53	wtc

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 7

ACZ Sample ID: ***L68095-07***
Date Sampled: *10/27/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
ICP MWMT Prep	M6010D ICP								10/28/21 16:00	jlw
ICPMS MWMT Prep	M6020B ICP-MS								10/28/21 8:10	mfm
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor								11/01/21 14:31	bls/md

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum (MWMT)	M6010D ICP	1	<0.05	U		mg/L	0.05	0.25	11/01/21 1:46	kja
Antimony (MWMT)	M6020B ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	11/04/21 16:13	bsu
Arsenic (MWMT)	M6020B ICP-MS	1	0.00203		*	mg/L	0.0002	0.001	11/04/21 16:13	bsu
Barium (MWMT)	M6010D ICP	1	0.0287	B		mg/L	0.007	0.035	11/01/21 1:46	kja
Beryllium (MWMT)	M6020B ICP-MS	1	<0.00008	U		mg/L	0.00008	0.00025	11/04/21 16:13	bsu
Boron (MWMT)	M6010D ICP	1	1.24			mg/L	0.03	0.1	11/01/21 1:46	kja
Cadmium (MWMT)	M6020B ICP-MS	1	<0.00005	U		mg/L	0.00005	0.00025	11/04/21 16:13	bsu
Calcium (MWMT)	M6010D ICP	1	73.6			mg/L	0.1	0.5	11/01/21 1:46	kja
Chromium (MWMT)	M6020B ICP-MS	1	<0.0005	U		mg/L	0.0005	0.002	11/04/21 16:13	bsu
Copper (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	11/01/21 1:46	kja
Iron (MWMT)	M6010D ICP	1	<0.06	U		mg/L	0.06	0.15	11/01/21 1:46	kja
Lead (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/04/21 16:13	bsu
Magnesium (MWMT)	M6010D ICP	1	13.9			mg/L	0.2	1	11/01/21 1:46	kja
Manganese (MWMT)	M6010D ICP	1	<0.01	U		mg/L	0.01	0.05	11/01/21 1:46	kja
Mercury (MWMT)	M7470A CVAA	1	<0.0002	U		mg/L	0.0002	0.001	10/29/21 7:24	mlh
Molybdenum (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.1	11/01/21 1:46	kja
Nickel (MWMT)	M6010D ICP	1	<0.008	U		mg/L	0.008	0.04	11/01/21 1:46	kja
Phosphorus (MWMT)	M6010D ICP	1	<0.1	U		mg/L	0.1	0.5	11/01/21 1:46	kja
Potassium (MWMT)	M6010D ICP	1	7.77			mg/L	0.2	1	11/01/21 1:46	kja
Selenium (MWMT)	M6020B ICP-MS	1	0.00021	B		mg/L	0.0001	0.00025	11/04/21 16:13	bsu
Silica (MWMT)	M6010D ICP	1	59.3		*	mg/L	0.2	1	11/01/21 1:46	kja
Silver (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/08/21 14:29	bsu
Sodium (MWMT)	M6010D ICP	1	65.3			mg/L	0.2	1	11/01/21 1:46	kja
Strontium (MWMT)	M6010D ICP	1	0.493			mg/L	0.009	0.045	11/01/21 1:46	kja
Thallium (MWMT)	M6020B ICP-MS	1	<0.0001	U		mg/L	0.0001	0.0005	11/04/21 16:13	bsu
Uranium (MWMT)	M6020B ICP-MS	1	0.00138			mg/L	0.0001	0.0005	11/04/21 16:13	bsu
Zinc (MWMT)	M6010D ICP	1	<0.02	U		mg/L	0.02	0.05	11/01/21 1:46	kja

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-WEEK 7

ACZ Sample ID: ***L68095-07***
Date Sampled: *10/27/21 00:00*
Date Received: *08/26/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Meteoric Water Mobility Extraction	ASTM E2242-13									
Dry Weight		1	2000		*	g			10/20/21 0:00	gkh
Extraction pH		1	7.5		*	units			10/20/21 0:00	gkh
Extraction Temperature		1	23.0		*	C	0.1	0.1	10/20/21 0:00	gkh
Extraction Time		1	168		*	hrs			10/20/21 0:00	gkh
Leachate Volume		1	2149.1		*	mL			10/20/21 0:00	gkh
Particle Size over 5 cm		1	0		*	%			10/20/21 0:00	gkh
Post Filter pH		1	7.7		*	units			10/20/21 0:00	gkh
Pre Filter pH		1	7.72		*	units			10/20/21 0:00	gkh
Retained Moisture		1	n/a		*	%			10/20/21 0:00	gkh
Temperature		1	2.7		*	C	0.1	0.1	10/20/21 0:00	gkh
Time In		1			*				10/20/21 0:00	gkh
Time Out		1			*				10/20/21 0:00	gkh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity (MWMT)	SM2320B - Titration									
Bicarbonate as CaCO3		1	130		*	mg/L	2	20	11/03/21 0:00	eep
Carbonate as CaCO3		1	2.9	B	*	mg/L	2	20	11/03/21 0:00	eep
Hydroxide as CaCO3		1	<2	U	*	mg/L	2	20	11/03/21 0:00	eep
Total Alkalinity		1	133		*	mg/L	2	20	11/03/21 0:00	eep
Chloride (MWMT)	SM4500Cl-E	1	61.0		*	mg/L	0.5	2	11/02/21 13:00	md
Fluoride (MWMT)	SM4500F-C	1	0.89		*	mg/L	0.15	0.35	11/03/21 20:24	eep
Nitrate as N (MWMT)	Calculation: NO3NO2 minus NO2		0.034	B		mg/L	0.02	0.1	11/15/21 0:00	calc
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	0.034	B	*	mg/L	0.02	0.1	10/28/21 1:13	pjb
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	10/28/21 1:13	pjb
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	1	<0.05	U	*	mg/L	0.05	0.2	11/04/21 14:59	syw
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	1	<0.2	U	*	mg/L	0.2	0.5	11/05/21 0:53	pjb
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid	1	0.060		*	mg/L	0.01	0.05	10/28/21 2:21	pjb
Sulfate (MWMT)	D516-07 - Turbidimetric	5	149		*	mg/L	5	25	10/28/21 13:13	wtc

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527409													
WG527409PBW	PBW	09/16/21 16:27				3.5	mg/L		-20	20			
WG527409LCSW1	LCSW	09/16/21 16:38	WC210908-1	820.0001		786.8	mg/L	96	90	110			
WG526640PBS	PBS	09/16/21 16:46				34.1	mg/L		-20	20			B4
L68094-01DUP	DUP	09/16/21 16:59			52.1	51.9	mg/L				0	20	
WG527183PBS	PBS	09/16/21 17:14				2.5	mg/L		-20	20			
WG527409LCSW2	LCSW	09/16/21 17:32	WC210908-1	820.0001		805.5	mg/L	98	90	110			
WG528817													
WG528817PBW	PBW	10/06/21 13:41				4.2	mg/L		-20	20			
WG528817LCSW1	LCSW	10/06/21 13:54	WC210930-12	820.0001		809.8	mg/L	99	90	110			
L68094-03DUP	DUP	10/06/21 14:27			44.2	45.4	mg/L				3	20	
WG528817LCSW2	LCSW	10/06/21 14:48	WC210930-12	820.0001		810.8	mg/L	99	90	110			
WG529057													
WG529057PBW	PBW	10/09/21 11:45				U	mg/L		-20	20			
WG529057LCSW1	LCSW	10/09/21 11:57	WC210930-12	820.0001		798	mg/L	97	90	110			
L68095-04DUP	DUP	10/09/21 12:21			47.5	47.9	mg/L				1	20	
WG529057LCSW2	LCSW	10/09/21 12:34	WC210930-12	820.0001		813.6	mg/L	99	90	110			
WG529732													
WG529732PBW	PBW	10/18/21 17:21				2.2	mg/L		-20	20			
WG529732LCSW2	LCSW	10/18/21 17:36	WC211018-1	820.0001		801	mg/L	98	90	110			
WG528948PBS	PBS	10/18/21 17:43				7.1	mg/L		-20	20			
L68949-01DUP	DUP	10/18/21 17:53			U	U	mg/L				0	20	RA
WG529732LCSW4	LCSW	10/18/21 18:20	WC211018-1	820.0001		785.3	mg/L	96	90	110			
WG530024													
WG530024PBW	PBW	10/21/21 13:33				4.9	mg/L		-20	20			
WG530024LCSW2	LCSW	10/21/21 13:46	WC211018-1	820.0001		789.8	mg/L	96	90	110			
WG529117PBS	PBS	10/21/21 13:52				4.9	mg/L		-20	20			
L68817-02DUP	DUP	10/21/21 14:14			22.2	30.5	mg/L				31	20	RD
WG529897PBS	PBS	10/21/21 14:39				208.9	mg/L		-20	20			B4
WG530024LCSW4	LCSW	10/21/21 15:11	WC211018-1	820.0001		798.4	mg/L	97	90	110			
WG530906													
WG530906PBW	PBW	11/03/21 12:31				8.7	mg/L		-20	20			
WG530906LCSW2	LCSW	11/03/21 12:45	WC211028-8	820.0001		794	mg/L	97	90	110			
WG530691PBS	PBS	11/03/21 13:10				U	mg/L		-20	20			
L69466-01DUP	DUP	11/03/21 13:28			61.7	63.2	mg/L				2	20	
WG530906LCSW4	LCSW	11/03/21 14:21	WC211028-8	820.0001		790.9	mg/L	96	90	110			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.024	mg/L	101	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.15	0.15			
WG526640PBS	PBS	09/18/21 2:17				.059	mg/L		-0.15	0.15			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.0008		1.007	mg/L	101	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.0008	U	1.077	mg/L	108	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.0008	U	1.057	mg/L	106	75	125	2	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.952	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.15	0.15			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.15	0.15			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.0008		1.017	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.0008	U	1.014	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.0008	U	1.029	mg/L	103	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.964	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.15	0.15			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.15	0.15			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.0008		1	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.0008	U	1.009	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.0008	U	1.03	mg/L	103	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.968	mg/L	98	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.15	0.15			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.15	0.15			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.0008		1.007	mg/L	101	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.0008	U	1.014	mg/L	101	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.0008	U	1.009	mg/L	101	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.003	mg/L	100	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.15	0.15			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.15	0.15			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.0008		1.061	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.0008	U	1.059	mg/L	106	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.0008	U	1.07	mg/L	107	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.015	mg/L	101	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.15	0.15			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.15	0.15			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.0008		1.056	mg/L	106	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.0008	U	1.071	mg/L	107	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.0008	U	1.048	mg/L	105	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.011	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.15	0.15			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.15	0.15			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.0008		1.014	mg/L	101	80	120			

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.0008	U	1.031	mg/L	103	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.0008	U	1.051	mg/L	105	75	125	2	20

Antimony (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.0201		.02102	mg/L	105	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0012	0.0012			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.01		.00977	mg/L	98	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.01	U	.01038	mg/L	104	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.01	U	.0102	mg/L	102	75	125	2	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.0201		.01982	mg/L	99	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0012	0.0012			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0012	0.0012			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.01	U	.00985	mg/L	99	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.01	U	.00986	mg/L	99	75	125	0	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.01		.00972	mg/L	97	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.01		.00975	mg/L	98	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.01	U	.01004	mg/L	100	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.01	U	.00995	mg/L	100	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.0201		.02051	mg/L	102	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0012	0.0012			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.01		.00988	mg/L	99	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.01	U	.01067	mg/L	107	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.01	U	.0107	mg/L	107	75	125	0	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.0201		.0207	mg/L	103	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0012	0.0012			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.01		.01031	mg/L	103	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.01	U	.01084	mg/L	108	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.01	U	.01093	mg/L	109	75	125	1	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.0201		.02107	mg/L	105	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0012	0.0012			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.01		.01018	mg/L	102	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.01	U	.01057	mg/L	106	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.01	U	.01059	mg/L	106	75	125	0	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0012	0.0012			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.01	.00044	.01073	mg/L	103	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.01	.00044	.01085	mg/L	104	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.01		.00918	mg/L	92	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.0201		.0198	mg/L	99	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0012	0.0012			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.01		.00968	mg/L	97	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.01	U	.01032	mg/L	103	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.01	U	.01039	mg/L	104	75	125	1	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Arsenic (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05305	mg/L	106	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0006	0.0006			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.04602	mg/L	92	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	.00114	.05172	mg/L	101	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	.00114	.05164	mg/L	101	75	125	0	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05192	mg/L	104	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0006	0.0006			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0006	0.0006			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	.00124	.04032	mg/L	78	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	.00124	.03969	mg/L	77	75	125	2	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.04494	mg/L	90	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.0455	mg/L	91	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	.00114	.04507	mg/L	88	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	.00114	.0432	mg/L	84	75	125	4	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05187	mg/L	104	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0006	0.0006			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05005		.04973	mg/L	99	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05005	.0018	.04802	mg/L	92	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05005	.0018	.05048	mg/L	97	75	125	5	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.05		.05081	mg/L	102	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0006	0.0006			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.05005		.04912	mg/L	98	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.05005	.0014	.05119	mg/L	99	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.05005	.0014	.05117	mg/L	99	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.0521	mg/L	104	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0006	0.0006			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.04784	mg/L	96	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	.00159	.05093	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	.00159	.04983	mg/L	96	75	125	2	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0006	0.0006			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	.00208	.04992	mg/L	96	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	.00208	.05099	mg/L	98	75	125	2	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.0498	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.04988	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0006	0.0006			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.0473	mg/L	95	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	.00203	.04963	mg/L	95	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	.00203	.04906	mg/L	94	75	125	1	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Barium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.045	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.021	0.021			
WG526640PBS	PBS	09/18/21 2:17				.0076	mg/L		-0.021	0.021			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.4845	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	.0183	.5184	mg/L	100	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	.0183	.5164	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.006	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.021	0.021			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.021	0.021			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.5045	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	.0141	.5132	mg/L	100	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	.0141	.5186	mg/L	101	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.002	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.021	0.021			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.021	0.021			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.4844	mg/L	97	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	.0157	.5137	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	.0157	.5198	mg/L	101	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.977	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.021	0.021			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.021	0.021			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.4876	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	.01	.5001	mg/L	98	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	.01	.5003	mg/L	98	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.008	mg/L	100	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.021	0.021			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.021	0.021			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.5047	mg/L	101	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	.0074	.5121	mg/L	101	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	.0074	.5161	mg/L	102	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.011	mg/L	101	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.021	0.021			
WG529897PBS	PBS	10/27/21 11:13				.041	mg/L		-0.021	0.021			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.5513	mg/L	110	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	.0201	.5324	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	.0201	.5206	mg/L	100	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.013	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.021	0.021			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.021	0.021			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.4877	mg/L	98	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	.0169	.5184	mg/L	100	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	.0169	.525	mg/L	102	75	125	1	20	

Beryllium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.054126	mg/L	108	90	110			
WG528195ICB	ICB	09/28/21 14:19				.00009	mg/L		-0.00024	0.00024			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.047804	mg/L	96	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	U	.02699	mg/L	54	75	125			M2
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	U	.026358	mg/L	53	75	125	2	20	M2
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.052766	mg/L	106	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.00024	0.00024			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.00024	0.00024			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	U	.046292	mg/L	92	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	U	.045972	mg/L	92	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.048845	mg/L	98	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.049346	mg/L	99	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	U	.04642	mg/L	93	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	U	.045071	mg/L	90	75	125	3	20	
WG529903													
WG529903ICV	ICV	10/20/21 13:00	MS211013-2	.05		.052605	mg/L	105	90	110			
WG529903ICB	ICB	10/20/21 13:02				U	mg/L		-0.00024	0.00024			
WG529558LFB	LFB	10/20/21 13:12	MS210927-3	.05005		.05227	mg/L	104	80	120			
L68095-05MS	MS	10/20/21 13:20	MS210927-3	.05005	U	.045892	mg/L	92	75	125			
L68095-05MSD	MSD	10/20/21 13:21	MS210927-3	.05005	U	.048302	mg/L	97	75	125	5	20	
WG530803													
WG530803ICV	ICV	11/02/21 12:02	MS211013-2	.05		.05136	mg/L	103	90	110			
WG530803ICB	ICB	11/02/21 12:04				U	mg/L		-0.00024	0.00024			
WG529085LFB	LFB	11/02/21 12:15	MS210927-3	.05005		.049991	mg/L	100	80	120			
L68095-04MS	MS	11/02/21 12:22	MS210927-3	.05005	U	.048731	mg/L	97	75	125			
L68095-04MSD	MSD	11/02/21 12:24	MS210927-3	.05005	U	.048858	mg/L	98	75	125	0	20	
WG529897PBS	PBS	11/02/21 12:29				U	mg/L		-0.00024	0.00024			
L68095-06MS	MS	11/02/21 12:34	MS210927-3	.05005	U	.046781	mg/L	93	75	125			
L68095-06MSD	MSD	11/02/21 12:36	MS210927-3	.05005	U	.046588	mg/L	93	75	125	0	20	
WG529897LFB2	LFB	11/02/21 12:38	MS210927-3	.05005		.050004	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.050002	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				.000101	mg/L		-0.00024	0.00024			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.045384	mg/L	91	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.043472	mg/L	87	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.043767	mg/L	87	75	125	1	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.033	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.09	0.09			
WG526640PBS	PBS	09/18/21 2:17				.313	mg/L		-0.09	0.09			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.796	mg/L	159	80	120			B1
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	2.04	2.516	mg/L	95	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	2.04	2.501	mg/L	92	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.004	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.09	0.09			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.09	0.09			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.53	mg/L	106	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	1.79	2.271	mg/L	96	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	1.79	2.323	mg/L	106	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.032	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.09	0.09			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.09	0.09			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.511	mg/L	102	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	1.85	2.355	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	1.85	2.376	mg/L	105	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		2.005	mg/L	100	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.09	0.09			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.09	0.09			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.512	mg/L	102	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	1.74	2.217	mg/L	95	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	1.74	2.206	mg/L	93	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.021	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.09	0.09			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.09	0.09			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.531	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	1.8	2.322	mg/L	104	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	1.8	2.358	mg/L	111	75	125	2	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.067	mg/L	103	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.09	0.09			
WG529897PBS	PBS	10/27/21 11:13				.197	mg/L		-0.09	0.09			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		.73	mg/L	146	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	1.69	2.264	mg/L	115	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	1.69	2.217	mg/L	105	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.996	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.09	0.09			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.09	0.09			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.498	mg/L	100	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	1.62	2.143	mg/L	104	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	1.62	2.171	mg/L	110	75	125	1	20

Cadmium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.055199	mg/L	110	90	110			
WG528195ICB	ICB	09/28/21 14:19				.000115	mg/L		-0.00015	0.00015			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05005		.047018	mg/L	94	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05005	.000067	.047871	mg/L	96	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05005	.000067	.046436	mg/L	93	75	125	3	20	
WG528919													
WG528919ICV	ICV	10/07/21 16:22	MS211001-2	.05		.051506	mg/L	103	90	110			
WG528919ICB	ICB	10/07/21 16:24				U	mg/L		-0.00015	0.00015			
WG526640PBS	PBS	10/07/21 16:32				U	mg/L		-0.00015	0.00015			
WG526640LFB2	LFB	10/07/21 16:34	MS210827-2	.05005		.046601	mg/L	93	80	120			
L68095-01MS	MS	10/07/21 16:40	MS210827-2	.05005	.000295	.045749	mg/L	91	75	125			
L68095-01MSD	MSD	10/07/21 16:42	MS210827-2	.05005	.000295	.046472	mg/L	92	75	125	2	20	
WG528369LFB	LFB	10/07/21 16:47	MS210927-3	.05005		.047783	mg/L	95	80	120			
L68095-03MS	MS	10/07/21 16:51	MS210927-3	.05005	U	.046139	mg/L	92	75	125			
L68095-03MSD	MSD	10/07/21 16:53	MS210927-3	.05005	U	.047618	mg/L	95	75	125	3	20	
WG529903													
WG529903ICV	ICV	10/20/21 13:00	MS211013-2	.05		.051124	mg/L	102	90	110			
WG529903ICB	ICB	10/20/21 13:02				U	mg/L		-0.00015	0.00015			
WG529558LFB	LFB	10/20/21 13:12	MS210927-3	.05005		.050875	mg/L	102	80	120			
L68095-05MS	MS	10/20/21 13:20	MS210927-3	.05005	U	.045913	mg/L	92	75	125			
L68095-05MSD	MSD	10/20/21 13:21	MS210927-3	.05005	U	.048567	mg/L	97	75	125	6	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.054366	mg/L	109	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.00015	0.00015			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.048367	mg/L	97	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	U	.048165	mg/L	96	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	U	.047928	mg/L	96	75	125	0	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.00015	0.00015			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	U	.048348	mg/L	97	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	U	.048438	mg/L	97	75	125	0	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.048754	mg/L	97	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.049865	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.00015	0.00015			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.044889	mg/L	90	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.044989	mg/L	90	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.045466	mg/L	91	75	125	1	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Calcium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		98.45	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.3	0.3			
WG526640PBS	PBS	09/18/21 2:17				16.49	mg/L		-0.3	0.3			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	67.98972		80.43	mg/L	118	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	67.98972	206	272.4	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	67.98972	206	269.4	mg/L	93	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		100.1	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.3	0.3			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.3	0.3			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	67.98972		71.05	mg/L	105	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	67.98972	147	214.5	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	67.98972	147	218.6	mg/L	105	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		101.5	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.3	0.3			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.3	0.3			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	67.98972		69.89	mg/L	103	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	67.98972	98.3	167.6	mg/L	102	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	67.98972	98.3	169.3	mg/L	104	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		100.5	mg/L	101	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.3	0.3			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.3	0.3			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	67.98972		68.73	mg/L	101	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	67.98972	52.1	120.8	mg/L	101	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	67.98972	52.1	120.4	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		101.4	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.3	0.3			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.3	0.3			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	67.98972		72.23	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	67.98972	31.7	103	mg/L	105	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	67.98972	31.7	104.2	mg/L	107	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		100.3	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.3	0.3			
WG529897PBS	PBS	10/27/21 11:13				75.3	mg/L		-0.3	0.3			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	67.98972		146.9	mg/L	216	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	67.98972	67.5	138.4	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	67.98972	67.5	135.2	mg/L	100	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		100.5	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.3	0.3			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.3	0.3			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	67.98972		69.1	mg/L	102	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	67.98972	64.4	133.8	mg/L	102	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	67.98972	64.4	135.2	mg/L	104	75	125	1	20	

Chloride (MWMT) SM4500Cl-E

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527931													
WG527931ICV	ICV	09/24/21 11:09	WI210503-1	54.89		53.49	mg/L	97	90	110			
WG527931ICB	ICB	09/24/21 11:09				U	mg/L		-1.5	1.5			
WG527931LFB	LFB	09/24/21 11:10	WI210908-11	29.97		28.03	mg/L	94	90	110			
WG526640PBS	PBS	09/24/21 11:10				36.22	mg/L		-1.5	1.5			B1
L68094-01AS	AS	09/24/21 11:11	WI210908-11	29.97	41.8	66.66	mg/L	83	90	110			M2
WG527183PBS	PBS	09/24/21 11:27				U	mg/L		-1.5	1.5			
WG528710													
WG528710ICV	ICV	10/05/21 15:57	WI210503-1	54.89		53.43	mg/L	97	90	110			
WG528710ICB	ICB	10/05/21 15:58				U	mg/L		-1.5	1.5			
WG528710LFB	LFB	10/05/21 15:58	WI210908-11	29.97		31.24	mg/L	104	90	110			
L68094-03AS	AS	10/05/21 15:59	WI210908-11	29.97	42.4	69.68	mg/L	91	90	110			
WG529573													
WG529573ICV	ICV	10/18/21 14:11	WI210503-1	54.89		53.24	mg/L	97	90	110			
WG529573ICB	ICB	10/18/21 14:12				U	mg/L		-1.5	1.5			
WG529573LFB	LFB	10/18/21 14:12	WI210908-11	29.97		29.84	mg/L	100	90	110			
L68094-04AS	AS	10/18/21 14:13	WI210908-11	29.97	43.2	70.95	mg/L	93	90	110			
WG528948PBS	PBS	10/18/21 14:14				U	mg/L		-1.5	1.5			
WG530304													
WG530304ICV	ICV	10/26/21 15:44	WI210503-1	54.89		52.91	mg/L	96	90	110			
WG530304ICB	ICB	10/26/21 15:45				.67	mg/L		-1.5	1.5			
WG530304LFB	LFB	10/26/21 15:45	WI210908-11	29.97		28.04	mg/L	94	90	110			
WG529117PBS	PBS	10/26/21 15:46				1.12	mg/L		-1.5	1.5			
WG529753PBS	PBS	10/26/21 15:49				U	mg/L		-1.5	1.5			
WG529897PBS	PBS	10/26/21 15:53				60.54	mg/L		-1.5	1.5			B1
L68095-06AS	AS	10/26/21 15:54	WI210908-11	29.97	57	83.89	mg/L	90	90	110			
L69249-01DUP	DUP	10/26/21 16:19			1530	1461.83	mg/L				5	20	
WG530823													
WG530823ICV	ICV	11/02/21 12:56	WI210503-1	54.89		53.82	mg/L	98	90	110			
WG530823ICB	ICB	11/02/21 12:56				U	mg/L		-1.5	1.5			
WG530823LFB	LFB	11/02/21 12:57	WI210908-11	29.97		29.41	mg/L	98	90	110			
WG529753PBS	PBS	11/02/21 12:57				U	mg/L		-1.5	1.5			
L69249-03AS	AS	11/02/21 13:14	5XCL	30	179	198.23	mg/L	64	90	110			M2
L69249-01DUP	DUP	11/02/21 13:25			1550	1525.75	mg/L				2	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Chromium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05483	mg/L	110	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0015	0.0015			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05		.04642	mg/L	93	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05	U	.05193	mg/L	104	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05	U	.05124	mg/L	102	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05354	mg/L	107	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0015	0.0015			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0015	0.0015			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	U	.04194	mg/L	84	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	U	.04111	mg/L	82	75	125	2	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04531	mg/L	91	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04599	mg/L	92	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	U	.04433	mg/L	89	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	U	.04262	mg/L	85	75	125	4	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05506	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0015	0.0015			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.05075	mg/L	102	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	U	.04574	mg/L	91	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	U	.04833	mg/L	97	75	125	6	20	
WG529940													
WG529940ICV	ICV	10/20/21 15:56	MS211013-2	.05		.05303	mg/L	106	90	110			
WG529940ICB	ICB	10/20/21 15:58				U	mg/L		-0.0015	0.0015			
WG529085LFB	LFB	10/20/21 16:09	MS210927-3	.05		.04962	mg/L	99	80	120			
L68095-04MS	MS	10/20/21 16:16	MS210927-3	.05	U	.04957	mg/L	99	75	125			
L68095-04MSD	MSD	10/20/21 16:18	MS210927-3	.05	U	.04969	mg/L	99	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05514	mg/L	110	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0015	0.0015			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.05096	mg/L	102	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	U	.05035	mg/L	101	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	U	.04969	mg/L	99	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0015	0.0015			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	U	.05029	mg/L	101	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	U	.05057	mg/L	101	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.05129	mg/L	103	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05036	mg/L	101	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0015	0.0015			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04642	mg/L	93	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	U	.04562	mg/L	91	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	U	.04534	mg/L	91	75	125	1	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Copper (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.964	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.03	0.03			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.03	0.03			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.48	mg/L	96	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	U	.503	mg/L	101	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	U	.501	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.939	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.03	0.03			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.03	0.03			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.504	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	U	.503	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	U	.509	mg/L	102	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.964	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.03	0.03			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.03	0.03			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.496	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	.014	.507	mg/L	99	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	.014	.52	mg/L	101	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.929	mg/L	96	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.03	0.03			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.03	0.03			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.494	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	U	.5	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	U	.496	mg/L	99	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.97	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.03	0.03			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.03	0.03			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.516	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	U	.516	mg/L	103	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	U	.518	mg/L	104	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.987	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.03	0.03			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.03	0.03			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.524	mg/L	105	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	U	.526	mg/L	105	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	U	.512	mg/L	102	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.988	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.03	0.03			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.03	0.03			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.498	mg/L	100	80	120			

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	U	.51	mg/L	102	75	125			
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	U	.517	mg/L	103	75	125	1	20	

Fluoride (MWMT) SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527353													
WG527353ICV	ICV	09/16/21 10:51	WC210903-1	2.002		2.1	mg/L	105	90	110			
WG527353ICB	ICB	09/16/21 10:56				U	mg/L		-0.3	0.3			
WG527413													
WG527413ICV	ICV	09/16/21 16:35	WC210903-1	2.002		2.12	mg/L	106	90	110			
WG527413ICB	ICB	09/16/21 16:43				U	mg/L		-0.3	0.3			
WG527413LFB	LFB	09/16/21 16:55	WC210803-9	5.02		4.53	mg/L	90	90	110			
WG526640PBS	PBS	09/16/21 17:01				U	mg/L		-0.3	0.3			
L68094-01AS	AS	09/16/21 17:17	WC210803-9	5.02	.64	5.28	mg/L	92	90	110			
L68094-01ASD	ASD	09/16/21 17:25	WC210803-9	5.02	.64	5.28	mg/L	92	90	110	0	20	
WG528795													
WG528795ICV	ICV	10/06/21 12:55	WC210920-1	2.002		2.12	mg/L	106	90	110			
WG528795ICB	ICB	10/06/21 13:00				U	mg/L		-0.3	0.3			
WG528795LFB	LFB	10/06/21 13:07	WC210803-9	5.02		4.89	mg/L	97	90	110			
L68094-02AS	AS	10/06/21 13:23	WC210803-9	5.02	.8	5.64	mg/L	96	90	110			
L68094-02ASD	ASD	10/06/21 13:31	WC210803-9	5.02	.8	5.56	mg/L	95	90	110	1	20	
WG529059													
WG529059ICV	ICV	10/09/21 11:35	WC211007-1	2.002		2.18	mg/L	109	90	110			
WG529059ICB	ICB	10/09/21 11:40				U	mg/L		-0.3	0.3			
WG529059LFB	LFB	10/09/21 11:48	WC210803-9	5.02		5.28	mg/L	105	90	110			
L68094-04AS	AS	10/09/21 12:04	WC210803-9	5.02	1.11	6.14	mg/L	100	90	110			
L68094-04ASD	ASD	10/09/21 12:12	WC210803-9	5.02	1.11	6.03	mg/L	98	90	110	2	20	
WG530030													
WG530030ICV	ICV	10/21/21 14:13	WC211019-3	2.002		2.07	mg/L	103	90	110			
WG530030ICB	ICB	10/21/21 14:17				U	mg/L		-0.3	0.3			
WG530030LFB	LFB	10/21/21 14:24	WC210803-9	5.02		5.21	mg/L	104	90	110			
WG528948PBS	PBS	10/21/21 14:28				U	mg/L		-0.3	0.3			
WG529117PBS	PBS	10/21/21 14:54				U	mg/L		-0.3	0.3			
L68817-02AS	AS	10/21/21 15:18	WC210803-9	5.02	1.39	6.22	mg/L	96	90	110			
L68817-02DUP	DUP	10/21/21 15:26			1.39	1.83	mg/L				27	20	RA
WG529897PBS	PBS	10/21/21 16:17				.28	mg/L		-0.3	0.3			
WG530907													
WG530907ICV	ICV	11/03/21 15:16	WC211030-1	2.002		2.07	mg/L	103	90	110			
WG530907ICB	ICB	11/03/21 15:21				U	mg/L		-0.3	0.3			
WG530976													
WG530976ICV	ICV	11/03/21 19:52	WC211030-1	2.002		2.17	mg/L	108	90	110			
WG530976ICB	ICB	11/03/21 19:59				U	mg/L		-0.3	0.3			
WG530976LFB	LFB	11/03/21 20:08	WC210803-9	5.02		5.24	mg/L	104	90	110			
WG530691PBS	PBS	11/03/21 20:32				U	mg/L		-0.3	0.3			
L69466-01AS	AS	11/03/21 20:48	WC210803-9	5.02	1.11	6.38	mg/L	105	90	110			
L69466-01DUP	DUP	11/03/21 20:56			1.11	1.18	mg/L				6	20	RA

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.976	mg/L	99	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.18	0.18			
WG526640PBS	PBS	09/18/21 2:17				.078	mg/L		-0.18	0.18			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.0001		.99	mg/L	99	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.0001	U	.998	mg/L	100	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.0001	U	.998	mg/L	100	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.967	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.18	0.18			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.18	0.18			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.0001		1.033	mg/L	103	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.0001	U	1.003	mg/L	100	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.0001	U	1.01	mg/L	101	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.993	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.18	0.18			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.18	0.18			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.0001		.998	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.0001	U	1.007	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.0001	U	1.048	mg/L	105	75	125	4	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.939	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.18	0.18			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.18	0.18			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.0001		.997	mg/L	100	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.0001	U	1.005	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.0001	U	1.005	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.956	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.18	0.18			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.18	0.18			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.0001		1.02	mg/L	102	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.0001	U	1.037	mg/L	104	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.0001	U	1.036	mg/L	104	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.999	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.18	0.18			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.18	0.18			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.0001		1.047	mg/L	105	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.0001	U	1.042	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.0001	U	1.015	mg/L	101	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.005	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.18	0.18			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.18	0.18			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.0001		1.011	mg/L	101	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.0001	U	1.017	mg/L	102	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.0001	U	1.022	mg/L	102	75	125	0	20

Lead (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.05014	mg/L	100	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05005		.05122	mg/L	102	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05005	U	.05195	mg/L	104	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05005	U	.05268	mg/L	105	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05399	mg/L	108	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05005	U	.04775	mg/L	95	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05005	U	.04707	mg/L	94	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05005		.04597	mg/L	92	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05005		.04773	mg/L	95	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05005	U	.045	mg/L	90	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05005	U	.04451	mg/L	89	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.0551	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05005		.0501	mg/L	100	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05005	U	.04519	mg/L	90	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05005	U	.04704	mg/L	94	75	125	4	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05462	mg/L	109	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05005		.04765	mg/L	95	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05005	U	.04952	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05005	U	.04924	mg/L	98	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05005	U	.04949	mg/L	99	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05005	U	.04967	mg/L	99	75	125	0	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05005		.04898	mg/L	98	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05122	mg/L	102	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05005		.04846	mg/L	97	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05005	U	.04827	mg/L	96	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05005	U	.04815	mg/L	96	75	125	0	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Magnesium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		95.5	mg/L	96	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				.71	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	49.99828		46.25	mg/L	93	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	49.99828	30.9	79.01	mg/L	96	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	49.99828	30.9	78.11	mg/L	94	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		95.29	mg/L	95	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	49.99828		49.65	mg/L	99	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	49.99828	18.2	66.41	mg/L	96	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	49.99828	18.2	67.6	mg/L	99	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		96.58	mg/L	97	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	49.99828		48.71	mg/L	97	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	49.99828	10.8	59.09	mg/L	97	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	49.99828	10.8	60.13	mg/L	99	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		96.1	mg/L	96	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	49.99828		47.71	mg/L	95	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	49.99828	5.41	53.48	mg/L	96	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	49.99828	5.41	53.21	mg/L	96	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		96.09	mg/L	96	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	49.99828		49.68	mg/L	99	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	49.99828	3.15	52.07	mg/L	98	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	49.99828	3.15	52.67	mg/L	99	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		96.2	mg/L	96	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				19.56	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	49.99828		69.18	mg/L	138	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	49.99828	9.88	59.3	mg/L	99	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	49.99828	9.88	57.74	mg/L	96	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		96.45	mg/L	96	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	49.99828		47.92	mg/L	96	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	49.99828	12.2	60.79	mg/L	97	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	49.99828	12.2	61.43	mg/L	98	75	125	1	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Manganese (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.962	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.03	0.03			
WG526640PBS	PBS	09/18/21 2:17				.017	mg/L		-0.03	0.03			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.484	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	.011	.506	mg/L	99	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	.011	.503	mg/L	98	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.935	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.03	0.03			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.03	0.03			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.506	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	U	.497	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	U	.503	mg/L	100	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.945	mg/L	97	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.03	0.03			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.03	0.03			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.496	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	U	.498	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	U	.506	mg/L	101	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.935	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.03	0.03			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.03	0.03			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.495	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	U	.5	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	U	.495	mg/L	99	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.929	mg/L	96	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.03	0.03			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.03	0.03			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.514	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	.033	.51	mg/L	95	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	.033	.512	mg/L	96	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.956	mg/L	98	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.03	0.03			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.03	0.03			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		.513	mg/L	102	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	U	.519	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	U	.504	mg/L	101	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.965	mg/L	98	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.03	0.03			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.03	0.03			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.496	mg/L	99	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	U	.506	mg/L	101	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	U	.512	mg/L	102	75	125	1	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury (MWMT) M7470A CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527527													
WG527527ICV	ICV	09/20/21 11:56	HG210913-3	.00501		.00506	mg/L	101	95	105			
WG527527ICB	ICB	09/20/21 11:57				U	mg/L		-0.0002	0.0002			
WG527528													
WG527528PBW	PBW	09/20/21 12:32				U	mg/L		-0.00044	0.00044			
WG527528LCSW	LCSW	09/20/21 12:33	HG210913-6	.002002		.00173	mg/L	86	85	115			
WG526640PBS	PBS	09/20/21 12:34				U	mg/L		-0.0006	0.0006			
L68094-01MS	MS	09/20/21 12:36	HG210913-6	.002002	U	.00174	mg/L	87	85	115			
L68094-01MSD	MSD	09/20/21 12:37	HG210913-6	.002002	U	.00195	mg/L	97	85	115	11	20	
WG526640LFB1	LFB	09/20/21 12:39	HG210913-6	.002002		.0018	mg/L	90	85	115			
WG527183PBS	PBS	09/20/21 12:40				U	mg/L		-0.0006	0.0006			
WG527183LFB1	LFB	09/20/21 12:45	HG210913-6	.002002		.00194	mg/L	97	85	115			
WG528073													
WG528073ICV	ICV	09/28/21 8:27	HG210927-3	.00501		.00514	mg/L	103	95	105			
WG528073ICB	ICB	09/28/21 8:28				U	mg/L		-0.0002	0.0002			
WG528080													
WG528080PBW	PBW	09/28/21 9:10				U	mg/L		-0.00044	0.00044			
WG528080LCSW	LCSW	09/28/21 9:11	HG210927-6	.002002		.00192	mg/L	96	85	115			
L68094-02MS	MS	09/28/21 9:13	HG210927-6	.002002	U	.00196	mg/L	98	85	115			
L68094-02MSD	MSD	09/28/21 9:14	HG210927-6	.002002	U	.00194	mg/L	97	85	115	1	20	
WG528379													
WG528379ICV	ICV	09/30/21 13:38	HG210927-3	.00501		.00511	mg/L	102	90	110			
WG528379ICB	ICB	09/30/21 13:39				U	mg/L		-0.0006	0.0006			
WG528379PBW	PBW	09/30/21 13:41				U	mg/L		-0.00044	0.00044			
WG528379LCSW	LCSW	09/30/21 13:42	HG210927-6	.002002		.00199	mg/L	99	85	115			
L68094-03MS	MS	09/30/21 13:44	HG210927-6	.002002	U	.00195	mg/L	97	85	115			
L68094-03MSD	MSD	09/30/21 13:45	HG210927-6	.002002	U	.00206	mg/L	103	85	115	5	20	
WG529213													
WG529213ICV1	ICV	10/12/21 14:26	HG211004-3	.00501		.00524	mg/L	105	95	105			
WG529213ICB	ICB	10/12/21 14:27				U	mg/L		-0.0002	0.0002			
WG529221													
WG529221PBW	PBW	10/12/21 15:13				U	mg/L		-0.00044	0.00044			
WG529221LCSW	LCSW	10/12/21 15:14	HG211004-6	.002002		.00203	mg/L	101	85	115			
L68094-04MS	MS	10/12/21 15:16	HG211004-6	.002002	U	.00196	mg/L	98	85	115			
L68094-04MSD	MSD	10/12/21 15:17	HG211004-6	.002002	U	.00199	mg/L	99	85	115	2	20	
WG529855													
WG529855ICV	ICV	10/20/21 13:52	HG211004-3	.00501		.0049	mg/L	98	90	110			
WG529855ICB	ICB	10/20/21 13:53				U	mg/L		-0.0006	0.0006			
WG529858													
WG529858PBW	PBW	10/20/21 15:19				U	mg/L		-0.00044	0.00044			
WG529858LCSW	LCSW	10/20/21 15:20	HG211015-3	.002002		.00187	mg/L	93	85	115			
L68094-05MS	MS	10/20/21 15:22	HG211015-3	.002002	U	.00186	mg/L	93	85	115			
L68094-05MSD	MSD	10/20/21 15:23	HG211015-3	.002002	U	.00191	mg/L	95	85	115	3	20	
WG530259													
WG530259ICV	ICV	10/26/21 14:33	HG211004-3	.00501		.00501	mg/L	100	95	105			
WG530259ICB	ICB	10/26/21 14:34				U	mg/L		-0.0002	0.0002			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG530296

WG530296PBW	PBW	10/26/21 16:15				U	mg/L		-0.00044	0.00044		
WG530296LCSW	LCSW	10/26/21 16:16	HG211015-3	.002002		.00206	mg/L	103	85	115		
WG529897PBS	PBS	10/26/21 16:16				U	mg/L		-0.0006	0.0006		
L68094-06MS	MS	10/26/21 16:18	HG211015-3	.002002	U	.002	mg/L	100	85	115		
L68094-06MSD	MSD	10/26/21 16:19	HG211015-3	.002002	U	.00203	mg/L	101	85	115	1	20
WG529897LFB1	LFB	10/26/21 16:21	HG211015-3	.002002		.00208	mg/L	104	85	115		

WG530504

WG530504ICV	ICV	10/29/21 7:19	HG211004-3	.00501		.00491	mg/L	98	90	110		
WG530504ICB	ICB	10/29/21 7:20				U	mg/L		-0.0006	0.0006		
WG530504PBW	PBW	10/29/21 7:22				U	mg/L		-0.00044	0.00044		
WG530504LCSW	LCSW	10/29/21 7:23	HG211015-3	.002002		.00183	mg/L	91	85	115		
L68095-07MS	MS	10/29/21 7:25	HG211015-3	.002002	U	.00178	mg/L	89	85	115		
L68095-07MSD	MSD	10/29/21 7:26	HG211015-3	.002002	U	.00183	mg/L	91	85	115	3	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Molybdenum (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2.019	mg/L	101	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.06	0.06			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.06	0.06			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.501		.483	mg/L	96	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.501	U	.507	mg/L	101	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.501	U	.506	mg/L	101	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.97	mg/L	99	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.06	0.06			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.06	0.06			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.501		.502	mg/L	100	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.501	U	.497	mg/L	99	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.501	U	.506	mg/L	101	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.005	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.06	0.06			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.06	0.06			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.501		.497	mg/L	99	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.501	U	.503	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.501	U	.514	mg/L	103	75	125	2	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.989	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.06	0.06			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.06	0.06			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.501		.489	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.501	U	.49	mg/L	98	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.501	U	.487	mg/L	97	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.981	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.06	0.06			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.06	0.06			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.501		.513	mg/L	102	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.501	U	.509	mg/L	102	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.501	U	.515	mg/L	103	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.975	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.06	0.06			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.06	0.06			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.501		.505	mg/L	101	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.501	U	.51	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.501	U	.498	mg/L	99	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.976	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.06	0.06			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.06	0.06			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.501		.489	mg/L	98	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.501	U	.499	mg/L	100	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.501	U	.503	mg/L	100	75	125	1	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nickel (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.969	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.024	0.024			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.024	0.024			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5		.4756	mg/L	95	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5	U	.492	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5	U	.4912	mg/L	98	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		2.124	mg/L	106	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.024	0.024			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.024	0.024			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5		.5455	mg/L	109	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5	U	.5316	mg/L	106	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5	U	.5393	mg/L	108	75	125	1	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.106	mg/L	105	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.024	0.024			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.024	0.024			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5		.5305	mg/L	106	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5	U	.5285	mg/L	106	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5	U	.5425	mg/L	109	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		2.087	mg/L	104	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.024	0.024			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.024	0.024			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5		.5296	mg/L	106	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5	U	.5318	mg/L	106	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5	U	.5273	mg/L	105	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		2.102	mg/L	105	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.024	0.024			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.024	0.024			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5		.5441	mg/L	109	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5	U	.5395	mg/L	108	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5	U	.5441	mg/L	109	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.059	mg/L	103	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.024	0.024			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.024	0.024			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5		.5327	mg/L	107	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5	U	.5337	mg/L	107	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5	U	.5205	mg/L	104	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.068	mg/L	103	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.024	0.024			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.024	0.024			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5		.5229	mg/L	105	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5	U	.5288	mg/L	106	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5	U	.5308	mg/L	106	75	125	0	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrate/Nitrite as N (MWMT) M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527508													
WG527508ICV	ICV	09/18/21 20:53	WI210904-1	2.4161		2.335	mg/L	97	90	110			
WG527508ICB	ICB	09/18/21 20:55				U	mg/L		-0.02	0.02			
WG527510													
WG527510LFB	LFB	09/18/21 23:04	WI210331-13	2		1.916	mg/L	96	90	110			
WG526640PBS	PBS	09/18/21 23:06				.333	mg/L		-0.02	0.02			B1
L68094-01AS	AS	09/18/21 23:13	WI210331-13	6	2.58	8.157	mg/L	93	90	110			
WG527991													
WG527991ICV	ICV	09/24/21 23:07	WI210904-1	2.4161		2.365	mg/L	98	90	110			
WG527991ICB	ICB	09/24/21 23:08				U	mg/L		-0.02	0.02			
WG527998													
WG527998LFB	LFB	09/25/21 2:54	WI210331-13	2		1.967	mg/L	98	90	110			
L68094-02AS	AS	09/25/21 2:57	WI210331-13	2	1.71	3.669	mg/L	98	90	110			
WG528346													
WG528346ICV	ICV	09/29/21 23:41	WI210904-1	2.4161		2.411	mg/L	100	90	110			
WG528346ICB	ICB	09/29/21 23:42				U	mg/L		-0.02	0.02			
WG528350													
WG528350LFB	LFB	09/30/21 3:01	WI210331-13	2		2.02	mg/L	101	90	110			
L68094-03AS	AS	09/30/21 3:04	WI210331-13	2	1.84	3.755	mg/L	96	90	110			
WG529043													
WG529043ICV	ICV	10/08/21 17:06	WI210904-1	2.4161		2.402	mg/L	99	90	110			
WG529043ICB	ICB	10/08/21 17:07				U	mg/L		-0.02	0.02			
WG529043ICV1	ICV	10/08/21 17:45	WI210904-1	2.4161		2.381	mg/L	99	90	110			
WG529043ICB1	ICB	10/08/21 17:46				U	mg/L		-0.02	0.02			
WG529043ICV2	ICV	10/09/21 10:37	WI210904-1	2.4161		2.367	mg/L	98	90	110			
WG529043ICB2	ICB	10/09/21 10:38				U	mg/L		-0.02	0.02			
WG529043ICV3	ICV	10/09/21 11:58	WI210904-1	2.4161		2.352	mg/L	97	90	110			
WG529043ICB3	ICB	10/09/21 12:00				U	mg/L		-0.02	0.02			
WG529047													
WG529047ICV	ICV	10/09/21 12:50	WI210904-1	2.4161		2.355	mg/L	97	90	110			
WG529047ICB	ICB	10/09/21 12:51				U	mg/L		-0.02	0.02			
L68095-04AS	AS	10/09/21 12:57	WI211001-5	2	2.13	3.989	mg/L	93	90	110			
WG529047LFB	LFB	10/09/21 13:01	WI211001-5	2		1.961	mg/L	98	90	110			
WG529516													
WG529516ICV	ICV	10/14/21 22:34	WI210904-1	2.4161		2.376	mg/L	98	90	110			
WG529516ICB	ICB	10/14/21 22:36				U	mg/L		-0.02	0.02			
WG529518													
WG529518LFB	LFB	10/15/21 1:05	WI211001-5	2		2.033	mg/L	102	90	110			
L68094-05AS	AS	10/15/21 1:14	WI211001-5	6	2.12	8.196	mg/L	101	90	110			
WG529972													
WG529972ICV	ICV	10/20/21 22:24	WI210904-1	2.4161		2.352	mg/L	97	90	110			
WG529972ICB	ICB	10/20/21 22:25				U	mg/L		-0.02	0.02			
WG529974													
WG529974LFB	LFB	10/21/21 0:04	WI211001-5	2		1.999	mg/L	100	90	110			
WG529897PBS	PBS	10/21/21 0:05				U	mg/L		-0.02	0.02			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-06AS	AS	10/21/21 0:07	WI211001-5	2	.604	2.713	mg/L	105	90	110
WG530441										
WG530441ICV	ICV	10/27/21 23:38	WI210904-1	2.4161		2.356	mg/L	98	90	110
WG530441ICB	ICB	10/27/21 23:39				U	mg/L		-0.02	0.02
WG530447										
WG530447LFB	LFB	10/28/21 1:09	WI211001-5	2		2.045	mg/L	102	90	110
L68094-07AS	AS	10/28/21 1:12	WI211001-5	2	.081	2.174	mg/L	105	90	110

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrite as N (MWMT) M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527508													
WG527508ICV	ICV	09/18/21 20:53	WI210904-1	.6089		.597	mg/L	98	90	110			
WG527508ICB	ICB	09/18/21 20:55				U	mg/L		-0.01	0.01			
WG527510													
WG527510LFB	LFB	09/18/21 23:04	WI210331-13	1		1.009	mg/L	101	90	110			
WG526640PBS	PBS	09/18/21 23:06				U	mg/L		-0.01	0.01			
L68094-01AS	AS	09/18/21 23:08	WI210331-13	1	.547	1.496	mg/L	95	90	110			
WG527991													
WG527991ICV	ICV	09/24/21 23:07	WI210904-1	.6089		.6	mg/L	99	90	110			
WG527991ICB	ICB	09/24/21 23:08				U	mg/L		-0.01	0.01			
WG527998													
WG527998LFB	LFB	09/25/21 2:54	WI210331-13	1		.975	mg/L	98	90	110			
L68094-02AS	AS	09/25/21 2:57	WI210331-13	1	.355	1.357	mg/L	100	90	110			
WG528346													
WG528346ICV	ICV	09/29/21 23:41	WI210904-1	.6089		.61	mg/L	100	90	110			
WG528346ICB	ICB	09/29/21 23:42				U	mg/L		-0.01	0.01			
WG528350													
WG528350LFB	LFB	09/30/21 3:01	WI210331-13	1		1.019	mg/L	102	90	110			
L68094-03AS	AS	09/30/21 3:04	WI210331-13	1	.097	1.148	mg/L	105	90	110			
WG529043													
WG529043ICV	ICV	10/08/21 17:06	WI210904-1	.6089		.614	mg/L	101	90	110			
WG529043ICB	ICB	10/08/21 17:07				U	mg/L		-0.01	0.01			
WG529043ICV1	ICV	10/08/21 17:45	WI210904-1	.6089		.623	mg/L	102	90	110			
WG529043ICB1	ICB	10/08/21 17:46				U	mg/L		-0.01	0.01			
WG529047													
WG529047ICV	ICV	10/09/21 12:50	WI210904-1	.6089		.615	mg/L	101	90	110			
WG529047ICB	ICB	10/09/21 12:51				U	mg/L		-0.01	0.01			
L68095-04AS	AS	10/09/21 12:57	WI211001-5	1	U	.989	mg/L	99	90	110			
WG529047LFB	LFB	10/09/21 13:01	WI211001-5	1		.963	mg/L	96	90	110			
WG529516													
WG529516ICV	ICV	10/14/21 22:34	WI210904-1	.6089		.583	mg/L	96	90	110			
WG529516ICB	ICB	10/14/21 22:36				U	mg/L		-0.01	0.01			
WG529518													
WG529518LFB	LFB	10/15/21 1:05	WI211001-5	1		.964	mg/L	96	90	110			
L68094-05AS	AS	10/15/21 1:08	WI211001-5	1	U	.987	mg/L	99	90	110			
WG529972													
WG529972ICV	ICV	10/20/21 22:24	WI210904-1	.6089		.59	mg/L	97	90	110			
WG529972ICB	ICB	10/20/21 22:25				U	mg/L		-0.01	0.01			
WG529974													
WG529974LFB	LFB	10/21/21 0:04	WI211001-5	1		.966	mg/L	97	90	110			
WG529897PBS	PBS	10/21/21 0:05				U	mg/L		-0.01	0.01			
L68094-06AS	AS	10/21/21 0:07	WI211001-5	1	U	1.047	mg/L	105	90	110			
WG530441													
WG530441ICV	ICV	10/27/21 23:38	WI210904-1	.6089		.602	mg/L	99	90	110			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

WG530441ICB	ICB	10/27/21 23:39				U	mg/L		-0.01	0.01			
WG530447													
WG530447LFB	LFB	10/28/21 1:09	WI211001-5	1		1.024	mg/L	102	90	110			
L68094-07AS	AS	10/28/21 1:12	WI211001-5	1	U	1.035	mg/L	104	90	110			

Nitrogen, ammonia (MWMT) M350.1 Auto Salicylate w/gas diffusion

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528086													
WG528086ICV	ICV	10/04/21 14:47	WI210713-1	11.988		11.119	mg/L	93	90	110			
WG528086ICB	ICB	10/04/21 14:49				U	mg/L		-0.05	0.05			
WG528086LFB	LFB	10/04/21 14:50	WI210901-5	10		10.566	mg/L	106	90	110			
WG526640PBS	PBS	10/04/21 14:52				1.476	mg/Kg		-0.05	0.05			B1
L68094-01AS	AS	10/04/21 14:55	WI210901-5	10	.107	9.086	mg/Kg	90	75	125			
WG529893													
WG529893LFB	LFB	10/20/21 11:46	WI210901-4	10		10.376	mg/L	104	90	110			
WG528948PBS	PBS	10/20/21 11:47				U	mg/Kg		-0.05	0.05			
WG529117PBS	PBS	10/20/21 11:49				U	mg/Kg		-0.05	0.05			
L68817-02DUP	DUP	10/20/21 11:55			U	U	mg/Kg				0	20	RA
L68817-03AS	AS	10/20/21 11:58	WI210901-4	10	U	9.364	mg/Kg	94	75	125			
WG530926													
WG530926ICV	ICV	11/03/21 15:39	WI211005-1	12		12.577	mg/L	105	90	110			
WG530926ICB	ICB	11/03/21 15:41				U	mg/L		-0.05	0.05			
WG531047													
WG531047LFB	LFB	11/04/21 14:50	WI210901-4	10		10.405	mg/L	104	90	110			
WG529897PBS	PBS	11/04/21 14:52				U	mg/Kg		-0.05	0.05			
L68094-07AS	AS	11/04/21 14:58	WI210901-4	10	U	11.567	mg/Kg	116	75	125			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nitrogen, total Kjeldahl (MWMT) M351.2 - Block Digestor

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527424													
WG527424ICV	ICV	09/16/21 23:39	WI210816-9	4		4.04	mg/L	101	90	110			
WG527424ICB	ICB	09/16/21 23:40				U	mg/L		-0.2	0.2			
WG527426													
WG527321PBS	PBS	09/17/21 0:30				U	%		-0.2	0.2			
WG527321LFB	LFB	09/17/21 0:31	WI210714-5	2.5		2.58	mg/L	103	90	110			
L68094-01MS	MS	09/17/21 0:34	WI210714-5	2.5	.53	2.93	mg/L	96	90	110			
L68095-01DUP	DUP	09/17/21 0:36			.53	.54	mg/L				2	20	RA
WG528519													
WG528519ICV	ICV	10/02/21 2:25	WI210922-8	4		3.89	mg/L	97	90	110			
WG528519ICB	ICB	10/02/21 2:26				U	mg/L		-0.2	0.2			
WG528521													
WG528301PBS	PBS	10/02/21 3:22				U	%		-0.2	0.2			
WG528301LFB	LFB	10/02/21 3:24	WI210714-5	2.5		2.43	mg/L	97	90	110			
L68094-02MS	MS	10/02/21 3:26	WI210714-5	2.5	.56	2.76	mg/L	88	90	110			M2
L68094-03DUP	DUP	10/02/21 3:29			.38	.36	mg/L				5	20	RA
WG530132													
WG530132ICV	ICV	10/23/21 21:55	WI211022-3	4		4.06	mg/L	102	90	110			
WG530132ICB	ICB	10/23/21 21:56				U	mg/L		-0.2	0.2			
WG530134													
WG528954PBS	PBS	10/23/21 23:00				U	%		-0.2	0.2			
WG528954LFB	LFB	10/23/21 23:01	WI210714-5	2.5		2.53	mg/L	101	90	110			
L68094-04MS	MS	10/23/21 23:03	WI210714-5	2.5	U	2.72	mg/L	109	90	110			
L68095-04DUP	DUP	10/23/21 23:05			U	U	mg/L				0	20	RA
WG529429PBS	PBS	10/23/21 23:07				U	%		-0.2	0.2			
WG529429LFB	LFB	10/23/21 23:08	WI211014-3	2.5		2.56	mg/L	102	90	110			
L68094-05MS	MS	10/23/21 23:10	WI211014-3	2.5	U	2.74	mg/L	110	90	110			
L68095-05DUP	DUP	10/23/21 23:14			U	U	mg/L				0	20	RA
WG531073													
WG531073ICV	ICV	11/04/21 22:52	WI211022-3	4		3.77	mg/L	94	90	110			
WG531073ICB	ICB	11/04/21 22:53				U	mg/L		-0.2	0.2			
WG531077													
WG529988PBS	PBS	11/05/21 0:40				U	%		-0.2	0.2			
WG529988LFB	LFB	11/05/21 0:41	WI211014-3	2.5		2.63	mg/L	105	90	110			
L68094-06MS	MS	11/05/21 0:43	WI211014-3	2.5	.37	2.63	mg/L	90	90	110			
L68095-06DUP	DUP	11/05/21 0:46			.2	U	mg/L				200	20	RA
WG530681PBS	PBS	11/05/21 0:47				U	%		-0.2	0.2			
WG530681LFB	LFB	11/05/21 0:48	WI211014-3	2.5		2.32	mg/L	93	90	110			
L68094-07MS	MS	11/05/21 0:50	WI211014-3	2.5	U	2.51	mg/L	100	90	110			
L68095-07DUP	DUP	11/05/21 0:55			U	U	mg/L				0	20	RA

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Phosphorus (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	5.0075		5.13	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.3	0.3			
WG526640PBS	PBS	09/18/21 2:17				U	mg/L		-0.3	0.3			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	1.001		1.01	mg/L	101	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	1.001	U	1.07	mg/L	107	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	1.001	U	1.05	mg/L	105	75	125	2	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	5.0075		5.12	mg/L	102	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.3	0.3			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.3	0.3			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	1.001		1.1	mg/L	110	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	1.001	U	1.04	mg/L	104	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	5.0075		5.1	mg/L	102	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.3	0.3			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.3	0.3			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	1.001		1.03	mg/L	103	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	1.001	U	1.04	mg/L	104	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	5.0075		5.02	mg/L	100	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.3	0.3			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.3	0.3			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	1.001		1.04	mg/L	104	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	1.001	U	1.06	mg/L	106	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	1.001	U	1.03	mg/L	103	75	125	3	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	5.0075		5.04	mg/L	101	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.3	0.3			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.3	0.3			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	1.001		1.07	mg/L	107	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	1.001	U	1.08	mg/L	108	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	1.001	U	1.08	mg/L	108	75	125	0	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	5.0075		5.1	mg/L	102	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.3	0.3			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.3	0.3			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	1.001		1.09	mg/L	109	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	1.001	U	1.1	mg/L	110	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	1.001	U	1.07	mg/L	107	75	125	3	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	5.0075		5.07	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.3	0.3			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.3	0.3			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	1.001		1.05	mg/L	105	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	1.001	U	1.08	mg/L	108	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	1.001	U	1.08	mg/L	108	75	125	0	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Phosphorus, ortho dissolved (MWMT) M365.1 - Automated Ascorbic Acid

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527512													
WG527512ICV	ICV	09/19/21 0:10	WI210401-4	.65228		.674	mg/L	103	90	110			
WG527512ICB	ICB	09/19/21 0:11				U	mg/L		-0.01	0.01			
WG527512LFB	LFB	09/19/21 0:13	WI210907-2	.5		.496	mg/L	99	90	110			
WG526640PBS	PBS	09/19/21 0:14				.014	mg/L		-0.01	0.01			B1
L68094-01AS	AS	09/19/21 0:17	WI210907-2	.5	.015	.494	mg/L	96	90	110			
WG527997													
WG527997ICV	ICV	09/25/21 1:50	WI210401-4	.65228		.663	mg/L	102	90	110			
WG527997ICB	ICB	09/25/21 1:51				U	mg/L		-0.01	0.01			
WG527999													
WG527999LFB	LFB	09/25/21 2:53	WI210921-12	.5		.48	mg/L	96	90	110			
L68094-02AS	AS	09/25/21 2:55	WI210921-12	.5	U	.484	mg/L	97	90	110			
WG528344													
WG528344ICV	ICV	09/29/21 21:31	WI210401-4	.65228		.68	mg/L	104	90	110			
WG528344ICB	ICB	09/29/21 21:32				U	mg/L		-0.01	0.01			
WG528345													
WG528345LFB	LFB	09/29/21 22:17	WI210921-12	.5		.496	mg/L	99	90	110			
L68094-03AS	AS	09/29/21 22:19	WI210921-12	.5	.011	.49	mg/L	96	90	110			
WG528964													
WG528964ICV	ICV	10/07/21 22:56	WI210401-4	.65228		.697	mg/L	107	90	110			
WG528964ICB	ICB	10/07/21 22:57				U	mg/L		-0.01	0.01			
WG528966													
WG528966LFB	LFB	10/08/21 0:12	WI211001-2	.5		.502	mg/L	100	90	110			
L68094-04AS	AS	10/08/21 0:14	WI211001-2	.5	U	.508	mg/L	102	90	110			
WG529514													
WG529514ICV	ICV	10/14/21 21:48	WI210401-4	.65228		.695	mg/L	107	90	110			
WG529514ICB	ICB	10/14/21 21:50				U	mg/L		-0.01	0.01			
WG529517													
WG529517LFB	LFB	10/14/21 23:02	WI211001-2	.5		.521	mg/L	104	90	110			
L68094-05AS	AS	10/14/21 23:04	WI211001-2	.5	U	.514	mg/L	103	90	110			
WG529973													
WG529973ICV	ICV	10/20/21 23:38	WI210401-4	.65228		.701	mg/L	107	90	110			
WG529973ICB	ICB	10/20/21 23:39				U	mg/L		-0.01	0.01			
WG529975													
WG529975LFB	LFB	10/20/21 23:59	WI211015-3	.5		.548	mg/L	110	90	110			
WG529897PBS	PBS	10/21/21 0:00				U	mg/L		-0.01	0.01			
L68094-06AS	AS	10/21/21 0:03	WI211015-3	.5	.084	.634	mg/L	110	90	110			
WG530449													
WG530449ICV	ICV	10/28/21 1:44	WI210401-4	.65228		.699	mg/L	107	90	110			
WG530449ICB	ICB	10/28/21 1:45				U	mg/L		-0.01	0.01			
WG530450													
WG530450LFB	LFB	10/28/21 2:18	WI211015-3	.5		.535	mg/L	107	90	110			
L68094-07AS	AS	10/28/21 2:20	WI211015-3	.5	.022	.523	mg/L	100	90	110			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Potassium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	20		19.8	mg/L	99	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				1.92	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	99.96008		94.97	mg/L	95	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	99.96008	12	111.3	mg/L	99	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	99.96008	12	110.6	mg/L	99	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	20		19.6	mg/L	98	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	99.96008		101.2	mg/L	101	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	99.96008	7.61	108.1	mg/L	101	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	99.96008	7.61	109.9	mg/L	102	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	20		19.74	mg/L	99	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	99.96008		99.52	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	99.96008	5.47	106.9	mg/L	101	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	99.96008	5.47	108.2	mg/L	103	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	20		19.87	mg/L	99	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	99.96008		97.93	mg/L	98	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	99.96008	3.93	102.9	mg/L	99	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	99.96008	3.93	102.6	mg/L	99	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	20		19.84	mg/L	99	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	99.96008		102.7	mg/L	103	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	99.96008	3.32	105.3	mg/L	102	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	99.96008	3.32	106.3	mg/L	103	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	20		19.98	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				7.99	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	99.96008		111.5	mg/L	112	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	99.96008	5.66	109.8	mg/L	104	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	99.96008	5.66	107.2	mg/L	102	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	20		20.02	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	99.96008		99.92	mg/L	100	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	99.96008	6.41	108.4	mg/L	102	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	99.96008	6.41	110.2	mg/L	104	75	125	2	20

Selenium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.05		.05366	mg/L	107	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.05		.04778	mg/L	96	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.05	.00018	.04888	mg/L	97	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.05	.00018	.04673	mg/L	93	75	125	4	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05363	mg/L	107	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	.00019	.04741	mg/L	94	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	.00019	.04533	mg/L	90	75	125	4	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04768	mg/L	95	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04672	mg/L	93	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	.00014	.04604	mg/L	92	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	.00014	.04469	mg/L	89	75	125	3	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05289	mg/L	106	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.05023	mg/L	100	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	.00015	.04587	mg/L	91	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	.00015	.04873	mg/L	97	75	125	6	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05331	mg/L	107	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.04832	mg/L	97	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	U	.04939	mg/L	99	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	U	.04848	mg/L	97	75	125	2	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	.0002	.04677	mg/L	93	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	.0002	.04871	mg/L	97	75	125	4	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.04996	mg/L	100	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.04998	mg/L	100	90	110			
WG531057ICB	ICB	11/04/21 15:59				.00012	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04589	mg/L	92	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	.00021	.04618	mg/L	92	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	.00021	.04603	mg/L	92	75	125	0	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silica (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	42.8		43.56	mg/L	102	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				.77	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	21.404		20.86	mg/L	97	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	21.404	24	40.12	mg/L	75	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	21.404	24	39.52	mg/L	73	75	125	2	20	MA
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	42.8		43.73	mg/L	102	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	21.404		21.81	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	21.404	22	30.81	mg/L	41	75	125			M2
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	21.404	22	29.47	mg/L	35	75	125	4	20	M2
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	42.8		44.14	mg/L	103	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	21.404		20.07	mg/L	94	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	21.404	24.7	45.77	mg/L	98	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	21.404	24.7	45.45	mg/L	97	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	42.8		43.57	mg/L	102	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	21.404		19.19	mg/L	90	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	21.404	22.2	32.45	mg/L	48	75	125			M2
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	21.404	22.2	20.17	mg/L	-9	75	125	47	20	M2 RS
WG530007													
WG530007ICV	ICV	10/22/21 3:39	II211013-1	42.8		44.15	mg/L	103	90	110			
WG530007ICB	ICB	10/22/21 3:42				U	mg/L		-0.6	0.6			
WG529375PBS	PBS	10/22/21 4:07				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/22/21 4:11	II210930-2	21.404		20.32	mg/L	95	80	120			
L68094-05MS	MS	10/22/21 4:19	II2XWATER	42.83	22.3	52.92	mg/L	71	75	125			M2
L68094-05MSD	MSD	10/22/21 4:22	II2XWATER	42.83	22.3	52.5	mg/L	71	75	125	1	20	M2
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	42.8		44.66	mg/L	104	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				64.95	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	21.404		18.18	mg/L	85	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	21.404	54.9	21.47	mg/L	-156	75	125			M2
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	21.404	54.9	20.56	mg/L	-160	75	125	4	20	M2
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	42.8		44.45	mg/L	104	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	21.404		20.74	mg/L	97	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	21.404	59.9	29.31	mg/L	-143	75	125			M2
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	21.404	59.9	26.19	mg/L	-157	75	125	11	20	M2

Silver (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528195													
WG528195ICV	ICV	09/28/21 14:17	MS210727-2	.02		.02037	mg/L	102	90	110			
WG528195ICB	ICB	09/28/21 14:19				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	09/28/21 14:30	MS210827-2	.01002		.01028	mg/L	103	80	120			
L68095-02MS	MS	09/28/21 14:37	MS210827-2	.01002	U	.00946	mg/L	94	75	125			
L68095-02MSD	MSD	09/28/21 14:39	MS210827-2	.01002	U	.00934	mg/L	93	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.02		.02022	mg/L	101	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.01002	U	.00872	mg/L	87	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.01002	U	.00872	mg/L	87	75	125	0	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.01002		.0094	mg/L	94	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.01		.00869	mg/L	87	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.01	U	.00798	mg/L	80	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.01	U	.00787	mg/L	79	75	125	1	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.02		.02143	mg/L	107	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.01		.00908	mg/L	91	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.01	U	.00879	mg/L	88	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.01	U	.00878	mg/L	88	75	125	0	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.02		.02142	mg/L	107	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.01		.00938	mg/L	94	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.01	U	.00882	mg/L	88	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.01	U	.00871	mg/L	87	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.01	U	.00849	mg/L	85	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.01	U	.00855	mg/L	86	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.01		.00862	mg/L	86	80	120			
WG531225													
WG531225ICV	ICV	11/08/21 14:14	MS211013-2	.02		.01924	mg/L	96	90	110			
WG531225ICB	ICB	11/08/21 14:16				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/08/21 14:24	MS210927-3	.01		.00928	mg/L	93	80	120			
L68095-07MS	MS	11/08/21 14:30	MS210927-3	.01	U	.00897	mg/L	90	75	125			
L68095-07MSD	MSD	11/08/21 14:32	MS210927-3	.01	U	.00877	mg/L	88	75	125	2	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sodium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	100		99.98	mg/L	100	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.6	0.6			
WG526640PBS	PBS	09/18/21 2:17				18.69	mg/L		-0.6	0.6			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	100.007		113.1	mg/L	113	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	100.007	180	277.6	mg/L	98	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	100.007	180	276.4	mg/L	96	75	125	0	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	100		99.93	mg/L	100	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.6	0.6			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.6	0.6			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	100.007		102	mg/L	102	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	100.007	87.6	185.3	mg/L	98	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	100.007	87.6	188.6	mg/L	101	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	100		101.3	mg/L	101	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.6	0.6			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.6	0.6			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	100.007		99.98	mg/L	100	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	100.007	51.5	151.6	mg/L	100	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	100.007	51.5	153.2	mg/L	102	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	100		100.9	mg/L	101	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.6	0.6			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.6	0.6			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	100.007		99.09	mg/L	99	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	100.007	36	136	mg/L	100	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	100.007	36	136.2	mg/L	100	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	100		101.7	mg/L	102	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.6	0.6			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.6	0.6			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	100.007		103.6	mg/L	104	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	100.007	31.9	132	mg/L	100	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	100.007	31.9	134.1	mg/L	102	75	125	2	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	100		99.76	mg/L	100	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.6	0.6			
WG529897PBS	PBS	10/27/21 11:13				62.59	mg/L		-0.6	0.6			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	100.007		165.2	mg/L	165	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	100.007	58.3	160.2	mg/L	102	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	100.007	58.3	156.9	mg/L	99	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	100		100.1	mg/L	100	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.6	0.6			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.6	0.6			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	100.007		99.04	mg/L	99	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	100.007	66.8	164.7	mg/L	98	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	100.007	66.8	168.2	mg/L	101	75	125	2	20

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Strontium (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		1.969	mg/L	98	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.027	0.027			
WG526640PBS	PBS	09/18/21 2:17				.2907	mg/L		-0.027	0.027			B1
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.5005		.7979	mg/L	159	80	120			B1
L68094-01MS	MS	09/18/21 2:28	II210903-3	.5005	1.11	1.635	mg/L	105	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.5005	1.11	1.624	mg/L	103	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.932	mg/L	97	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.027	0.027			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.027	0.027			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.5005		.5394	mg/L	108	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.5005	.706	1.234	mg/L	105	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.5005	.706	1.259	mg/L	110	75	125	2	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		1.957	mg/L	98	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.027	0.027			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.027	0.027			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.5005		.5265	mg/L	105	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.5005	.463	1.007	mg/L	109	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.5005	.463	1.014	mg/L	110	75	125	1	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.933	mg/L	97	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.027	0.027			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.027	0.027			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.5005		.5228	mg/L	104	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.5005	.253	.7782	mg/L	105	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.5005	.253	.778	mg/L	105	75	125	0	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.957	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.027	0.027			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.027	0.027			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.5005		.5468	mg/L	109	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.5005	.169	.7136	mg/L	109	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.5005	.169	.7235	mg/L	111	75	125	1	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		1.973	mg/L	99	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.027	0.027			
WG529897PBS	PBS	10/27/21 11:13				.52	mg/L		-0.027	0.027			B1
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.5005		1.084	mg/L	217	80	120			B1
L68094-06MS	MS	10/27/21 11:24	II211018-2	.5005	.406	.9679	mg/L	112	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.5005	.406	.9472	mg/L	108	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		1.972	mg/L	99	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.027	0.027			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.027	0.027			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.5005		.5325	mg/L	106	80	120			

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.5005	.423	.9666	mg/L	109	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.5005	.423	.9793	mg/L	111	75	125	1	20

Sulfate (MWMT) D516-07 - Turbidimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528808													
WG528808ICB	ICB	10/06/21 11:02				U	mg/L		-3	3			
WG528808ICV	ICV	10/06/21 11:02	WI210923-1	20.46		19.4	mg/L	95	90	110			
WG528808LFB	LFB	10/06/21 15:49	WI210105-3	10		10.1	mg/L	101	90	110			
WG526640PBS	PBS	10/06/21 15:49				U	mg/L		-3	3			
L68094-01DUP	DUP	10/06/21 16:05			898	914.4	mg/L				2	20	
WG527183PBS	PBS	10/06/21 16:06				U	mg/L		-3	3			
WG529610													
WG529610ICB1	ICB	10/18/21 11:53				U	mg/L		-3	3			
WG529610ICB	ICB	10/18/21 11:53				U	mg/L		-3	3			
WG529610ICV	ICV	10/18/21 11:53	WI211012-1	20.46		19	mg/L	93	90	110			
WG529610ICV1	ICV	10/18/21 11:53	WI211012-1	20.46		19	mg/L	93	90	110			
WG529610LFB	LFB	10/18/21 13:58	WI210105-3	10		9.8	mg/L	98	90	110			
L68094-03DUP	DUP	10/18/21 18:54			279	285	mg/L				2	20	
WG530017													
WG530017ICB	ICB	10/21/21 9:14				U	mg/L		-3	3			
WG530017ICV	ICV	10/21/21 9:14	WI211012-1	20.46		19	mg/L	93	90	110			
WG530017LFB	LFB	10/21/21 12:29	WI210105-3	10		9.1	mg/L	91	90	110			
WG529117PBS	PBS	10/21/21 12:29				U	mg/L		-3	3			
L68817-02DUP	DUP	10/21/21 13:51			67.5	61.5	mg/L				9	20	
WG529897PBS	PBS	10/21/21 13:51				102.4	mg/L		-15	15			B1
L68094-06AS	AS	10/21/21 13:52	SO4TURB5X	10	88.6	97	mg/L	84	90	110			M3
WG530510													
WG530510ICB	ICB	10/28/21 9:40				U	mg/L		-3	3			
WG530510ICV	ICV	10/28/21 9:40	WI211027-1	20.46		19.4	mg/L	95	90	110			
WG530510LFB	LFB	10/28/21 12:45	WI210105-3	10		9.4	mg/L	94	90	110			
WG529753PBS	PBS	10/28/21 12:45				U	mg/L		-3	3			
L69249-01DUP	DUP	10/28/21 13:15			332	395.1	mg/L				17	20	
L69249-02AS	AS	10/28/21 13:15	SO4TURB10X	10	220	231.5	mg/L	115	90	110			M3

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.05068	mg/L	101	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05		.04943	mg/L	99	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05	U	.05116	mg/L	102	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05	U	.0516	mg/L	103	75	125	1	20	
WG528919													
WG528919ICV	ICV	10/07/21 16:22	MS211001-2	.05		.05069	mg/L	101	90	110			
WG528919ICB	ICB	10/07/21 16:24				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/07/21 16:32				U	mg/L		-0.0003	0.0003			
WG526640LFB2	LFB	10/07/21 16:34	MS210827-2	.05		.04485	mg/L	90	80	120			
L68095-01MS	MS	10/07/21 16:40	MS210827-2	.05	U	.04595	mg/L	92	75	125			
L68095-01MSD	MSD	10/07/21 16:42	MS210827-2	.05	U	.046	mg/L	92	75	125	0	20	
WG528369LFB	LFB	10/07/21 16:47	MS210927-3	.05		.04759	mg/L	95	80	120			
L68095-03MS	MS	10/07/21 16:51	MS210927-3	.05	U	.04714	mg/L	94	75	125			
L68095-03MSD	MSD	10/07/21 16:53	MS210927-3	.05	U	.04639	mg/L	93	75	125	2	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05475	mg/L	110	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.04758	mg/L	95	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	U	.04193	mg/L	84	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	U	.04427	mg/L	89	75	125	5	20	
WG530803													
WG530803ICV	ICV	11/02/21 12:02	MS211013-2	.05		.05417	mg/L	108	90	110			
WG530803ICB	ICB	11/02/21 12:04				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	11/02/21 12:15	MS210927-3	.05		.05036	mg/L	101	80	120			
L68095-04MS	MS	11/02/21 12:22	MS210927-3	.05	U	.05133	mg/L	103	75	125			
L68095-04MSD	MSD	11/02/21 12:24	MS210927-3	.05	U	.05083	mg/L	102	75	125	1	20	
WG529897PBS	PBS	11/02/21 12:29				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	11/02/21 12:34	MS210927-3	.05	U	.05313	mg/L	106	75	125			
L68095-06MSD	MSD	11/02/21 12:36	MS210927-3	.05	U	.05215	mg/L	104	75	125	2	20	
WG529897LFB2	LFB	11/02/21 12:38	MS210927-3	.05		.05314	mg/L	106	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.0523	mg/L	105	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04627	mg/L	93	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	U	.0465	mg/L	93	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	U	.04627	mg/L	93	75	125	0	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium (MWMT) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG528420													
WG528420ICV	ICV	10/05/21 13:49	MS210727-2	.05		.04978	mg/L	100	90	110			
WG528420ICB	ICB	10/05/21 13:51				U	mg/L		-0.0003	0.0003			
WG527858LFB	LFB	10/05/21 14:14	MS210827-2	.05		.05058	mg/L	101	80	120			
L68095-02MS	MS	10/05/21 14:22	MS210827-2	.05	.00085	.05704	mg/L	112	75	125			
L68095-02MSD	MSD	10/05/21 14:24	MS210827-2	.05	.00085	.05745	mg/L	113	75	125	1	20	
WG528731													
WG528731ICV	ICV	10/05/21 18:28	MS211001-2	.05		.05305	mg/L	106	90	110			
WG528731ICB	ICB	10/05/21 18:30				U	mg/L		-0.0003	0.0003			
WG526640PBS	PBS	10/05/21 18:41				U	mg/L		-0.0003	0.0003			
L68095-01MS	MS	10/05/21 18:46	MS210827-2	.05	.00164	.05068	mg/L	98	75	125			
L68095-01MSD	MSD	10/05/21 18:48	MS210827-2	.05	.00164	.04997	mg/L	97	75	125	1	20	
WG526640LFB2	LFB	10/05/21 18:50	MS210827-2	.05		.04616	mg/L	92	80	120			
WG528369LFB	LFB	10/05/21 18:55	MS210927-3	.05		.04615	mg/L	92	80	120			
L68095-03MS	MS	10/05/21 19:03	MS210927-3	.05	.00043	.04825	mg/L	96	75	125			
L68095-03MSD	MSD	10/05/21 19:05	MS210927-3	.05	.00043	.04746	mg/L	94	75	125	2	20	
WG529719													
WG529719ICV	ICV	10/18/21 15:14	MS211013-2	.05		.05328	mg/L	107	90	110			
WG529719ICB	ICB	10/18/21 15:16				U	mg/L		-0.0003	0.0003			
WG529558LFB	LFB	10/18/21 15:27	MS210927-3	.05		.04705	mg/L	94	80	120			
L68095-05MS	MS	10/18/21 15:34	MS210927-3	.05	.00039	.04463	mg/L	88	75	125			
L68095-05MSD	MSD	10/18/21 15:36	MS210927-3	.05	.00039	.0477	mg/L	95	75	125	7	20	
WG530327													
WG530327ICV	ICV	10/26/21 15:45	MS211013-2	.05		.05399	mg/L	108	90	110			
WG530327ICB	ICB	10/26/21 15:47				U	mg/L		-0.0003	0.0003			
WG529085LFB	LFB	10/26/21 15:58	MS210927-3	.05		.04541	mg/L	91	80	120			
L68095-04MS	MS	10/26/21 16:03	MS210927-3	.05	.00037	.05013	mg/L	100	75	125			
L68095-04MSD	MSD	10/26/21 16:05	MS210927-3	.05	.00037	.04967	mg/L	99	75	125	1	20	
WG529897PBS	PBS	10/26/21 16:10				U	mg/L		-0.0003	0.0003			
L68095-06MS	MS	10/26/21 16:18	MS210927-3	.05	.0017	.05314	mg/L	103	75	125			
L68095-06MSD	MSD	10/26/21 16:20	MS210927-3	.05	.0017	.05347	mg/L	104	75	125	1	20	
WG529897LFB2	LFB	10/26/21 16:21	MS210927-3	.05		.05203	mg/L	104	80	120			
WG531057													
WG531057ICV	ICV	11/04/21 15:58	MS211013-2	.05		.05097	mg/L	102	90	110			
WG531057ICB	ICB	11/04/21 15:59				U	mg/L		-0.0003	0.0003			
WG530452LFB	LFB	11/04/21 16:08	MS210927-3	.05		.04799	mg/L	96	80	120			
L68095-07MS	MS	11/04/21 16:15	MS210927-3	.05	.00138	.05038	mg/L	98	75	125			
L68095-07MSD	MSD	11/04/21 16:16	MS210927-3	.05	.00138	.05149	mg/L	100	75	125	2	20	

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Zinc (MWMT) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG527490													
WG527490ICV	ICV	09/18/21 1:48	II210823-1	2		2	mg/L	100	90	110			
WG527490ICB	ICB	09/18/21 1:52				U	mg/L		-0.06	0.06			
WG526640PBS	PBS	09/18/21 2:17				.024	mg/L		-0.06	0.06			
WG526640LFB1	LFB	09/18/21 2:21	II210903-3	.50045		.51	mg/L	102	80	120			
L68094-01MS	MS	09/18/21 2:28	II210903-3	.50045	U	.534	mg/L	107	75	125			
L68094-01MSD	MSD	09/18/21 2:32	II210903-3	.50045	U	.529	mg/L	106	75	125	1	20	
WG528020													
WG528020ICV	ICV	09/26/21 17:55	II210923-1	2		1.971	mg/L	99	90	110			
WG528020ICB	ICB	09/26/21 17:59				U	mg/L		-0.06	0.06			
WG527796PBS	PBS	09/26/21 18:22				U	mg/L		-0.06	0.06			
WG527796LFB	LFB	09/26/21 18:26	II210910-2	.50045		.535	mg/L	107	80	120			
L68094-02MS	MS	09/26/21 18:33	II210910-2	.50045	U	.525	mg/L	105	75	125			
L68094-02MSD	MSD	09/26/21 18:37	II210910-2	.50045	U	.542	mg/L	108	75	125	3	20	
WG529255													
WG529255ICV	ICV	10/12/21 21:06	II210923-1	2		2.009	mg/L	100	90	110			
WG529255ICB	ICB	10/12/21 21:09				U	mg/L		-0.06	0.06			
WG528253PBS	PBS	10/12/21 21:33				U	mg/L		-0.06	0.06			
WG528253LFB	LFB	10/12/21 21:37	II210930-2	.50045		.523	mg/L	105	80	120			
L68094-03MS	MS	10/12/21 21:44	II210910-2	.50045	U	.525	mg/L	105	75	125			
L68094-03MSD	MSD	10/12/21 21:48	II210910-2	.50045	U	.54	mg/L	108	75	125	3	20	
WG529216													
WG529216ICV	ICV	10/12/21 21:16	II210923-1	2		1.96	mg/L	98	90	110			
WG529216ICB	ICB	10/12/21 21:20				U	mg/L		-0.06	0.06			
WG528832PBS	PBS	10/12/21 21:44				U	mg/L		-0.06	0.06			
WG528832LFB	LFB	10/12/21 21:48	II210930-2	.50045		.511	mg/L	102	80	120			
L68094-04MS	MS	10/12/21 21:56	II210930-2	.50045	U	.514	mg/L	103	75	125			
L68094-04MSD	MSD	10/12/21 22:00	II210930-2	.50045	U	.51	mg/L	102	75	125	1	20	
WG529693													
WG529693ICV	ICV	10/19/21 1:50	II211013-1	2		1.953	mg/L	98	90	110			
WG529693ICB	ICB	10/19/21 1:54				U	mg/L		-0.06	0.06			
WG529693PBS	PBS	10/19/21 2:18				U	mg/L		-0.06	0.06			
WG529375LFB	LFB	10/19/21 2:22	II210930-2	.50045		.532	mg/L	106	80	120			
L68094-05MS	MS	10/19/21 2:29	II210930-2	.50045	U	.526	mg/L	105	75	125			
L68094-05MSD	MSD	10/19/21 2:33	II210930-2	.50045	U	.54	mg/L	108	75	125	3	20	
WG530143													
WG530143ICV	ICV	10/27/21 10:45	II211013-1	2		2.046	mg/L	102	90	110			
WG530143ICB	ICB	10/27/21 10:49				U	mg/L		-0.06	0.06			
WG529897PBS	PBS	10/27/21 11:13				U	mg/L		-0.06	0.06			
WG529897LFB1	LFB	10/27/21 11:16	II211018-2	.50045		.553	mg/L	111	80	120			
L68094-06MS	MS	10/27/21 11:24	II211018-2	.50045	U	.546	mg/L	109	75	125			
L68094-06MSD	MSD	10/27/21 11:28	II211018-2	.50045	U	.536	mg/L	107	75	125	2	20	
WG530669													
WG530669ICV	ICV	11/01/21 1:00	II211013-1	2		2.013	mg/L	101	90	110			
WG530669ICB	ICB	11/01/21 1:03				U	mg/L		-0.06	0.06			
WG530401PBS	PBS	11/01/21 1:27				U	mg/L		-0.06	0.06			
WG530401LFB	LFB	11/01/21 1:31	II211024-2	.50045		.527	mg/L	105	80	120			

BAC

ACZ Project ID: ***L68095***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

L68094-07MS	MS	11/01/21 1:38	II211024-2	.50045	U	.53	mg/L	106	75	125		
L68094-07MSD	MSD	11/01/21 1:42	II211024-2	.50045	U	.527	mg/L	105	75	125	1	20

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-01	WG527490	Barium (MWMT)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Boron (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Calcium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG527931	Chloride (MWMT)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527490	Magnesium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG527528	Mercury (MWMT)	M7470A CVAA	H3	Sample was received and analyzed past holding time.
	WG527510	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528086	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527426	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527512	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527490	Potassium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Silica (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Sodium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG528808	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG527409	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
	WG527490	Zinc (MWMT)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-02	WG528195	Arsenic (MWMT)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Beryllium (MWMT)	M6020B ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
			M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527931	Chloride (MWMT)	SM4500Cl-E	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527796	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
		Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG527998	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
	WG528086	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG528301	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	DJ	Sample dilution required due to insufficient sample.
	WG528521		M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527796	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG527999	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG527796	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG528020	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG528808	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG527796	Temperature	ASTM E2242-13	N1	See Case Narrative.

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.
L68095-03	WG528710	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG528350	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528521	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528345	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-04	WG530327	Cadmium (MWMT)	M6020B ICP-MS	DB	Sample required dilution due to low bias result.
	WG529573	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG530327	Lead (MWMT)	M6020B ICP-MS	DB	Sample required dilution due to low bias result.
	WG529047	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
			M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	H1	Sample prep or analysis performed past holding time. See case narrative.
			M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530134	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG528966	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG530327	Selenium (MWMT)	M6020B ICP-MS	DB	Sample required dilution due to low bias result.
	WG529216	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	RS	RPD of matrix spikes for total or total recoverable silica is outside acceptance limits. Acceptable precision for other metals indicates silica RPD failure may be attributed to digestion-triggered silica polymerization and precipitation.
			M6010D ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG530327	Silver (MWMT)	M6020B ICP-MS	DB	Sample required dilution due to low bias result.
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530327	Uranium (MWMT)	M6020B ICP-MS	DB	Sample required dilution due to low bias result.

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-05	WG529573	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529375	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530030	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529375	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG529518	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529893	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530134	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529375	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG529517	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529375	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG530007	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG529610	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell

ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG529375	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.
	WG529732	Total Alkalinity	SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-06	WG530143	Barium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Boron (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Calcium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG530304	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
	WG529897	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530030	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG530143	Magnesium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG529974	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531047	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531077	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG529975	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG529897	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
	WG530143	Potassium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.

Brown and Caldwell

ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG529897	Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG530143	Silica (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
		Strontium (MWMT)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
	WG530017	Sulfate (MWMT)	D516-07 - Turbidimetric	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG529897	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.
	WG530024	Total Alkalinity	SM2320B - Titration	B4	Target analyte detected in blank at or above the acceptance criteria.
			SM2320B - Titration	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.

Brown and Caldwell

ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L68095-07	WG531057	Arsenic (MWMT)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG530823	Chloride (MWMT)	SM4500Cl-E	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			SM4500Cl-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530401	Dry Weight	ASTM E2242-13	N1	See Case Narrative.
		Extraction pH	ASTM E2242-13	N1	See Case Narrative.
		Extraction Temperature	ASTM E2242-13	N1	See Case Narrative.
		Extraction Time	ASTM E2242-13	N1	See Case Narrative.
	WG530976	Fluoride (MWMT)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Leachate Volume	ASTM E2242-13	N1	See Case Narrative.
	WG530447	Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531047	Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG531077	Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M351.2 - Block Digestor	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Particle Size over 5 cm	ASTM E2242-13	N1	See Case Narrative.
	WG530450	Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			M365.1 - Automated Ascorbic	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG530401	Post Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Pre Filter pH	ASTM E2242-13	N1	See Case Narrative.
		Retained Moisture	ASTM E2242-13	N1	See Case Narrative.
	WG530669	Silica (MWMT)	M6010D ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530510	Sulfate (MWMT)	D516-07 - Turbidimetric	HD	Analysis is outside the intended scope of the method, which

Brown and Caldwell ACZ Project ID: ***L68095***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
			D516-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG530401	Temperature	ASTM E2242-13	N1	See Case Narrative.
		Time In	ASTM E2242-13	N1	See Case Narrative.
		Time Out	ASTM E2242-13	N1	See Case Narrative.

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bicarbonate as CaCO3	SM2320B - Titration
Carbonate as CaCO3	SM2320B - Titration
Chloride (MWMT)	SM4500Cl-E
Fluoride (MWMT)	SM4500F-C
Hydroxide as CaCO3	SM2320B - Titration
Nitrate/Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction
Nitrite as N (MWMT)	M353.2 - Automated Cadmium Reduction
Nitrogen, ammonia (MWMT)	M350.1 Auto Salicylate w/gas diffusion
Nitrogen, total Kjeldahl (MWMT)	M351.2 - Block Digestor
Phosphorus, ortho dissolved (MWMT)	M365.1 - Automated Ascorbic Acid
Sulfate (MWMT)	D516-07 - Turbidimetric
Total Alkalinity	SM2320B - Titration

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L68095
Date Received: 08/26/2021 16:01
Received By:
Date Printed: 8/27/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L68095
Date Received: 08/26/2021 16:01
Received By:
Date Printed: 8/27/2021

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L68095

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: MWMP-COLUMN-MOD

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	MWMP-COLUMN-MOD +							
TLCHT-670-720	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

See special instructions with quote.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			8/26/21 14:00

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L68095 Chain of Custod

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: special MWMT project crm 9-16-21

9/15/2021 3:30:06 PM . 91321

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

Sample	Login Comments
L68094-01	ZIPLOCK -- RELOG OF L66672-01 || Sample will be in an Orange bucket with L65898 and L66671-73
L68094-01MS	ICP Spike
L68094-01MSD	ICP Spike
L68095-01	ZIPLOCK -- RELOG OF L66673-01 || Sample will be in an Orange bucket with L65898 and L66671-73
L68095-01MS	ICPMS Spike
L68095-01MSD	ICPMS Spike
WG526640CCV	pH QC
WG526640CSTD1	pH QC
WG526640CSTD2	pH QC
WG526640CSTD3	pH QC
WG526640ICV	pH QC
WG526640LFB1	ICP LFB
WG526640LFB2	ICPMS LFB

Report Comments: _____

Internal Comments _____

METEORIC WATER MOBILITY TEST

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Analyst: **GKH**
Date:
Start Time: 9/8/21 11a
End Time: 9/15/21 3p

Workgroup Number: WG526640

Feed Moisture

Sx Number	Pan Weight (g)	Wet Sx + Pan Weight (g)	Dry Sx + Pan Weight (g)	% Solid	% Feed Moisture
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!

Screening-Particle Size

Sx Number	Sx Weight (g)	Sx > 5 cm (g)	Sx < 5 cm (g)	%Sx > 5cm	%Sx < 5cm
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!
0			0	#DIV/0!	#DIV/0!

Residual Moisture

Sx Number	Pan Weight (g)	Wet Sx + Pan Weight (g)	Dry Sx + Pan Weight (g)	% Solid	% Res. Moisture
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!
0				#DIV/0!	#DIV/0!

Time and Temperature for Residual Moisture: n/a
Sample Description: sand/rock
Centrifuge or pre-filter? no
Observation of changes: none
Storage Conditions of "as rec" sample: Room

METEORIC WATER MOBILITY TEST

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Analyst: **GKH**
Date:
Start Time: **9/8/21 11a**
End Time: **9/15/21 3p**

Workgroup Number: WG526640

Loaded Sample Wet Weight

Sx Number	Sx Wet Weight (g)
L68094-01	2000
L68094-01	2000
0	
0	
0	
0	
0	

H2O rate start:
H2O rate finish:

Filter Type/pore size: .45um
Special Comments:

Dry Weight Calculations

Sx Number	Sx Weight (g) (From above)	(x)	% Solid	=	Dry Sx Weight (g)	+	Cubetainer Weight (g)	=	Target Leachate & Cubtainer Wt (g)
L68094-01	2000	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
L68094-01	2000	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
0	0	x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
		x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!
		x	#DIV/0!	=	#DIV/0!	+		=	#DIV/0!

Final Leachate Weight

Sx Number	Actual Leachate & Cubetainer Weight (g)	-	Cubetainer Wt (g)	=	Final Leachate Volume (mL)
L68094-01		-	0	=	0
L68094-01		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
0		-	0	=	0
		-	0	=	0
		-	0	=	0

Comments:

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:25	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:20	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG526640

Instrument: SOILSPREP

	Initials	Date
AREV:	GKH	9/15/2021 3:59:38 PM
SREV:	CRA	9/16/2021 11:28:24 AM

WG526640

Date Reported: 16-Sep-21
Run ID: R1835360
Date Analyzed: 08-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG526640ICV

Tag:

Measured: 9/8/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.02		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.05		
SREV	TEMPERATURE	PREP	21.7	1		C	NEED	0.1	0.1			

WG526640PBS

Tag:

Measured: 9/8/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

L68094-01

Tag:

Measured: 9/8/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.07		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.04		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68094-01MS

Tag:

Measured: 9/8/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.07		
SREV	PRE FILTER PH	TEXT		1		units	++			8.04		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-01MSD

Tag:

Measured: 9/8/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1621.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.07		
SREV	PRE FILTER PH	TEXT		1		units	++			8.04		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-01

Tag:

Measured: 9/8/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.01		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			7.99		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68095-01MS

Tag: Measured: 9/8/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.01		
SREV	PRE FILTER PH	TEXT		1		units	++			7.99		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-01MSD

Tag: Measured: 9/8/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1698.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.01		
SREV	PRE FILTER PH	TEXT		1		units	++			7.99		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG526640LFB1

Tag: Measured: 9/8/2021 11:00:11 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

WG526640LFB2

Tag:

Measured: 9/8/2021 11:00:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.57		
SREV	PRE FILTER PH	TEXT		1		units	++			7.56		
SREV	TEMPERATURE	PREP	20.8	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	0	1		g	++					

WG526640CCV

Tag:

Measured: 9/8/2021 11:00:13 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.01		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.02		
SREV	TEMPERATURE	PREP	21.4	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG526640
SAMPLE TYPE: SO

ANALYSIS DATE : 9/15/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☑	☐	☐
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG527796

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/22/2021 13:24
Start Date/Time: 09/15/2021 11:00
End Date/Time: 09/22/2021 14:45

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG527796CSTD1	NONE	As Rec		09/15/21 11:00		10.04		10.01	10.01							21.6
2	WG527796CSTD2	NONE	As Rec		09/15/21 11:00		7.03		6.97	6.97							21.8
3	WG527796CSTD3	NONE	As Rec		09/15/21 11:00		2.06		2.01	2.01							21.5
4	WG527796ICV	PCN63115	As Rec		09/15/21 11:00		3.99		4.04	4.07							21.9
5	**L68094-02**	WHAT-640-710-WEEK 2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
6	L68094-02MS	II210910-2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
7	L68094-02MSD	II210910-2	As Rec		09/15/21 11:00	0	7.56	23	8.19	8.26	2000	1980.3	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.5
8	**L68095-02**	TLCHT-670-720-WEEK 2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
9	L68095-02MS	MS210827-2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
10	L68095-02MSD	MS210827-2	As Rec		09/15/21 11:00	0	7.56	23	7.97	7.99	2000	1980.6	n/a	9/15/2021 11:00:00 AM	9/22/2021 11:00:00 AM	168	20.4
11	WG527796CCV	PCN63115	As Rec		09/15/21 11:00		4.02		4.07	4.03							21.6

Sample	Login Comments
L68094-02MS	ICP Spike
L68094-02MSD	ICP Spike
L68095-02MS	ICPMS Spike
L68095-02MSD	ICPMS Spike
WG527796CCV	pH QC
WG527796CSTD1	pH QC
WG527796CSTD2	pH QC
WG527796CSTD3	pH QC
WG527796ICV	pH QC

Report Comments: _____

Internal Comments _____

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: SPECIAL MWMT PROJECT CRM 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG527796

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		9/22/2021 3:04:36 PM
SREV:	CRA		9/23/2021 10:59:22 AM

WG527796

Date Reported: 23-Sep-21
Run ID: R1836390
Date Analyzed: 15-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG527796ICV

Tag:

Measured: 9/15/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.07		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.04		
SREV	TEMPERATURE	PREP	21.9	1		C	NEED	0.1	0.1			

L68094-02

Tag:

Measured: 9/15/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.26		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.19		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-02MS

Tag:

Measured: 9/15/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.26		
SREV	PRE FILTER PH	TEXT		1		units	++			8.19		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-02MSD

Tag:

Measured: 9/15/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.3	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.26		
SREV	PRE FILTER PH	TEXT		1		units	++			8.19		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-02

Tag:

Measured: 9/15/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.99		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.97		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-02MS

Tag:

Measured: 9/15/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.99		
SREV	PRE FILTER PH	TEXT		1		units	++			7.97		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-02MSD

Tag: Measured: 9/15/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1980.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.99		
SREV	PRE FILTER PH	TEXT		1		units	++			7.97		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG527796CCV

Tag: Measured: 9/15/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.03		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.07		
SREV	TEMPERATURE	PREP	21.6	1		C	NEED	0.1	0.1			

WG527796 Extended Qualifiers with Case Narratives

L68094-02	EXTRACTION PH EXTRACTION TEMPERATURE EXTRACTION TIME LEACHATE VOLUME PARTICLE SIZE OVER 5 CM POST FILTER PH PRE FILTER PH RETAINED MOISTURE TEMPERATURE TIME IN TIME OUT WEIGHT, DRY	N1	No PBS analyzed with WG. Samples extracted in site water provided by client, which was analyzed in week 1.
L68095-02	EXTRACTION PH EXTRACTION TEMPERATURE EXTRACTION TIME LEACHATE VOLUME PARTICLE SIZE OVER 5 CM POST FILTER PH PRE FILTER PH RETAINED MOISTURE TEMPERATURE TIME IN TIME OUT WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG527796
SAMPLE TYPE: SO

ANALYSIS DATE : 9/22/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG528253

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/29/2021 9:14
Start Date/Time: 09/22/2021 11:00
End Date/Time: 09/29/2021 11:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG528253CSTD1	NONE	As Rec		09/22/21 11:00		10.04		10.01								21.4
2	WG528253CSTD2	NONE	As Rec		09/22/21 11:00		7.03		7.06								21.5
3	WG528253CSTD3	NONE	As Rec		09/22/21 11:00		2.06		2.07								21.5
4	WG528253ICV	PCN63115	As Rec		09/22/21 11:00		3.99		4	4.06							21.5
5	**L68094-03**	WHAT-640-710-WEEK 3	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
6	L68094-03MS	II210910-2	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
7	L68094-03MSD	II210910-2	As Rec		09/22/21 11:00	0	7.56	23	8.23	8.22	2000	1985.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.4
8	**L68095-03**	TLCHT-670-720-WEEK 3	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
9	L68095-03MS	MS210927-2	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
10	L68095-03MSD	MS210927-2	As Rec		09/22/21 11:00	0	7.56	23	8.01	7.97	2000	1989.6	n/a	9/22/2021 11:00:00 AM	9/29/2021 11:00:00 AM	168	21.5
11	WG528253CCV	PCN63115	As Rec		09/22/21 11:00		4.02		4.06	4.03							21.3

Sample	Login Comments
L68094-03MS	ICP Spike
L68094-03MSD	ICP Spike
L68095-03MS	ICPMS Spike
L68095-03MSD	ICPMS Spike
WG528253CCV	pH QC
WG528253CSTD1	pH QC
WG528253CSTD2	pH QC
WG528253CSTD3	pH QC
WG528253ICV	pH QC

Report Comments: special mwmt extended soak. pbs analyzed on week 1

Internal Comments: extraction fluid provided by client from site. cra 10-1-21

cra 10-1-21

9/29/2021 11:46:07 AM 91021

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: SPECIAL MWMT PROJECT CRM 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG528253

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		9/29/2021 12:36:54 PM
SREV:	CRA		10/1/2021 10:19:16 AM

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG528253

Date Reported: 01-Oct-21
Run ID: R1837208
Date Analyzed: 22-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

L68094-03

Tag:

Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.22		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.23		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68094-03MS

Tag:

Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.22		
SREV	PRE FILTER PH	TEXT		1		units	++			8.23		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-03MSD

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1985.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.22		
SREV	PRE FILTER PH	TEXT		1		units	++			8.23		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.4	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-03

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.97		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.01		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++					

L68095-03MS

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.97		
SREV	PRE FILTER PH	TEXT		1		units	++			8.01		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-03MSD

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1989.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.97		
SREV	PRE FILTER PH	TEXT		1		units	++			8.01		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21.5	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG528253CCV

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.03		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.06		
SREV	TEMPERATURE	PREP	21.3	1		C	NEED	0.1	0.1			

WG528253ICV

Tag: Measured: 9/22/2021 11:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.06		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4		
SREV	TEMPERATURE	PREP	21.5	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG528253
SAMPLE TYPE: SO

ANALYSIS DATE : 9/29/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
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12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210803-1	8/3/22
SULFURIC ACID	SH210721-1	7/21/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG528832

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/06/2021 14:19
Start Date/Time: 09/29/2021 11:00
End Date/Time: 10/06/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG528832CSTD1	NONE	As Rec		09/29/21 11:00		10.04		9.99	9.99							21.8
2	WG528832CSTD2	NONE	As Rec		09/29/21 11:00		7.03		6.99	6.99							21.8
3	WG528832CSTD3	NONE	As Rec		09/29/21 11:00		2.06		2.04	2.04							21.8
4	WG528832ICV	PCN63115	As Rec		09/29/21 11:00		3.99		3.95	4.01							21.7
5	**L68094-04**	WHAT-640-710-WEEK 4	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
6	L68094-04MS	II210930-2	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
7	L68094-04MSD	II210930-2	As Rec		09/29/21 11:00	0	7.56	23	8.55	8.85	2000	1977.5	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	20.7
8	**L68095-04**	TLCHT-670-720-WEEK 4	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
9	L68095-04MS	MS210927-3	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
10	L68095-04MSD	MS210927-3	As Rec		09/29/21 11:00	0	7.56	23	8.34	8.32	2000	1978.6	n/a	9/29/2021 11:00:00 AM	10/6/2021 11:00:00 AM	168	21
11	WG528832CCV	PCN63115	As Rec		09/29/21 11:00		4.02		4.01	3.99							21.5

Sample	Login Comments
L68094-04MS	ICP Spike
L68094-04MSD	ICP Spike
L68095-04MS	ICPMS Spike
L68095-04MSD	ICPMS Spike
WG528832CCV	pH QC
WG528832CSTD1	pH QC
WG528832CSTD2	pH QC
WG528832CSTD3	pH QC
WG528832ICV	pH QC

Report Comments: SPECIAL MWMT PROJECT, NO PBS/LFB - GKH 10/6/21

Internal Comments

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: special MWMT project crm 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG528832

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/6/2021 3:42:41 PM
SREV:	CRA		10/7/2021 11:32:58 AM

WG528832

Date Reported: 07-Oct-21
Run ID: R1838042
Date Analyzed: 29-Sep-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG528832ICV

Tag:

Measured: 9/29/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			4.01		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.95		
SREV	TEMPERATURE	PREP	21.7	1		C	NEED	0.1	0.1			

L68094-04

Tag:

Measured: 9/29/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++					
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.85		
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.55		
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	[illegible]-96-MOD	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	[illegible]-96-MOD		1			++					
SREV	TIME OUT	[illegible]-96-MOD		1			++					
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++					

L68094-04MS

Tag:

Measured: 9/29/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.85		
SREV	PRE FILTER PH	TEXT		1		units	++			8.55		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-04MSD

Tag:

Measured: 9/29/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1977.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.85		
SREV	PRE FILTER PH	TEXT		1		units	++			8.55		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-04

Tag:

Measured: 9/29/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.32		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.34		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	21.0	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++					

L68095-04MS

Tag:

Measured: 9/29/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.32		
SREV	PRE FILTER PH	TEXT		1		units	++			8.34		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-04MSD

Tag:

Measured: 9/29/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1978.6	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.32		
SREV	PRE FILTER PH	TEXT		1		units	++			8.34		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	21	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG528832CCV

Tag:

Measured: 9/29/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			4.01		
SREV	TEMPERATURE	PREP	21.5	1		C	NEED	0.1	0.1			

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG528832
SAMPLE TYPE: SO

ANALYSIS DATE : 10/6/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☐	☐	☑
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH2100929-1	9/29/22
SULFURIC ACID	SH210929-2	9/29/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529375

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/13/2021 14:42
Start Date/Time: 10/06/2021 11:00
End Date/Time: 10/13/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG529375CSTD1	NONE	As Rec		10/06/21 11:00		10.04		9.95	9.95							20.6
2	WG529375CSTD2	NONE	As Rec		10/06/21 11:00		7.03		6.94	6.94							20.7
3	WG529375CSTD3	NONE	As Rec		10/06/21 11:00		2.06		2.06	2.06							20.7
4	WG529375ICV	PCN63115	As Rec		10/06/21 11:00		3.99		3.97	3.99							20.7
5	**L68094-05**	WHAT-640-710-WEEK 5	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
6	L68094-05MS	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
7	L68094-05MSD	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.59	8.67	2000	1981.5	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	19.6
8	**L68095-05**	TLCHT-670-720-WEEK 5	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
9	L68095-05MS	MS210927-3	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
10	L68095-05MSD	II210930-2	As Rec		10/06/21 11:00	0	7.56	23	8.35	8.39	2000	1986.9	n/a	10/6/2021 11:00:00 AM	10/13/2021 11:00:00 AM	168	20
11	WG529375CCV	PCN63115	As Rec		10/06/21 11:00		4.02		3.99	3.96							20.4

Sample	Login Comments
L68094-05MS	ICP Spike
L68094-05MSD	ICP Spike
L68095-05MS	ICPMS Spike
L68095-05MSD	ICPMS Spike
WG529375CCV	pH QC
WG529375CSTD1	pH QC
WG529375CSTD2	pH QC
WG529375CSTD3	pH QC
WG529375ICV	pH QC

Report Comments: SPECIAL MWMT PROJECT, NO PBS/LFB -GKH 10/13/21

Internal Comments

10/13/2021 2:52:22 PM 91021

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG526640

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 09/07/2021 9:32
Start Date/Time: 09/08/2021 11:00
End Date/Time: 09/15/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG526640CSTD1	NONE	As Rec		09/08/21 11:00		10.04		10.05	10.05							21.6
2	WG526640CSTD2	NONE	As Rec		09/08/21 11:00		7.03		7.03	7.03							21.8
3	WG526640CSTD3	NONE	As Rec		09/08/21 11:00		2.06		2.04	2.04							21.5
4	WG526640ICV	PCN63115	As Rec		09/08/21 11:00		3.99		4.05	4.02							21.7
5	WG526640PBS	NONE	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
6	**L68094-01**	WHAT-640-710	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
7	L68094-01MS	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
8	L68094-01MSD	II210903-3	As Rec		09/08/21 11:00	0	7.56	23	8.04	8.07	2000	1621.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
9	**L68095-01**	TLCHT-670-720	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
10	L68095-01MS	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
11	L68095-01MSD	MS210827-2	As Rec		09/08/21 11:00	0	7.56	23	7.99	8.01	2000	1698.7	n/a	9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.7
12	WG526640LFB1	II210903-3	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
13	WG526640LFB2	MS210827-2	As Rec		09/08/21 11:00		7.56	23	7.56	7.57	0	1000		9/8/2021 11:00:00 AM	9/15/2021 11:00:00 AM	168	20.8
14	WG526640CCV	PCN63115	As Rec		09/08/21 11:00		4.02		4.02	4.01							21.4

Report Comments: PBS IS MOW WATER THAT WAS NOT PUT THROUGH COLUMN & GLASS FIBER - GKH 9/15/21

Internal Comments: SPECIAL MWMT PROJECT CRM 9-16-21

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Dept:20

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), 9-8-9-15
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), 9-15-22
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), 9-22-29
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), 9-29-10-6
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG529375

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/13/2021 3:43:58 PM
SREV:	CRA		10/18/2021 2:37:30 PM

WG529375

Date Reported: 18-Oct-21
Run ID: R1839317
Date Analyzed: 06-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG529375ICV

Tag:

Measured: 10/6/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.99		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.97		
SREV	TEMPERATURE	PREP	20.7	1		C	NEED	0.1	0.1			

L68094-05

Tag:

Measured: 10/6/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56	N1	
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	Γ-96-MOD	1981.5	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.67	N1	
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.59	N1	
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	Γ-96-MOD	19.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	Γ-96-MOD		1			++				N1	
SREV	TIME OUT	Γ-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-05MS

Tag:

Measured: 10/6/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1981.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.67		
SREV	PRE FILTER PH	TEXT		1		units	++			8.59		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	19.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-05MSD

Tag:

Measured: 10/6/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1981.5	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.67		
SREV	PRE FILTER PH	TEXT		1		units	++			8.59		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	19.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-05

Tag:

Measured: 10/6/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.56	N1	
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	Γ-96-MOD	1986.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			8.39	N1	
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			8.35	N1	
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	Γ-96-MOD	20.0	1		C	++	0.1	0.1		N1	
SREV	TIME IN	Γ-96-MOD		1			++				N1	
SREV	TIME OUT	Γ-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-05MS

Tag:

Measured: 10/6/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1986.9	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.39		
SREV	PRE FILTER PH	TEXT		1		units	++			8.35		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-05MSD

Tag: Measured: 10/6/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.56		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1986.9	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			8.39		
SREV	PRE FILTER PH	TEXT		1		units	++			8.35		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG529375CCV

Tag: Measured: 10/6/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			4.02		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.99		
SREV	TEMPERATURE	PREP	20.4	1		C	NEED	0.1	0.1			

WG529375 Extended Qualifiers with Case Narratives

L68094-05	EXTRACTION PH	N1	"MOW" water used for leach
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-05	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG529375
SAMPLE TYPE: SO

ANALYSIS DATE : 10/13/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH210929-2	9/29/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm	Extraction pH	Extraction Temperature	Pre Filter pH	Post Filter pH	Dry Weight	Leachate Volume	Retained Moisture	Time In	Time Out	Extraction Time	Temperature
						(%)	(units)	(C)	(units)	(units)	(g)	(mL)	(%)			(hrs)	(C)
1	WG529897CSTD1	NONE	As Rec		10/13/21 11:00		9.97		9.96	9.96							21.1
2	WG529897CSTD2	NONE	As Rec		10/13/21 11:00		6.98		6.96	6.96							21.1
3	WG529897CSTD3	NONE	As Rec		10/13/21 11:00		1.99		1.97	1.97							21.1
4	WG529897ICV	PCN63115	As Rec		10/13/21 11:00		3.94		3.93	3.98							21.2
5	WG529897PBS	NONE	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
6	**L68094-06**	WHAT-640-710-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
7	L68094-06MS	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
8	L68094-06MSD	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
9	**L68095-06**	TLCHT-670-720-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
10	L68095-06MS	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
11	L68095-06MSD	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
12	WG529897LFB1	II211018-2	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
13	WG529897LFB2	MS210927-3	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
14	WG529897CCV	PCN63115	As Rec		10/13/21 11:00		3.95		3.98	3.96							20.9

Report Comments: PBS IS TANNERY II WATER THAT WAS NOT PUT THROUGH COLUMN

Internal Comments: SPECIAL MWMT PROJECT -GKH 10/20/21

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

Sample	Login Comments
L68094-06MS	ICP Spike
L68094-06MSD	ICP Spike
L68095-06MS	ICPMS Spike
L68095-06MSD	ICPMS Spike
WG529897CCV	pH QC
WG529897CSTD1	pH QC
WG529897CSTD2	pH QC
WG529897CSTD3	pH QC
WG529897ICV	pH QC
WG529897LFB1	ICP LFB
WG529897LFB2	ICPMS LFB

Report Comments: _____

Internal Comments: _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To	Instruction
8/25/2021	sw	Dept:25	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)
8/25/2021	sw	Dept:20	-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1), -02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2), -03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3), -04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4), -05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5), -06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG529897

Instrument: SOILSPREP

		Initials	Date
AREV:	GKH		10/20/2021 2:51:09 PM
SREV:	CRA		10/21/2021 10:59:20 AM

WG529897

Date Reported: 21-Oct-21
Run ID: R1840275
Date Analyzed: 13-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG529897ICV

Tag: Measured: 10/13/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.94		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.98		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.93		
SREV	TEMPERATURE	PREP	21.2	1		C	NEED	0.1	0.1			

WG529897PBS

Tag: Measured: 10/13/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

L68094-06

Tag: Measured: 10/13/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	[illegible]-96-MOD		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	[illegible]-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	[illegible]-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	[illegible]-96-MOD	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	[illegible]-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	[illegible]-96-MOD		1		units	++			8.21	N1	
SREV	PRE FILTER PH	[illegible]-96-MOD		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	[illegible]-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	[illegible]-96-MOD	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	[illegible]-96-MOD		1			++				N1	
SREV	TIME OUT	[illegible]-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	[illegible]-96-MOD	2000	1		g	++				N1	

L68094-06MS

Tag:

Measured: 10/13/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			8.21	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68094-06MSD

Tag:

Measured: 10/13/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1980	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			8.21	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			8.19	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.4	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68095-06

Tag:

Measured: 10/13/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	Γ-96-MOD	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++				N1	
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.73	N1	
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a	N1	
SREV	TEMPERATURE	Γ-96-MOD	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	Γ-96-MOD		1			++				N1	
SREV	TIME OUT	Γ-96-MOD		1			++				N1	
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-06MS

Tag: Measured: 10/13/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.73	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

L68095-06MSD

Tag: Measured: 10/13/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1826.9	1		mL	++				N1	
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.73	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.71	N1	
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a	N1	
SREV	TEMPERATURE	PREP	20.2	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	2000	1		g	++				N1	

WG529897LFB1

Tag: Measured: 10/13/2021 11:00:11 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

WG529897LFB2

Tag:

Measured: 10/13/2021 11:00:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5	N1	
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1		N1	
SREV	EXTRACTION TIME	PREP	168	1		hrs	++				N1	
SREV	LEACHATE VOLUME	PREP	1000	1		mL	++				N1	
SREV	POST FILTER PH	TEXT		1		units	++			7.44	N1	
SREV	PRE FILTER PH	TEXT		1		units	++			7.5	N1	
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1		N1	
SREV	TIME IN	DATE		1			++				N1	
SREV	TIME OUT	DATE		1			++				N1	
SREV	WEIGHT, DRY	PREP	0	1		g	++				N1	

WG529897CCV

Tag:

Measured: 10/13/2021 11:00:13 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.95		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.98		
SREV	TEMPERATURE	PREP	20.9	1		C	NEED	0.1	0.1			

WG529897 Extended Qualifiers with Case Narratives

L68094-06	EXTRACTION PH	N1	first week of "Tannery II" water
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68094-06MS	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68094-06MSD	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06MS	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-06MSD	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		

	RETAINED MOISTURE
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897LFB1	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897LFB2	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY
WG529897PBS	EXTRACTION PH
	EXTRACTION TEMPERATURE
	EXTRACTION TIME
	LEACHATE VOLUME
	POST FILTER PH
	PRE FILTER PH
	TEMPERATURE
	TIME IN
	TIME OUT
	WEIGHT, DRY

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG529897
SAMPLE TYPE: SO

ANALYSIS DATE : 10/20/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH211012-1	10/12/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG530401

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/27/2021 13:10
Start Date/Time: 10/20/2021 11:00
End Date/Time: 10/27/2021 15:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG530401CSTD1	NONE	As Rec		10/20/21 11:00		9.97		10.03	10.03							20.6
2	WG530401CSTD2	NONE	As Rec		10/20/21 11:00		6.98		6.98	6.98							20.7
3	WG530401CSTD3	NONE	As Rec		10/20/21 11:00		1.99		2.03	2.03							20.7
4	WG530401ICV	PCN63115	As Rec		10/20/21 11:00		3.94		3.95	3.99							20.8
5	**L68094-07**	WHAT-640-710-WEEK 7	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
6	L68094-07MS	II211024-2	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
7	L68094-07MSD	II211024-2	As Rec		10/20/21 11:00	0	7.5	23	7.91	7.95	2000	1988.7	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.6
8	**L68095-07**	TLCHT-670-720-WEEK 7	As Rec		10/20/21 11:00	0	7.5	23	7.72	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	2.7
9	L68095-07MS	MS210927-3	As Rec		10/20/21 11:00	0	7.5	23	7.72	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.7
10	L68095-07MSD	MS210927-3	As Rec		10/20/21 11:00	0	7.5	23	7.73	7.7	2000	2149.1	n/a	10/20/2021 11:00:00 AM	10/27/2021 11:00:00 AM	168	20.7
11	WG530401CCV	PCN63115	As Rec		10/20/21 11:00		3.95		3.99	3.96							20.3

Sample	Login Comments
L68094-07MS	ICP Spike
L68094-07MSD	ICP Spike
L68095-07MS	ICPMS Spike
L68095-07MSD	ICPMS Spike
WG530401CCV	pH QC
WG530401CSTD1	pH QC
WG530401CSTD2	pH QC
WG530401CSTD3	pH QC
WG530401ICV	pH QC

Report Comments: Special project no PBS
CRA 11-1-21

Internal Comments:

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Special Instructions

Date	By	Applies To
8/25/2021	sw	Production Acct:BAC Quot:MWMP-COLUMN-MOD Dept:25

Instruction

-01 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week1),
-02 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 2),
-03 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 3),
-04 - fill with MOW water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 4),
-05 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 5),
-06 - fill with Tannery II water, sit 7 days, drain, run MWMP-COLUMN-MOD (week 6)

Metoric Water Mobility

QC List Type: I-X-MWME
QCListMatClass: SOLID
Bench Sheet List: I-RFA-CN-FREE
QC Ref: CSTD3X-PBS-LFB-MSX2
Group ID: SP-G-MWMT-96-MOD
Method Ref: ASTM E2242-13
SOP Ref: SOPSO036

WG529897

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: GKH
ACZ Dept: 20
Create Date: 10/20/2021 11:43
Start Date/Time: 10/13/2021 11:00
End Date/Time: 10/20/2021 13:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Particle Size over 5 cm (%)	Extraction pH (units)	Extraction Temperature (C)	Pre Filter pH (units)	Post Filter pH (units)	Dry Weight (g)	Leachate Volume (mL)	Retained Moisture (%)	Time In	Time Out	Extraction Time (hrs)	Temperature (C)
1	WG529897CSTD1	NONE	As Rec		10/13/21 11:00		9.97		9.96	9.96							21.1
2	WG529897CSTD2	NONE	As Rec		10/13/21 11:00		6.98		6.96	6.96							21.1
3	WG529897CSTD3	NONE	As Rec		10/13/21 11:00		1.99		1.97	1.97							21.1
4	WG529897ICV	PCN63115	As Rec		10/13/21 11:00		3.94		3.93	3.98							21.2
5	WG529897PBS	NONE	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000					20.6
6	**L68094-06**	WHAT-640-710-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
7	L68094-06MS	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
8	L68094-06MSD	II211018-2	As Rec		10/13/21 11:00	0	7.5	23	8.19	8.21	2000	1980	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.4
9	**L68095-06**	TLCHT-670-720-WEEK 6	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
10	L68095-06MS	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
11	L68095-06MSD	MS210927-3	As Rec		10/13/21 11:00	0	7.5	23	7.71	7.73	2000	1826.9	n/a	10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.2
12	WG529897LFB1	II211018-2	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
13	WG529897LFB2	MS210927-3	As Rec		10/13/21 11:00		7.5	23	7.5	7.44	0	1000		10/13/2021 11:00:00 AM	10/20/2021 11:00:00 AM	168	20.6
14	WG529897CCV	PCN63115	As Rec		10/13/21 11:00		3.95		3.98	3.96							20.9

Report Comments: PBS IS TANNERY II WATER THAT WAS NOT PUT THROUGH COLUMN

Internal Comments: SPECIAL MWMT PROJECT - GKH 10/20/21

10/20/2021 1:07:56 PM 91021

Workgroup Review Electronic Signatures

By entering your employee PIN, you are signing this data package electronically and certify that all required documentation has been reviewed and submitted in accordance with ACZ policies and procedures. You agree your electronic signature is the legal equivalent of your manual/handwritten signature

Workgroup: WG530401

Instrument: SOILSPREP

	Initials	Date		Initials	Date
AREV:	GKH	10/27/2021 4:30:08 PM	SREV:	CRA	11/1/2021 11:58:22 AM

WG530401

Date Reported: 01-Nov-21
Run ID: R1841126
Date Analyzed: 20-Oct-21
ICAL Workgroup:
Instrument ID: SOILSPREP

WG530401ICV

Tag: Measured: 10/20/2021 11:00:03 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.94		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.99		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.95		
SREV	TEMPERATURE	PREP	20.8	1		C	NEED	0.1	0.1			

L68094-07

Tag: Measured: 10/20/2021 11:00:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.95		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.91		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68094-07MS

Tag: Measured: 10/20/2021 11:00:05 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.95		
SREV	PRE FILTER PH	TEXT		1		units	++			7.91		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68094-07MSD

Tag:

Measured: 10/20/2021 11:00:06 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	1988.7	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.95		
SREV	PRE FILTER PH	TEXT		1		units	++			7.91		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.6	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-07

Tag:

Measured: 10/20/2021 11:00:07 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	Γ-96-MOD		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	Γ-96-MOD	23.0	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	Γ-96-MOD	168	1		hrs	++					
SREV	LEACHATE VOLUME	Γ-96-MOD	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	Γ-96-MOD	0	1		%	++					
SREV	POST FILTER PH	Γ-96-MOD		1		units	++			7.7		
SREV	PRE FILTER PH	Γ-96-MOD		1		units	++			7.72		
SREV	RETAINED MOISTURE	Γ-96-MOD		1		%	++			n/a		
SREV	TEMPERATURE	Γ-96-MOD	2.7	1		C	++	0.1	0.1			
SREV	TIME IN	Γ-96-MOD		1			++					
SREV	TIME OUT	Γ-96-MOD		1			++					
SREV	WEIGHT, DRY	Γ-96-MOD	2000	1		g	++				N1	

L68095-07MS

Tag:

Measured: 10/20/2021 11:00:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.7		
SREV	PRE FILTER PH	TEXT		1		units	++			7.72		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

L68095-07MSD

Tag: Measured: 10/20/2021 11:00:09 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	++			7.5		
SREV	EXTRACTION TEMPERATURE	REG	23	1		C	++	0.1	0.1			
SREV	EXTRACTION TIME	PREP	168	1		hrs	++					
SREV	LEACHATE VOLUME	PREP	2149.1	1		mL	++					
SREV	PARTICLE SIZE OVER 5 CM	PREP	0	1		%	++					
SREV	POST FILTER PH	TEXT		1		units	++			7.7		
SREV	PRE FILTER PH	TEXT		1		units	++			7.73		
SREV	RETAINED MOISTURE	TEXT		1		%	++			n/a		
SREV	TEMPERATURE	PREP	20.7	1		C	++	0.1	0.1			
SREV	TIME IN	DATE		1			++					
SREV	TIME OUT	DATE		1			++					
SREV	WEIGHT, DRY	PREP	2000	1		g	++					

WG530401CCV

Tag: Measured: 10/20/2021 11:00:10 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	EXTRACTION PH	TEXT		1		units	NEED			3.95		
SREV	POST FILTER PH	TEXT		1		units	NEED			3.96		
SREV	PRE FILTER PH	TEXT		1		units	NEED			3.99		
SREV	TEMPERATURE	PREP	20.3	1		C	NEED	0.1	0.1			

WG530401 Extended Qualifiers with Case Narratives

L68094-07	EXTRACTION PH	N1	Second week of "Tannery II" water
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		
L68095-07	EXTRACTION PH		
	EXTRACTION TEMPERATURE		
	EXTRACTION TIME		
	LEACHATE VOLUME		
	PARTICLE SIZE OVER 5 CM		
	POST FILTER PH		
	PRE FILTER PH		
	RETAINED MOISTURE		
	TEMPERATURE		
	TIME IN		
	TIME OUT		
	WEIGHT, DRY		

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

Geochemistry Department
Data Review and Reagents

WORK GROUP: WG530401
SAMPLE TYPE: SO

ANALYSIS DATE : 10/27/2021
ANALYST: GKH

	YES	NO	N/A
1. Is the raw data checked to the computer printout for transcription errors?	☑	☐	☐
2. Is the %solid or TS attached for dilution factors?	☐	☐	☑
3. Were proper volumes of reagents used per final volume?	☐	☐	☑
4. Was the proper sub-sample used (**as received**, client prep, <2000, <500, <250, dry, R&P, RPLL)?	☑	☐	☐
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	☐	☐	☑
6. Did the RPD pass?	☐	☐	☑
7. Does all the spike information correlate with each other?	☑	☐	☐
8. Is the appropriate spike in the computer-designated line?	☑	☐	☐
9. Are all errors properly corrected (single-line cross out, dated & initialed)?	☑	☐	☐
10. Is the standard/reagent information complete and current?	☑	☐	☐
11. Is your instrument calibration passing (and included in the data package if needed)?	☑	☐	☐
12. Are any Special Instructions pertaining to the workgroup included in the data package?	☑	☐	☐
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	☑	☐	☐

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
Buffer 10	PCN63117	6/30/22
Buffer 7	PCN63116	9/30/22
Buffer 2	PCN63355	3/31/23
NITRIC ACID	SH210929-1	9/29/22
SULFURIC ACID	SH211012-1	10/12/22

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

COMMENTS:

Qualtrax ID: 1223

Revision #: 4

Hydroxylamine-Hydrochloride Extraction

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

July 21, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L66671

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on June 22, 2021. This project has been assigned to ACZ's project number, L66671. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L66671. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 20, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

July 21, 2021

Project ID:
ACZ Project ID: L66671

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 soil samples from Brown and Caldwell on June 22, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L66671. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report reflects the results of the 2 step Tessier extraction procedure.

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720

ACZ Sample ID: ***L66671-01***
Date Sampled: *05/03/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								07/13/21 9:26	gkh

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720-STEP 1

ACZ Sample ID: ***L66671-02***
Date Sampled: *07/13/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	5	0.409	B	*	mg/L	0.25	1.25	07/16/21 2:45	jlw
Antimony, dissolved	M200.8 ICP-MS	10	<0.004	U	*	mg/L	0.004	0.02	07/14/21 15:14	enb
Arsenic, dissolved	M200.8 ICP-MS	10	<0.002	U	*	mg/L	0.002	0.01	07/19/21 20:48	bsu
Barium, dissolved	M200.7 ICP	5	0.788		*	mg/L	0.035	0.175	07/16/21 2:45	jlw
Beryllium, dissolved	M200.8 ICP-MS	10	<0.0008	U	*	mg/L	0.0008	0.0025	07/14/21 15:14	enb
Boron, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.5	07/16/21 2:45	jlw
Cadmium, dissolved	M200.8 ICP-MS	10	0.00184	B	*	mg/L	0.0005	0.0025	07/14/21 15:14	enb
Calcium, dissolved	M200.7 ICP	5	1040		*	mg/L	0.5	2.5	07/16/21 2:45	jlw
Chromium, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.25	07/16/21 2:45	jlw
Copper, dissolved	M200.7 ICP	5	<0.05	U	*	mg/L	0.05	0.25	07/16/21 2:45	jlw
Iron, dissolved	M200.7 ICP	5	28.4		*	mg/L	0.3	0.75	07/16/21 2:45	jlw
Lead, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.75	07/16/21 2:45	jlw
Magnesium, dissolved	M200.7 ICP	5	21.4		*	mg/L	1	5	07/16/21 2:45	jlw
Manganese, dissolved	M200.7 ICP	5	9.51		*	mg/L	0.05	0.25	07/16/21 2:45	jlw
Mercury, dissolved	M245.1 CVAA	5	<0.001	U	*	mg/L	0.001	0.005	07/14/21 11:47	mlh
Molybdenum, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.5	07/16/21 2:45	jlw
Nickel, dissolved	M200.7 ICP	5	0.112	B	*	mg/L	0.04	0.2	07/16/21 2:45	jlw
Phosphorus, dissolved	M200.7 ICP	5	<0.5	U	*	mg/L	0.5	2.5	07/16/21 2:45	jlw
Potassium, dissolved	M200.7 ICP	5	18.8		*	mg/L	1	5	07/16/21 2:45	jlw
Selenium, dissolved	M200.8 ICP-MS	10	0.00108	B	*	mg/L	0.001	0.0025	07/19/21 20:48	bsu
Silver, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:14	enb
Sodium, dissolved	M200.7 ICP	5	19.0		*	mg/L	1	5	07/16/21 2:45	jlw
Strontium, dissolved	M200.7 ICP	5	1.68		*	mg/L	0.045	0.225	07/16/21 2:45	jlw
Thallium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:14	enb
Uranium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:14	enb
Zinc, dissolved	M200.7 ICP	5	0.102	B	*	mg/L	0.1	0.25	07/16/21 2:45	jlw

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride	M300.0 - Ion Chromatography	1	<0.05	U	*	mg/L	0.05	0.25	07/15/21 4:21	krh
Sulfate	M300.0 - Ion Chromatography	50	294		*	mg/L	20	100	07/19/21 23:05	krh

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.998	mg/L	100	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.15	0.15			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	1.0008		1.033	mg/L	103	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	1.0008	U	1.058	mg/L	106	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	1.0008	U	1.036	mg/L	104	85	115	2	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.0201		.01895	mg/L	94	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00088	0.00088			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01		.00935	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01	U	.00916	mg/L	92	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01	U	.00992	mg/L	99	70	130	8	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04937	mg/L	99	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00044	0.00044			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05005		.04909	mg/L	98	85	115			
L66513-02AS	AS	07/19/21 20:10	MS210610-2	.05005	U	.05357	mg/L	107	70	130			
L66513-02ASD	ASD	07/19/21 20:15	MS210610-2	.05005	U	.05233	mg/L	105	70	130	2	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.9707	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.021	0.021			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5		.4896	mg/L	98	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5	U	.4886	mg/L	98	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5	U	.4902	mg/L	98	85	115	0	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04618	mg/L	92	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.000176	0.000176			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.044234	mg/L	88	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.046655	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.047918	mg/L	96	70	130	3	20	

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		2.013	mg/L	101	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.09	0.09			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5005		.515	mg/L	103	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5005	U	.52	mg/L	104	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5005	U	.513	mg/L	102	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049512	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00011	0.00011			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.04648	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.05054	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.052687	mg/L	105	70	130	4	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	100		99.4	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.3	0.3			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	67.99734		69.15	mg/L	102	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	67.99734	2.85	71.63	mg/L	101	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	67.99734	2.85	71.27	mg/L	101	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.958	mg/L	98	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.06	0.06			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.502		.499	mg/L	99	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.502	U	.5	mg/L	100	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.502	U	.495	mg/L	99	85	115	1	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.928	mg/L	96	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.03	0.03			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5		.496	mg/L	99	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5	U	.496	mg/L	99	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5	U	.492	mg/L	98	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Fluoride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG522573													
WG522573ICV	ICV	07/02/21 18:45	WI210702-4	4.004		4.288	mg/L	107	90	110			
WG522573ICB	ICB	07/02/21 19:02				U	mg/L		-0.05	0.05			
WG523222													
WG523222LFB1	LFB	07/14/21 17:36	WI210329-1	1.5		1.501	mg/L	100	90	110			
WG523222LFB2	LFB	07/15/21 2:16	WI210329-1	1.5		1.591	mg/L	106	90	110			
L66781-01DUP	DUP	07/15/21 5:33			5.67	U	mg/L				200	20	RA
L66781-02AS	AS	07/15/21 21:21	WI210329-1	1.5	U	1.514	mg/L	101	90	110			

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.922	mg/L	96	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.18	0.18			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	1.0001		.996	mg/L	100	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	1.0001	U	.99	mg/L	99	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	1.0001	U	.992	mg/L	99	85	115	0	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	4		3.9	mg/L	98	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.09	0.09			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	1.0014		.995	mg/L	99	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	1.0014	U	1.008	mg/L	101	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	1.0014	U	.993	mg/L	99	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	100		98.71	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.6	0.6			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	50.00074		49.77	mg/L	100	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	50.00074	U	49.99	mg/L	100	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	50.00074	U	49.74	mg/L	99	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.949	mg/L	97	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.03	0.03			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5005		.506	mg/L	101	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5005	.196	.683	mg/L	97	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5005	.196	.682	mg/L	97	85	115	0	20	

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523039													
WG523039ICV1	ICV	07/14/21 9:56	HG210701-3	.00501		.00497	mg/L	99	95	105			
WG523039ICB	ICB	07/14/21 9:57				U	mg/L		-0.0002	0.0002			
WG523155													
WG523155LRB	LRB	07/14/21 11:45				U	mg/L		-0.00044	0.00044			
WG523155LFB	LFB	07/14/21 11:46	HG210709-9	.002002		.0019	mg/L	95	85	115			
L66967-03LFM	LFM	07/14/21 11:57	HG210709-9	.002002	U	.00192	mg/L	96	85	115			
L66967-03LFMD	LFMD	07/14/21 11:58	HG210709-9	.002002	U	.00192	mg/L	96	85	115	0	20	

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		2.019	mg/L	101	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.06	0.06			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.501		.516	mg/L	103	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.501	U	.513	mg/L	102	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.501	U	.51	mg/L	102	85	115	1	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.9518	mg/L	98	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.024	0.024			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5		.4983	mg/L	100	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5	U	.4965	mg/L	99	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5	U	.4952	mg/L	99	85	115	0	20	

Phosphorus, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	5.0075		5.06	mg/L	101	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.3	0.3			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	1.001		1.05	mg/L	105	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	1.001	U	1.06	mg/L	106	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	1.001	U	1.09	mg/L	109	85	115	3	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	20		19.85	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.6	0.6			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	99.99574		99.32	mg/L	99	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	99.99574	.32	99.85	mg/L	100	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	99.99574	.32	99.52	mg/L	99	85	115	0	20	

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04893	mg/L	98	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00022	0.00022			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05		.04863	mg/L	97	85	115			
L66513-02AS	AS	07/19/21 20:10	MS210610-2	.05	U	.05615	mg/L	112	70	130			
L66513-02ASD	ASD	07/19/21 20:15	MS210610-2	.05	U	.05486	mg/L	110	70	130	2	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.02		.01819	mg/L	91	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01002		.00956	mg/L	95	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01002	U	.00934	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01002	U	.00938	mg/L	94	70	130	0	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	100		99.36	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.6	0.6			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	100.0109		99.08	mg/L	99	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	100.0109	U	99.68	mg/L	100	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	100.0109	U	99.37	mg/L	99	85	115	0	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.9658	mg/L	98	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.027	0.027			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.5005		.5417	mg/L	108	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.5005	.0128	.5495	mg/L	107	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.5005	.0128	.5498	mg/L	107	85	115	0	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG519666													
WG519666ICV	ICV	05/20/21 17:50	WI210520-6	51.15		51.12	mg/L	100	90	110			
WG519666ICB	ICB	05/20/21 18:08				U	mg/L		-0.4	0.4			
WG523547													
WG523547LFB1	LFB	07/19/21 19:12	WI210329-1	29.97		31.94	mg/L	107	90	110			
L66649-01DUP	DUP	07/19/21 19:48			133	132.82	mg/L				0	20	
L66649-02AS	AS	07/19/21 20:24	WI210329-1	59.94	134	199.34	mg/L	109	90	110			
WG523547LFB2	LFB	07/20/21 3:52	WI210329-1	29.97		31.18	mg/L	104	90	110			

Brown and Caldwell

ACZ Project ID: ***L66671***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.05014	mg/L	100	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.0464	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.04997	mg/L	100	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05153	mg/L	103	70	130	3	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04939	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04577	mg/L	92	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05035	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05249	mg/L	105	70	130	4	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523304													
WG523304ICV	ICV	07/16/21 0:54	II210628-1	2		1.971	mg/L	99	95	105			
WG523304ICB	ICB	07/16/21 1:00				U	mg/L		-0.06	0.06			
WG523304LFB	LFB	07/16/21 1:14	II210714-2	.50045		.517	mg/L	103	85	115			
L45965-155AS	AS	07/16/21 2:32	II210714-2	.50045	.024	.548	mg/L	105	85	115			
L45965-155ASD	ASD	07/16/21 2:35	II210714-2	.50045	.024	.537	mg/L	103	85	115	2	20	

Brown and Caldwell

ACZ Project ID: ***L66671***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66671-02	WG523304	Aluminum, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523213	Antimony, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523532	Arsenic, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523213	Beryllium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523304	Boron, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523213	Cadmium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523304	Chromium, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
		Copper, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523222	Fluoride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523304	Lead, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523155	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG523304	Molybdenum, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
		Nickel, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
		Phosphorus, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523532	Selenium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523213	Silver, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Thallium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Uranium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523304	Zinc, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Fluoride	M300.0 - Ion Chromatography
Sulfate	M300.0 - Ion Chromatography

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L66671
Date Received: 06/22/2021 16:37
Received By:
Date Printed: 6/23/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L66671
Date Received:	06/22/2021 16:37
Received By:	
Date Printed:	6/23/2021

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L66671

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: TESSIER-SINGLE-STEP

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier-Single-Step	Tessier-Leach-2020						
WBA-480-720	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
WBA-480-720	5/3/21	LE	2	☐	☒	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Sample -01 TESSIER-SINGLE-STEP
Sample -02 TESSIER-LEACH-2020 (leach from sample -01)

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			6/22/21 16:36

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L66671 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

July 21, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L66673

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on June 22, 2021. This project has been assigned to ACZ's project number, L66673. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L66673. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 20, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

July 21, 2021

Project ID:
ACZ Project ID: L66673

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 soil samples from Brown and Caldwell on June 22, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L66673. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report reflects the results of the 2 step Tessier extraction procedure.

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720

ACZ Sample ID: ***L66673-01***
Date Sampled: *05/03/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								07/13/21 14:20	gkh

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720-STEP 1

ACZ Sample ID: ***L66673-02***
Date Sampled: *07/13/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	5	3.76		*	mg/L	0.25	1.25	07/16/21 0:31	jlw
Antimony, dissolved	M200.8 ICP-MS	10	<0.004	U	*	mg/L	0.004	0.02	07/14/21 15:21	enb
Arsenic, dissolved	M200.8 ICP-MS	10	0.0336		*	mg/L	0.002	0.01	07/19/21 20:52	bsu
Barium, dissolved	M200.7 ICP	5	0.432		*	mg/L	0.035	0.175	07/16/21 0:31	jlw
Beryllium, dissolved	M200.8 ICP-MS	10	0.00164	B	*	mg/L	0.0008	0.0025	07/14/21 15:21	enb
Boron, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.5	07/16/21 0:31	jlw
Cadmium, dissolved	M200.8 ICP-MS	10	0.00258		*	mg/L	0.0005	0.0025	07/14/21 15:21	enb
Calcium, dissolved	M200.7 ICP	5	291		*	mg/L	0.5	2.5	07/16/21 0:31	jlw
Chromium, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.25	07/16/21 0:31	jlw
Copper, dissolved	M200.7 ICP	5	<0.05	U	*	mg/L	0.05	0.25	07/16/21 0:31	jlw
Iron, dissolved	M200.7 ICP	5	101		*	mg/L	0.3	0.75	07/16/21 0:31	jlw
Lead, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.75	07/16/21 0:31	jlw
Magnesium, dissolved	M200.7 ICP	5	29.6		*	mg/L	1	5	07/16/21 0:31	jlw
Manganese, dissolved	M200.7 ICP	5	3.75		*	mg/L	0.05	0.25	07/16/21 0:31	jlw
Mercury, dissolved	M245.1 CVAA	10	<0.002	U	*	mg/L	0.002	0.01	07/14/21 11:49	mlh
Molybdenum, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.5	07/16/21 0:31	jlw
Nickel, dissolved	M200.7 ICP	5	0.323		*	mg/L	0.04	0.2	07/16/21 0:31	jlw
Phosphorus, dissolved	M200.7 ICP	5	4.40		*	mg/L	0.5	2.5	07/16/21 0:31	jlw
Potassium, dissolved	M200.7 ICP	5	13.8		*	mg/L	1	5	07/16/21 0:31	jlw
Selenium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.0025	07/19/21 20:52	bsu
Silver, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:21	enb
Sodium, dissolved	M200.7 ICP	5	28.4		*	mg/L	1	5	07/16/21 0:31	jlw
Strontium, dissolved	M200.7 ICP	5	1.36		*	mg/L	0.045	0.225	07/16/21 0:31	jlw
Thallium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:21	enb
Uranium, dissolved	M200.8 ICP-MS	10	0.00233	B	*	mg/L	0.001	0.005	07/14/21 15:21	enb
Zinc, dissolved	M200.7 ICP	5	0.242	B	*	mg/L	0.1	0.25	07/16/21 0:31	jlw

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride	M300.0 - Ion Chromatography	1	<0.05	U	*	mg/L	0.05	0.25	07/15/21 4:57	krh
Sulfate	M300.0 - Ion Chromatography	50	301		*	mg/L	20	100	07/19/21 23:41	krh

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.999	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.15	0.15			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0008		1.015	mg/L	101	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0008	.072	1.122	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0008	.072	1.108	mg/L	104	85	115	1	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.0201		.01895	mg/L	94	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00088	0.00088			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01		.00935	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01	U	.00916	mg/L	92	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01	U	.00992	mg/L	99	70	130	8	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04937	mg/L	99	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00044	0.00044			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05005		.04909	mg/L	98	85	115			
L66513-02AS	AS	07/19/21 20:10	MS210610-2	.05005	U	.05357	mg/L	107	70	130			
L66513-02ASD	ASD	07/19/21 20:15	MS210610-2	.05005	U	.05233	mg/L	105	70	130	2	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9745	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.021	0.021			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.4847	mg/L	97	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.4978	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.4949	mg/L	99	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04618	mg/L	92	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.000176	0.000176			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.044234	mg/L	88	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.046655	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.047918	mg/L	96	70	130	3	20	

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		2.002	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.09	0.09			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.505	mg/L	101	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	U	.524	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	U	.519	mg/L	104	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049512	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00011	0.00011			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.04648	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.05054	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.052687	mg/L	105	70	130	4	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		99.15	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.3	0.3			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	67.99734		67.65	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	67.99734	18.7	86.7	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	67.99734	18.7	85.7	mg/L	99	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.966	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.502		.499	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.502	U	.51	mg/L	102	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.502	U	.505	mg/L	101	85	115	1	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.929	mg/L	96	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.03	0.03			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.491	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.501	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.496	mg/L	99	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Fluoride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG522573													
WG522573ICV	ICV	07/02/21 18:45	WI210702-4	4.004		4.288	mg/L	107	90	110			
WG522573ICB	ICB	07/02/21 19:02				U	mg/L		-0.05	0.05			
WG523222													
WG523222LFB1	LFB	07/14/21 17:36	WI210329-1	1.5		1.501	mg/L	100	90	110			
WG523222LFB2	LFB	07/15/21 2:16	WI210329-1	1.5		1.591	mg/L	106	90	110			
L66781-01DUP	DUP	07/15/21 5:33			5.67	U	mg/L				200	20	RA
L66781-02AS	AS	07/15/21 21:21	WI210329-1	1.5	U	1.514	mg/L	101	90	110			

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.945	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.18	0.18			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0001		.985	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0001	U	1.043	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0001	U	1.037	mg/L	104	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	4		3.884	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.09	0.09			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0014		.988	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0014	U	1.003	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0014	U	.979	mg/L	98	85	115	2	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		98.58	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	50.00074		48.92	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	50.00074	3.05	53.02	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	50.00074	3.05	52.59	mg/L	99	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.954	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.03	0.03			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.499	mg/L	100	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	.041	.545	mg/L	101	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	.041	.539	mg/L	100	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523039													
WG523039ICV1	ICV	07/14/21 9:56	HG210701-3	.00501		.00497	mg/L	99	95	105			
WG523039ICB	ICB	07/14/21 9:57				U	mg/L		-0.0002	0.0002			
WG523155													
WG523155LRB	LRB	07/14/21 11:45				U	mg/L		-0.00044	0.00044			
WG523155LFB	LFB	07/14/21 11:46	HG210709-9	.002002		.0019	mg/L	95	85	115			
L66967-03LFM	LFM	07/14/21 11:57	HG210709-9	.002002	U	.00192	mg/L	96	85	115			
L66967-03LFMD	LFMD	07/14/21 11:58	HG210709-9	.002002	U	.00192	mg/L	96	85	115	0	20	

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		2.009	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.501		.503	mg/L	100	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.501	U	.521	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.501	U	.513	mg/L	102	85	115	2	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9352	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.024	0.024			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.4864	mg/L	97	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.4932	mg/L	99	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.4918	mg/L	98	85	115	0	20	

Phosphorus, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	5.0075		5.06	mg/L	101	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.3	0.3			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.001		1.03	mg/L	103	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.001	U	1.04	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.001	U	1.03	mg/L	103	85	115	1	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	20		19.82	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	99.99574		97.76	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	99.99574	1.68	101.8	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	99.99574	1.68	100.9	mg/L	99	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04893	mg/L	98	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00022	0.00022			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05		.04863	mg/L	97	85	115			
L66513-02AS	AS	07/19/21 20:10	MS210610-2	.05	U	.05615	mg/L	112	70	130			
L66513-02ASD	ASD	07/19/21 20:15	MS210610-2	.05	U	.05486	mg/L	110	70	130	2	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.02		.01819	mg/L	91	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01002		.00956	mg/L	95	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01002	U	.00934	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01002	U	.00938	mg/L	94	70	130	0	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		99.21	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	100.0109		97.85	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	100.0109	.76	101.3	mg/L	101	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	100.0109	.76	100.5	mg/L	100	85	115	1	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9698	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.027	0.027			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.5343	mg/L	107	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	.0592	.6004	mg/L	108	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	.0592	.5958	mg/L	107	85	115	1	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG519666													
WG519666ICV	ICV	05/20/21 17:50	WI210520-6	51.15		51.12	mg/L	100	90	110			
WG519666ICB	ICB	05/20/21 18:08				U	mg/L		-0.4	0.4			
WG523547													
WG523547LFB1	LFB	07/19/21 19:12	WI210329-1	29.97		31.94	mg/L	107	90	110			
L66696-01DUP	DUP	07/20/21 0:17			3.16	3.1	mg/L				2	20	RA
L66696-02AS	AS	07/20/21 0:53	WI210329-1	29.97	19	50.28	mg/L	104	90	110			
WG523547LFB2	LFB	07/20/21 3:52	WI210329-1	29.97		31.18	mg/L	104	90	110			

Brown and Caldwell

ACZ Project ID: ***L66673***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.05014	mg/L	100	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.0464	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.04997	mg/L	100	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05153	mg/L	103	70	130	3	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04939	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04577	mg/L	92	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05035	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05249	mg/L	105	70	130	4	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.972	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.50045		.51	mg/L	102	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.50045	U	.524	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.50045	U	.521	mg/L	104	85	115	1	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L66673***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66673-02	WG523213	Antimony, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Beryllium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Boron, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523213	Cadmium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Chromium, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
		Copper, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523222	Fluoride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523308	Lead, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523155	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG523308	Molybdenum, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523532	Selenium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523213	Silver, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523547	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523213	Thallium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Uranium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Zinc, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Fluoride	M300.0 - Ion Chromatography
Sulfate	M300.0 - Ion Chromatography

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L66673
Date Received: 06/22/2021 17:11
Received By:
Date Printed: 6/23/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L66673
Date Received:	06/22/2021 17:11
Received By:	
Date Printed:	6/23/2021

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L66673

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: TESSIER-SINGLE-STEP

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier-Single-Step	Tessier-Leach-2020						
TLCHT-670-720	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
TLCHT-670-720	5/3/21	LE	2	☐	☒	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Sample -01 TESSIER-SINGLE-STEP
Sample -02 TESSIER-LEACH-2020 (leach from sample -01)

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			6/22/21 16:36

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L66673 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

August 04, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L67081

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on July 13, 2021. This project has been assigned to ACZ's project number, L67081. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L67081. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after September 03, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

August 04, 2021

Project ID:
ACZ Project ID: L67081

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 1 leachate sample from Brown and Caldwell on July 13, 2021. The sample was received in good condition. Upon receipt, the sample custodian removed the sample from the cooler, inspected the contents, and logged the sample into ACZ's computerized Laboratory Information Management System (LIMS). The sample was assigned ACZ LIMS project number L67081. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

This sample was analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This project report PBS data for the 2 step Tessier extraction.

Brown and Caldwell
Project ID:
Sample ID: PBS-STEP 1

ACZ Sample ID: ***L67081-01***
Date Sampled: *07/13/21 00:00*
Date Received: *07/13/21*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	<0.05	U	*	mg/L	0.05	0.25	07/25/21 21:31	kja
Antimony, dissolved	M200.8 ICP-MS	10	<0.004	U	*	mg/L	0.004	0.02	07/14/21 15:24	enb
Arsenic, dissolved	M200.8 ICP-MS	10	<0.002	U	*	mg/L	0.002	0.01	07/19/21 20:47	bsu
Barium, dissolved	M200.7 ICP	1	<0.007	U	*	mg/L	0.007	0.035	07/25/21 21:31	kja
Beryllium, dissolved	M200.8 ICP-MS	10	<0.0008	U	*	mg/L	0.0008	0.0025	07/14/21 15:24	enb
Boron, dissolved	M200.7 ICP	1	<0.03	U	*	mg/L	0.03	0.1	07/26/21 16:53	kja
Cadmium, dissolved	M200.8 ICP-MS	10	<0.0005	U	*	mg/L	0.0005	0.0025	07/14/21 15:24	enb
Calcium, dissolved	M200.7 ICP	1	<0.1	U	*	mg/L	0.1	0.5	07/25/21 21:31	kja
Chromium, dissolved	M200.7 ICP	1	<0.02	U	*	mg/L	0.02	0.05	07/26/21 16:53	kja
Copper, dissolved	M200.7 ICP	1	<0.01	U	*	mg/L	0.01	0.05	07/25/21 21:31	kja
Iron, dissolved	M200.7 ICP	1	<0.06	U	*	mg/L	0.06	0.15	07/25/21 21:31	kja
Lead, dissolved	M200.7 ICP	1	<0.03	U	*	mg/L	0.03	0.15	07/25/21 21:31	kja
Magnesium, dissolved	M200.7 ICP	1	<0.2	U	*	mg/L	0.2	1	07/25/21 21:31	kja
Manganese, dissolved	M200.7 ICP	1	<0.01	U	*	mg/L	0.01	0.05	07/25/21 21:31	kja
Mercury, dissolved	M245.1 CVAA	10	<0.002	U	*	mg/L	0.002	0.01	07/14/21 12:13	mlh
Molybdenum, dissolved	M200.7 ICP	1	<0.02	U	*	mg/L	0.02	0.1	07/26/21 16:53	kja
Nickel, dissolved	M200.7 ICP	1	0.0138	B	*	mg/L	0.008	0.04	07/25/21 21:31	kja
Phosphorus, dissolved	M200.7 ICP	1	0.42	B	*	mg/L	0.1	0.5	07/26/21 16:53	kja
Potassium, dissolved	M200.7 ICP	1	<0.2	U	*	mg/L	0.2	1	07/25/21 21:31	kja
Selenium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.0025	07/14/21 15:24	enb
Silver, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:24	enb
Sodium, dissolved	M200.7 ICP	1	<0.2	U	*	mg/L	0.2	1	07/25/21 21:31	kja
Strontium, dissolved	M200.7 ICP	1	<0.009	U	*	mg/L	0.009	0.045	07/25/21 21:31	kja
Thallium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:24	enb
Uranium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:24	enb
Zinc, dissolved	M200.7 ICP	1	<0.02	U	*	mg/L	0.02	0.05	07/25/21 21:31	kja

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride	M300.0 - Ion Chromatography	10	<0.5	U	*	mg/L	0.5	2.5	07/28/21 1:34	krh
Sulfate	M300.0 - Ion Chromatography	10	470		*	mg/L	4	20	07/28/21 1:34	krh

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		1.969	mg/L	98	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.15	0.15			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	1.0008		.935	mg/L	93	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	5.004	U	4.569	mg/L	91	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	5.004	U	4.655	mg/L	93	85	115	2	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.0201		.01895	mg/L	94	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00088	0.00088			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01		.00935	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01	U	.00916	mg/L	92	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01	U	.00992	mg/L	99	70	130	8	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04937	mg/L	99	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00044	0.00044			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05005		.04909	mg/L	98	85	115			
L67061-02AS	AS	07/19/21 20:26	MS210702-2	.05005	.00047	.05109	mg/L	101	70	130			
L67061-02ASD	ASD	07/19/21 20:28	MS210702-2	.05005	.00047	.05159	mg/L	102	70	130	1	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		2.0405	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.021	0.021			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.5		.4674	mg/L	93	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.5	U	2.331	mg/L	93	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.5	U	2.361	mg/L	94	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04618	mg/L	92	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.000176	0.000176			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.044234	mg/L	88	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.046655	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.047918	mg/L	96	70	130	3	20	

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523978													
WG523978ICV	ICV	07/26/21 16:29	II210720-1	2		1.981	mg/L	99	95	105			
WG523978ICB	ICB	07/26/21 16:35				U	mg/L		-0.09	0.09			
WG523978LFB	LFB	07/26/21 16:47	II210714-2	.5005		.512	mg/L	102	85	115			
L67189-06AS	AS	07/26/21 17:16	II210714-2	10.01	78.5	88.26	mg/L	98	85	115			
L67189-06ASD	ASD	07/26/21 17:25	II210714-2	10.01	78.5	89.22	mg/L	107	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049512	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00011	0.00011			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.04648	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.05054	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.052687	mg/L	105	70	130	4	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	100		101.93	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				.18	mg/L		-0.3	0.3			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	67.99734		67.78	mg/L	100	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	339.9867	15.3	349.45	mg/L	98	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	339.9867	15.3	353	mg/L	99	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523978													
WG523978ICV	ICV	07/26/21 16:29	II210720-1	2		1.953	mg/L	98	95	105			
WG523978ICB	ICB	07/26/21 16:35				U	mg/L		-0.06	0.06			
WG523978LFB	LFB	07/26/21 16:47	II210714-2	.502		.504	mg/L	100	85	115			
L67189-06AS	AS	07/26/21 17:16	II210714-2	10.04	U	9.822	mg/L	98	85	115			
L67189-06ASD	ASD	07/26/21 17:25	II210714-2	10.04	U	9.966	mg/L	99	85	115	1	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		1.987	mg/L	99	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.03	0.03			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.5		.474	mg/L	95	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.5	U	2.342	mg/L	94	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.5	U	2.388	mg/L	96	85	115	2	20	

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Fluoride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523598													
WG523598ICV	ICV	07/21/21 14:23	WI210719-3	4.004		4.105	mg/L	103	90	110			
WG523598ICB	ICB	07/21/21 14:41				U	mg/L		-0.05	0.05			
WG524093													
WG524093LFB1	LFB	07/27/21 18:24	WI210329-1	1.5		1.609	mg/L	107	90	110			
L67041-03DUP	DUP	07/27/21 23:11			U	U	mg/L				0	20	RA
L67041-07AS	AS	07/28/21 1:16	WI210329-1	3	1.07	4.3	mg/L	108	90	110			
WG524093LFB2	LFB	07/28/21 3:04	WI210329-1	1.5		1.614	mg/L	108	90	110			

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		2.032	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.18	0.18			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	1.0001		.971	mg/L	97	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	5.0005	U	4.838	mg/L	97	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	5.0005	U	4.879	mg/L	98	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	4		4.08	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.09	0.09			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	1.0014		.989	mg/L	99	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	5.007	U	4.868	mg/L	97	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	5.007	U	4.912	mg/L	98	85	115	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	100		98.77	mg/L	99	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.6	0.6			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	50.00074		47.54	mg/L	95	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	250.0037	1.64	234.8	mg/L	93	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	250.0037	1.64	237.6	mg/L	94	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		1.99	mg/L	100	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.03	0.03			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.5005		.478	mg/L	96	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.5025	U	2.357	mg/L	94	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.5025	U	2.387	mg/L	95	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523039													
WG523039ICV1	ICV	07/14/21 9:56	HG210701-3	.00501		.00497	mg/L	99	95	105			
WG523039ICB	ICB	07/14/21 9:57				U	mg/L		-0.0002	0.0002			
WG523155													
WG523155LRB	LRB	07/14/21 11:45				U	mg/L		-0.00044	0.00044			
WG523155LFB	LFB	07/14/21 11:46	HG210709-9	.002002		.0019	mg/L	95	85	115			
L67013-01LFM	LFM	07/14/21 12:04	HG210709-9	.002002	U	.00204	mg/L	102	85	115			
L67013-01LFMD	LFMD	07/14/21 12:07	HG210709-9	.002002	U	.00182	mg/L	91	85	115	11	20	

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523978													
WG523978ICV	ICV	07/26/21 16:29	II210720-1	2		1.993	mg/L	100	95	105			
WG523978ICB	ICB	07/26/21 16:35				U	mg/L		-0.06	0.06			
WG523978LFB	LFB	07/26/21 16:47	II210714-2	.501		.52	mg/L	104	85	115			
L67189-06AS	AS	07/26/21 17:16	II210714-2	10.02	U	10.302	mg/L	103	85	115			
L67189-06ASD	ASD	07/26/21 17:25	II210714-2	10.02	U	10.368	mg/L	103	85	115	1	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		1.989	mg/L	99	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.024	0.024			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.5		.4782	mg/L	96	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.5	U	2.3585	mg/L	94	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.5	U	2.408	mg/L	96	85	115	2	20	

Phosphorus, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523978													
WG523978ICV	ICV	07/26/21 16:29	II210720-1	5.0075		5.12	mg/L	102	95	105			
WG523978ICB	ICB	07/26/21 16:35				U	mg/L		-0.3	0.3			
WG523978LFB	LFB	07/26/21 16:47	II210714-2	1.001		1.06	mg/L	106	85	115			
L67189-06AS	AS	07/26/21 17:16	II210714-2	20.02	U	21.38	mg/L	107	85	115			
L67189-06ASD	ASD	07/26/21 17:25	II210714-2	20.02	U	21.8	mg/L	109	85	115	2	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	20		20.2	mg/L	101	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.6	0.6			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	99.99574		96.72	mg/L	97	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	499.9787	U	475.85	mg/L	95	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	499.9787	U	480.35	mg/L	96	85	115	1	20	

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049	mg/L	98	90	110			
WG523213ICB	ICB	07/14/21 13:47				.00012	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04723	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05483	mg/L	110	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.0576	mg/L	115	70	130	5	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.02		.01819	mg/L	91	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01002		.00956	mg/L	95	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01002	U	.00934	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01002	U	.00938	mg/L	94	70	130	0	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	100		102.18	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.6	0.6			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	100.0109		97.61	mg/L	98	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	500.0545	3.38	486.45	mg/L	97	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	500.0545	3.38	491.65	mg/L	98	85	115	1	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		2.0005	mg/L	100	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.027	0.027			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.5005		.52	mg/L	104	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.5025	U	2.5945	mg/L	104	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.5025	U	2.6225	mg/L	105	85	115	1	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523598													
WG523598ICV	ICV	07/21/21 14:23	WI210719-3	51.15		50.06	mg/L	98	90	110			
WG523598ICB	ICB	07/21/21 14:41				U	mg/L		-0.4	0.4			
WG524093													
WG524093LFB1	LFB	07/27/21 18:24	WI210329-1	29.97		31.56	mg/L	105	90	110			
L67041-03DUP	DUP	07/27/21 23:11			U	U	mg/L				0	20	RA
L67041-07AS	AS	07/28/21 1:16	WI210329-1	59.94	38.5	100.14	mg/L	103	90	110			
WG524093LFB2	LFB	07/28/21 3:04	WI210329-1	29.97		31.91	mg/L	106	90	110			

Brown and Caldwell

ACZ Project ID: ***L67081***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.05014	mg/L	100	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.0464	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.04997	mg/L	100	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05153	mg/L	103	70	130	3	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04939	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04577	mg/L	92	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05035	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05249	mg/L	105	70	130	4	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523941													
WG523941ICV	ICV	07/25/21 21:09	II210720-1	2		2.03	mg/L	102	95	105			
WG523941ICB	ICB	07/25/21 21:15				U	mg/L		-0.06	0.06			
WG523941LFB	LFB	07/25/21 21:28	II210714-2	.50045		.497	mg/L	99	85	115			
L67182-28AS	AS	07/25/21 21:40	II210714-2	2.50225	U	2.478	mg/L	99	85	115			
L67182-28ASD	ASD	07/25/21 21:43	II210714-2	2.50225	U	2.488	mg/L	99	85	115	0	20	

Brown and Caldwell

ACZ Project ID: ***L67081***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L67081-01	WG523213	Antimony, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523532	Arsenic, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523213	Beryllium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Cadmium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG524093	Fluoride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523155	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG523213	Selenium, dissolved	M200.8 ICP-MS	BE	Target analyte in continuing calibration blank (CCB) at or above the acceptance criteria. Target analyte was not detected in the sample [< MDL].
			M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Silver, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG524093	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523213	Thallium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Uranium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Fluoride	M300.0 - Ion Chromatography
Sulfate	M300.0 - Ion Chromatography

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L67081
Date Received: 07/13/2021 16:47
Received By:
Date Printed: 7/15/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		<=6.0		

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L67081
Date Received:	07/13/2021 16:47
Received By:	
Date Printed:	7/15/2021

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: TESSIER-SINGLE-STEP

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier-Single-Step	Tessier-Leach-2020						
PBS-STEP-1	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
PBS-STEP-1	5/3/21	LE	2	☐	☒	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Sample -01 TESSIER-SINGLE-STEP
Sample -02 TESSIER-LEACH-2020 (leach from sample -01)

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

July 21, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L66672

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on June 22, 2021. This project has been assigned to ACZ's project number, L66672. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L66672. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 20, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

July 21, 2021

Project ID:
ACZ Project ID: L66672

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 soil samples from Brown and Caldwell on June 22, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L66672. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report reflects the results of the 2 step Tessier extraction procedure.

Brown and Caldwell
Project ID:
Sample ID: WHTA-640-710

ACZ Sample ID: ***L66672-01***
Date Sampled: *05/03/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sequential Batch Extraction	Tessier, et al.								07/13/21 11:53	gkh

Brown and Caldwell
Project ID:
Sample ID: WHTA-640-710-STEP 1

ACZ Sample ID: ***L66672-02***
Date Sampled: *07/13/21 00:00*
Date Received: *06/22/21*
Sample Matrix: *Leachate*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	5	4.05		*	mg/L	0.25	1.25	07/16/21 0:22	jlw
Antimony, dissolved	M200.8 ICP-MS	10	<0.004	U	*	mg/L	0.004	0.02	07/14/21 15:18	enb
Arsenic, dissolved	M200.8 ICP-MS	10	0.0305		*	mg/L	0.002	0.01	07/19/21 20:50	bsu
Barium, dissolved	M200.7 ICP	5	0.528		*	mg/L	0.035	0.175	07/16/21 0:22	jlw
Beryllium, dissolved	M200.8 ICP-MS	10	0.00155	B	*	mg/L	0.0008	0.0025	07/14/21 15:18	enb
Boron, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.5	07/16/21 0:22	jlw
Cadmium, dissolved	M200.8 ICP-MS	10	0.00172	B	*	mg/L	0.0005	0.0025	07/14/21 15:18	enb
Calcium, dissolved	M200.7 ICP	5	277		*	mg/L	0.5	2.5	07/16/21 0:22	jlw
Chromium, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.25	07/16/21 0:22	jlw
Copper, dissolved	M200.7 ICP	5	<0.05	U	*	mg/L	0.05	0.25	07/16/21 0:22	jlw
Iron, dissolved	M200.7 ICP	5	109		*	mg/L	0.3	0.75	07/16/21 0:22	jlw
Lead, dissolved	M200.7 ICP	5	<0.15	U	*	mg/L	0.15	0.75	07/16/21 0:22	jlw
Magnesium, dissolved	M200.7 ICP	5	23.9		*	mg/L	1	5	07/16/21 0:22	jlw
Manganese, dissolved	M200.7 ICP	5	3.92		*	mg/L	0.05	0.25	07/16/21 0:22	jlw
Mercury, dissolved	M245.1 CVAA	10	<0.002	U	*	mg/L	0.002	0.01	07/14/21 11:48	mlh
Molybdenum, dissolved	M200.7 ICP	5	<0.1	U	*	mg/L	0.1	0.5	07/16/21 0:22	jlw
Nickel, dissolved	M200.7 ICP	5	0.256		*	mg/L	0.04	0.2	07/16/21 0:22	jlw
Phosphorus, dissolved	M200.7 ICP	5	4.18		*	mg/L	0.5	2.5	07/16/21 0:22	jlw
Potassium, dissolved	M200.7 ICP	5	12.0		*	mg/L	1	5	07/16/21 0:22	jlw
Selenium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.0025	07/14/21 15:18	enb
Silver, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:18	enb
Sodium, dissolved	M200.7 ICP	5	21.9		*	mg/L	1	5	07/16/21 0:22	jlw
Strontium, dissolved	M200.7 ICP	5	1.08		*	mg/L	0.045	0.225	07/16/21 0:22	jlw
Thallium, dissolved	M200.8 ICP-MS	10	<0.001	U	*	mg/L	0.001	0.005	07/14/21 15:18	enb
Uranium, dissolved	M200.8 ICP-MS	10	0.00235	B	*	mg/L	0.001	0.005	07/14/21 15:18	enb
Zinc, dissolved	M200.7 ICP	5	0.184	B	*	mg/L	0.1	0.25	07/16/21 0:22	jlw

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride	M300.0 - Ion Chromatography	1	<0.05	U	*	mg/L	0.05	0.25	07/15/21 4:39	krh
Sulfate	M300.0 - Ion Chromatography	50	348		*	mg/L	20	100	07/19/21 23:23	krh

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

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ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.999	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.15	0.15			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0008		1.015	mg/L	101	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0008	.072	1.122	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0008	.072	1.108	mg/L	104	85	115	1	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.0201		.01895	mg/L	94	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00088	0.00088			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01		.00935	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01	U	.00916	mg/L	92	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01	U	.00992	mg/L	99	70	130	8	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523532													
WG523532ICV	ICV	07/19/21 19:53	MS210630-2	.05		.04937	mg/L	99	90	110			
WG523532ICB	ICB	07/19/21 19:55				U	mg/L		-0.00044	0.00044			
WG523532LFB	LFB	07/19/21 19:57	MS210702-2	.05005		.04909	mg/L	98	85	115			
L66513-02AS	AS	07/19/21 20:10	MS210610-2	.05005	U	.05357	mg/L	107	70	130			
L66513-02ASD	ASD	07/19/21 20:15	MS210610-2	.05005	U	.05233	mg/L	105	70	130	2	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9745	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.021	0.021			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.4847	mg/L	97	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.4978	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.4949	mg/L	99	85	115	1	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04618	mg/L	92	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.000176	0.000176			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.044234	mg/L	88	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.046655	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.047918	mg/L	96	70	130	3	20	

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ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		2.002	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.09	0.09			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.505	mg/L	101	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	U	.524	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	U	.519	mg/L	104	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049512	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00011	0.00011			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05005		.04648	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05005	U	.05054	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05005	U	.052687	mg/L	105	70	130	4	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		99.15	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.3	0.3			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	67.99734		67.65	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	67.99734	18.7	86.7	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	67.99734	18.7	85.7	mg/L	99	85	115	1	20	

Chromium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.966	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.502		.499	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.502	U	.51	mg/L	102	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.502	U	.505	mg/L	101	85	115	1	20	

Copper, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.929	mg/L	96	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.03	0.03			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.491	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.501	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.496	mg/L	99	85	115	1	20	

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ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Fluoride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG522573													
WG522573ICV	ICV	07/02/21 18:45	WI210702-4	4.004		4.288	mg/L	107	90	110			
WG522573ICB	ICB	07/02/21 19:02				U	mg/L		-0.05	0.05			
WG523222													
WG523222LFB1	LFB	07/14/21 17:36	WI210329-1	1.5		1.501	mg/L	100	90	110			
WG523222LFB2	LFB	07/15/21 2:16	WI210329-1	1.5		1.591	mg/L	106	90	110			
L66781-01DUP	DUP	07/15/21 5:33			5.67	U	mg/L				200	20	RA
L66781-02AS	AS	07/15/21 21:21	WI210329-1	1.5	U	1.514	mg/L	101	90	110			

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.945	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.18	0.18			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0001		.985	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0001	U	1.043	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0001	U	1.037	mg/L	104	85	115	1	20	

Lead, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	4		3.884	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.09	0.09			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.0014		.988	mg/L	99	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.0014	U	1.003	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.0014	U	.979	mg/L	98	85	115	2	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		98.58	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	50.00074		48.92	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	50.00074	3.05	53.02	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	50.00074	3.05	52.59	mg/L	99	85	115	1	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.954	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.03	0.03			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.499	mg/L	100	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	.041	.545	mg/L	101	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	.041	.539	mg/L	100	85	115	1	20	

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ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523039													
WG523039ICV1	ICV	07/14/21 9:56	HG210701-3	.00501		.00497	mg/L	99	95	105			
WG523039ICB	ICB	07/14/21 9:57				U	mg/L		-0.0002	0.0002			
WG523155													
WG523155LRB	LRB	07/14/21 11:45				U	mg/L		-0.00044	0.00044			
WG523155LFB	LFB	07/14/21 11:46	HG210709-9	.002002		.0019	mg/L	95	85	115			
L66967-03LFM	LFM	07/14/21 11:57	HG210709-9	.002002	U	.00192	mg/L	96	85	115			
L66967-03LFMD	LFMD	07/14/21 11:58	HG210709-9	.002002	U	.00192	mg/L	96	85	115	0	20	

Molybdenum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		2.009	mg/L	100	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.501		.503	mg/L	100	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.501	U	.521	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.501	U	.513	mg/L	102	85	115	2	20	

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9352	mg/L	97	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.024	0.024			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5		.4864	mg/L	97	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5	U	.4932	mg/L	99	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5	U	.4918	mg/L	98	85	115	0	20	

Phosphorus, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	5.0075		5.06	mg/L	101	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.3	0.3			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	1.001		1.03	mg/L	103	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	1.001	U	1.04	mg/L	104	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	1.001	U	1.03	mg/L	103	85	115	1	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	20		19.82	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	99.99574		97.76	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	99.99574	1.68	101.8	mg/L	100	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	99.99574	1.68	100.9	mg/L	99	85	115	1	20	

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ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.049	mg/L	98	90	110			
WG523213ICB	ICB	07/14/21 13:47				.00012	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04723	mg/L	94	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05483	mg/L	110	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.0576	mg/L	115	70	130	5	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.02		.01819	mg/L	91	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.01002		.00956	mg/L	95	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.01002	U	.00934	mg/L	93	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.01002	U	.00938	mg/L	94	70	130	0	20	

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	100		99.21	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.6	0.6			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	100.0109		97.85	mg/L	98	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	100.0109	.76	101.3	mg/L	101	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	100.0109	.76	100.5	mg/L	100	85	115	1	20	

Strontium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.9698	mg/L	98	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.027	0.027			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.5005		.5343	mg/L	107	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.5005	.0592	.6004	mg/L	108	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.5005	.0592	.5958	mg/L	107	85	115	1	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG519666													
WG519666ICV	ICV	05/20/21 17:50	WI210520-6	51.15		51.12	mg/L	100	90	110			
WG519666ICB	ICB	05/20/21 18:08				U	mg/L		-0.4	0.4			
WG523547													
WG523547LFB1	LFB	07/19/21 19:12	WI210329-1	29.97		31.94	mg/L	107	90	110			
L66649-01DUP	DUP	07/19/21 19:48			133	132.82	mg/L				0	20	
L66649-02AS	AS	07/19/21 20:24	WI210329-1	59.94	134	199.34	mg/L	109	90	110			
WG523547LFB2	LFB	07/20/21 3:52	WI210329-1	29.97		31.18	mg/L	104	90	110			

Brown and Caldwell

ACZ Project ID: ***L66672***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.05014	mg/L	100	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.0464	mg/L	93	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.04997	mg/L	100	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05153	mg/L	103	70	130	3	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523213													
WG523213ICV	ICV	07/14/21 13:43	MS210630-2	.05		.04939	mg/L	99	90	110			
WG523213ICB	ICB	07/14/21 13:47				U	mg/L		-0.00022	0.00022			
WG523213LFB	LFB	07/14/21 13:50	MS210702-2	.05		.04577	mg/L	92	85	115			
L66187-06AS	AS	07/14/21 14:47	MS210702-2	.05	U	.05035	mg/L	101	70	130			
L66187-06ASD	ASD	07/14/21 14:51	MS210702-2	.05	U	.05249	mg/L	105	70	130	4	20	

Zinc, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG523308													
WG523308ICV	ICV	07/15/21 22:54	II210628-1	2		1.972	mg/L	99	95	105			
WG523308ICB	ICB	07/15/21 23:00				U	mg/L		-0.06	0.06			
WG523308LFB	LFB	07/15/21 23:13	II210714-2	.50045		.51	mg/L	102	85	115			
L66186-07AS	AS	07/16/21 0:12	II210714-2	.50045	U	.524	mg/L	105	85	115			
L66186-07ASD	ASD	07/16/21 0:15	II210714-2	.50045	U	.521	mg/L	104	85	115	1	20	

Inorganic Extended Qualifier Report

Brown and Caldwell

ACZ Project ID: ***L66672***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66672-02	WG523213	Antimony, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Beryllium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Boron, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523213	Cadmium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Chromium, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
		Copper, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523222	Fluoride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG523308	Lead, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523155	Mercury, dissolved	M245.1 CVAA	D1	Sample required dilution due to matrix.
	WG523308	Molybdenum, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.
	WG523213	Selenium, dissolved	M200.8 ICP-MS	BE	Target analyte in continuing calibration blank (CCB) at or above the acceptance criteria. Target analyte was not detected in the sample [< MDL].
			M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Silver, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Thallium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
		Uranium, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DJ	Sample dilution required due to insufficient sample.
	WG523308	Zinc, dissolved	M200.7 ICP	D1	Sample required dilution due to matrix.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Aluminum, dissolved	M200.7 ICP
Antimony, dissolved	M200.8 ICP-MS
Arsenic, dissolved	M200.8 ICP-MS
Barium, dissolved	M200.7 ICP
Beryllium, dissolved	M200.8 ICP-MS
Boron, dissolved	M200.7 ICP
Cadmium, dissolved	M200.8 ICP-MS
Calcium, dissolved	M200.7 ICP
Chromium, dissolved	M200.7 ICP
Copper, dissolved	M200.7 ICP
Iron, dissolved	M200.7 ICP
Lead, dissolved	M200.7 ICP
Magnesium, dissolved	M200.7 ICP
Manganese, dissolved	M200.7 ICP
Mercury, dissolved	M245.1 CVAA
Molybdenum, dissolved	M200.7 ICP
Nickel, dissolved	M200.7 ICP
Phosphorus, dissolved	M200.7 ICP
Potassium, dissolved	M200.7 ICP
Selenium, dissolved	M200.8 ICP-MS
Silver, dissolved	M200.8 ICP-MS
Sodium, dissolved	M200.7 ICP
Strontium, dissolved	M200.7 ICP
Thallium, dissolved	M200.8 ICP-MS
Uranium, dissolved	M200.8 ICP-MS
Zinc, dissolved	M200.7 ICP

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Fluoride	M300.0 - Ion Chromatography
Sulfate	M300.0 - Ion Chromatography

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L66672
Date Received: 06/22/2021 17:06
Received By:
Date Printed: 6/23/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID:	L66672
Date Received:	06/22/2021 17:06
Received By:	
Date Printed:	6/23/2021

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L66672

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ **Sampler's Site Information** **State**_____ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: TESSIER-SINGLE-STEP

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Tessier-Single-Step	Tessier-Leach-2020							
WHTA-640-710	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐	☐
WHTA-640-710	5/3/21	LE	2	☐	☒	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Sample -01 TESSIER-SINGLE-STEP
Sample -02 TESSIER-LEACH-2020 (leach from sample -01)

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
			5/22/21 1610

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L66672 Chain of Custod

Whole-Rock Chemical Analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

June 28, 2021

Report to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd Suite 300

Golden, CO 80401

Bill to:
Kelly Donahue
Brown and Caldwell
1527 Cole Blvd
Suite 300
Golden, CO 80401

Project ID:
ACZ Project ID: L66006

Kelly Donahue:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on May 24, 2021. This project has been assigned to ACZ's project number, L66006. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L66006. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after July 28, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

Brown and Caldwell

June 28, 2021

Project ID:
ACZ Project ID: L66006

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 3 miscellaneous samples from Brown and Caldwell on May 24, 2021. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L66006. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. Silica (B1) - SiO2 detected in method blank (PBS) above the method reporting limit. PBS consists of Ottowa sand, resulting in elevated levels of SiO2.

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720

ACZ Sample ID: ***L66006-01***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	5010	72800		*	mg/Kg	251	1250	06/18/21 17:37	jlw
Antimony, total (3052)	M6020B ICP-MS	12500	<5	U	*	mg/Kg	5	25	06/24/21 17:04	mfm
Arsenic, total (3052)	M6020B ICP-MS	12500	8.89	B		mg/Kg	2.5	12.5	06/24/21 17:04	mfm
Barium, total (3052)	M6010D ICP	5010	911		*	mg/Kg	35.1	175	06/18/21 17:37	jlw
Beryllium, total (3052)	M6020B ICP-MS	12500	1.58	B	*	mg/Kg	1	3.13	06/24/21 17:04	mfm
Boron, total (3050)	M6010D ICP	100	15.8			mg/Kg	3	10	06/15/21 1:36	kja
Cadmium, total (3052)	M6020B ICP-MS	12500	1.63	B		mg/Kg	0.625	3.13	06/24/21 17:04	mfm
Calcium, total (3052)	M6010D ICP	5010	35400			mg/Kg	501	2510	06/18/21 17:37	jlw
Chromium, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	251	06/18/21 17:37	jlw
Copper, total (3052)	M6010D ICP	5010	<50.1	U		mg/Kg	50.1	251	06/18/21 17:37	jlw
Iron, total (3052)	M6010D ICP	5010	34400		*	mg/Kg	301	752	06/18/21 17:37	jlw
Lead, total (3052)	M6020B ICP-MS	12500	13.2			mg/Kg	1.25	6.25	06/24/21 17:04	mfm
Magnesium, total (3052)	M6010D ICP	5010	14300		*	mg/Kg	1000	5010	06/18/21 17:37	jlw
Manganese, total (3052)	M6010D ICP	5010	565			mg/Kg	50.1	251	06/18/21 17:37	jlw
Mercury by Direct Combustion AA	M7473 CVAAS	1	12.2		*	ng/g	2.06	10.3	05/28/21 14:02	aeh
Molybdenum, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	501	06/18/21 17:37	jlw
Nickel, total (3052)	M6010D ICP	5010	<40.1	U	*	mg/Kg	40.1	200	06/18/21 17:37	jlw
Potassium, total (3052)	M6010D ICP	5010	19500		*	mg/Kg	1000	5010	06/18/21 17:37	jlw
Selenium, total (3052)	M6020B ICP-MS	12500	<1.25	U		mg/Kg	1.25	3.13	06/24/21 17:04	mfm
Silica, total (3052)	M6010D ICP	10000	728000		*	mg/Kg	2000	10000	06/22/21 0:22	jlw
Silver, total (3052)	M6010D ICP	5010	<50.1	U	*	mg/Kg	50.1	125	06/18/21 17:37	jlw
Sodium, total (3052)	M6010D ICP	5010	23500		*	mg/Kg	1000	5010	06/18/21 17:37	jlw
Strontium, total (3052)	M6010D ICP	5010	534		*	mg/Kg	45.1	225	06/18/21 17:37	jlw
Sulfur, total (3050)	M6010D ICP	100	4670		*	mg/Kg	25	125	06/15/21 1:36	kja
Thallium, total (3052)	M6020B ICP-MS	12500	<1.25	U		mg/Kg	1.25	6.25	06/24/21 17:04	mfm
Uranium, total (3052)	M6020B ICP-MS	12500	1.93	B		mg/Kg	1.25	6.25	06/24/21 17:04	mfm
Zinc, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	251	06/18/21 17:37	jlw

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	81.4		*	%	0.1	0.5	05/31/21 13:12	jpb

Brown and Caldwell
Project ID:
Sample ID: WBA-480-720

ACZ Sample ID: ***L66006-01***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								06/01/21 9:45	sjm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								06/08/21 9:30	zln
Digestion - Hot Plate	M3050B ICP								06/10/21 10:52	mep/mlp
ICP 3052 Digestion	M3052								06/16/21 23:30	gkh
ICPMS 3052 Digestion	M3052								06/16/21 23:30	gkh
Water Extraction	ASA No. 9 10-2.3.2								06/11/21 12:48	zln/sjm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride, soluble (Water)	SM4500F-C	5	4.18		*	mg/Kg	0.75	1.75	06/15/21 15:38	emk

Brown and Caldwell
Project ID:
Sample ID: WHTA-640-710

ACZ Sample ID: ***L66006-02***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	5010	66200		*	mg/Kg	251	1250	06/18/21 17:49	jlw
Antimony, total (3052)	M6020B ICP-MS	12500	<5	U	*	mg/Kg	5	25	06/24/21 17:06	mfm
Arsenic, total (3052)	M6020B ICP-MS	12500	7.10	B		mg/Kg	2.5	12.5	06/24/21 17:06	mfm
Barium, total (3052)	M6010D ICP	5010	895		*	mg/Kg	35.1	175	06/18/21 17:49	jlw
Beryllium, total (3052)	M6020B ICP-MS	12500	1.72	B	*	mg/Kg	1	3.13	06/24/21 17:06	mfm
Boron, total (3050)	M6010D ICP	100	10.8			mg/Kg	3	10	06/15/21 1:39	kja
Cadmium, total (3052)	M6020B ICP-MS	12500	1.69	B		mg/Kg	0.625	3.13	06/24/21 17:06	mfm
Calcium, total (3052)	M6010D ICP	5010	31600			mg/Kg	501	2510	06/18/21 17:49	jlw
Chromium, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	251	06/18/21 17:49	jlw
Copper, total (3052)	M6010D ICP	5010	<50.1	U		mg/Kg	50.1	251	06/18/21 17:49	jlw
Iron, total (3052)	M6010D ICP	5010	34000		*	mg/Kg	301	752	06/18/21 17:49	jlw
Lead, total (3052)	M6020B ICP-MS	12500	12.6			mg/Kg	1.25	6.25	06/24/21 17:06	mfm
Magnesium, total (3052)	M6010D ICP	5010	13200		*	mg/Kg	1000	5010	06/18/21 17:49	jlw
Manganese, total (3052)	M6010D ICP	5010	559			mg/Kg	50.1	251	06/18/21 17:49	jlw
Mercury by Direct Combustion AA	M7473 CVAAS	1	9.75	B	*	ng/g	2.1	10.5	05/28/21 14:11	aeh
Molybdenum, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	501	06/18/21 17:49	jlw
Nickel, total (3052)	M6010D ICP	5010	<40.1	U	*	mg/Kg	40.1	200	06/18/21 17:49	jlw
Potassium, total (3052)	M6010D ICP	5010	18300		*	mg/Kg	1000	5010	06/18/21 17:49	jlw
Selenium, total (3052)	M6020B ICP-MS	12500	<1.25	U		mg/Kg	1.25	3.13	06/24/21 17:06	mfm
Silica, total (3052)	M6010D ICP	10000	696000		*	mg/Kg	2000	10000	06/22/21 0:33	jlw
Silver, total (3052)	M6010D ICP	5010	<50.1	U	*	mg/Kg	50.1	125	06/18/21 17:49	jlw
Sodium, total (3052)	M6010D ICP	5010	22000		*	mg/Kg	1000	5010	06/18/21 17:49	jlw
Strontium, total (3052)	M6010D ICP	5010	487		*	mg/Kg	45.1	225	06/18/21 17:49	jlw
Sulfur, total (3050)	M6010D ICP	100	3640		*	mg/Kg	25	125	06/15/21 1:39	kja
Thallium, total (3052)	M6020B ICP-MS	12500	<1.25	U		mg/Kg	1.25	6.25	06/24/21 17:06	mfm
Uranium, total (3052)	M6020B ICP-MS	12500	1.89	B		mg/Kg	1.25	6.25	06/24/21 17:06	mfm
Zinc, total (3052)	M6010D ICP	5010	<100	U	*	mg/Kg	100	251	06/18/21 17:49	jlw

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	83.5		*	%	0.1	0.5	05/31/21 19:28	jpb

Brown and Caldwell
Project ID:
Sample ID: WHTA-640-710

ACZ Sample ID: ***L66006-02***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								06/01/21 9:47	sjm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								06/08/21 9:45	zln
Digestion - Hot Plate	M3050B ICP								06/10/21 11:52	mep/mlp
ICP 3052 Digestion	M3052								06/17/21 16:00	gkh
ICPMS 3052 Digestion	M3052								06/17/21 16:00	gkh
Water Extraction	ASA No. 9 10-2.3.2								06/11/21 13:12	zln/sjm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride, soluble (Water)	SM4500F-C	5	3.74		*	mg/Kg	0.75	1.75	06/15/21 15:42	emk

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720

ACZ Sample ID: ***L66006-03***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3052)	M6010D ICP	5020	57100		*	mg/Kg	251	1260	06/18/21 17:56	jlw
Antimony, total (3052)	M6020B ICP-MS	12600	<5.04	U	*	mg/Kg	5.04	25.2	06/24/21 17:11	mfm
Arsenic, total (3052)	M6020B ICP-MS	12600	5.15	B		mg/Kg	2.52	12.6	06/24/21 17:11	mfm
Barium, total (3052)	M6010D ICP	5020	766		*	mg/Kg	35.1	176	06/18/21 17:56	jlw
Beryllium, total (3052)	M6020B ICP-MS	12600	1.76	B	*	mg/Kg	1.01	3.15	06/24/21 17:11	mfm
Boron, total (3050)	M6010D ICP	100	13.6			mg/Kg	3	10	06/15/21 1:47	kja
Cadmium, total (3052)	M6020B ICP-MS	12600	1.61	B		mg/Kg	0.63	3.15	06/24/21 17:11	mfm
Calcium, total (3052)	M6010D ICP	5020	88200			mg/Kg	502	2510	06/18/21 17:56	jlw
Chromium, total (3052)	M6010D ICP	5020	<100	U	*	mg/Kg	100	251	06/18/21 17:56	jlw
Copper, total (3052)	M6010D ICP	5020	<50.2	U		mg/Kg	50.2	251	06/18/21 17:56	jlw
Iron, total (3052)	M6010D ICP	5020	28100		*	mg/Kg	301	753	06/18/21 17:56	jlw
Lead, total (3052)	M6020B ICP-MS	12600	10.1			mg/Kg	1.26	6.3	06/24/21 17:11	mfm
Magnesium, total (3052)	M6010D ICP	5020	10600		*	mg/Kg	1000	5020	06/18/21 17:56	jlw
Manganese, total (3052)	M6010D ICP	5020	1000			mg/Kg	50.2	251	06/18/21 17:56	jlw
Mercury by Direct Combustion AA	M7473 CVAAS	1	10.3	B	*	ng/g	2.18	10.9	05/28/21 14:19	aeh
Molybdenum, total (3052)	M6010D ICP	5020	<100	U	*	mg/Kg	100	502	06/18/21 17:56	jlw
Nickel, total (3052)	M6010D ICP	5020	<40.2	U	*	mg/Kg	40.2	201	06/18/21 17:56	jlw
Potassium, total (3052)	M6010D ICP	5020	16300		*	mg/Kg	1000	5020	06/18/21 17:56	jlw
Selenium, total (3052)	M6020B ICP-MS	12600	<1.26	U		mg/Kg	1.26	3.15	06/24/21 17:11	mfm
Silica, total (3052)	M6010D ICP	10000	625000		*	mg/Kg	2000	10000	06/22/21 0:37	jlw
Silver, total (3052)	M6010D ICP	5020	<50.2	U	*	mg/Kg	50.2	126	06/18/21 17:56	jlw
Sodium, total (3052)	M6010D ICP	5020	18800		*	mg/Kg	1000	5020	06/18/21 17:56	jlw
Strontium, total (3052)	M6010D ICP	5020	438		*	mg/Kg	45.2	226	06/18/21 17:56	jlw
Sulfur, total (3050)	M6010D ICP	200	6160		*	mg/Kg	50	250	06/15/21 23:59	kja
Thallium, total (3052)	M6020B ICP-MS	12600	<1.26	U		mg/Kg	1.26	6.3	06/24/21 17:11	mfm
Uranium, total (3052)	M6020B ICP-MS	12600	2.19	B		mg/Kg	1.26	6.3	06/24/21 17:11	mfm
Zinc, total (3052)	M6010D ICP	5020	<100	U	*	mg/Kg	100	251	06/18/21 17:56	jlw

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	83.1		*	%	0.1	0.5	06/01/21 1:44	jpb

Brown and Caldwell
Project ID:
Sample ID: TLCHT-670-720

ACZ Sample ID: ***L66006-03***
Date Sampled: *05/03/21 00:00*
Date Received: *05/24/21*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								06/01/21 9:49	sjm
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								06/08/21 10:00	zln
Digestion - Hot Plate	M3050B ICP								06/10/21 12:53	mep/mlp
ICP 3052 Digestion	M3052								06/18/21 8:30	gkh
ICPMS 3052 Digestion	M3052								06/18/21 8:30	gkh
Water Extraction	ASA No. 9 10-2.3.2								06/11/21 13:36	zln/sjm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Fluoride, soluble (Water)	SM4500F-C	5	2.48		*	mg/Kg	0.75	1.75	06/15/21 15:46	emk

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Aluminum, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.968	mg/L	98	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.15	0.15			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.250325		.243	mg/L	97	70	130			
WG521398ICSAB	ICSAB	06/18/21 17:09	II210419-3	500.65		505.6	mg/L	101	80	120			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-150	150			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	59500		61750	mg/Kg		47600	71400			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	59500		66450	mg/Kg		47600	71400	7	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	501.9519	72800	70190.1	mg/Kg	-520	75	125			M3
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	501.9519	72800	67735.2	mg/Kg	-1009	75	125	4	20	M3
L66006-02SDL	SDL	06/18/21 17:53			66200	67584.9	mg/Kg				2	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.979	mg/L	98	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.15	0.15			

Antimony, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.0201		.0196	mg/L	98	90	110			
WG521881ICB	ICB	06/24/21 16:48				.00044	mg/L		-0.0012	0.0012			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.002		.00192	mg/L	96	70	130			
WG521881ICSA	ICSA	06/24/21 16:51				U	mg/L		-0.002	0.002			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.01		.00975	mg/L	98	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-3	3			
WG520903LCSS	LCSS	06/24/21 17:00	PCN58899	52.5		53.74285	mg/Kg		42	63			
WG520903LCSSD	LCSSD	06/24/21 17:02	PCN58899	52.5		54.54787	mg/Kg		42	63	1	20	
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	25	U	10.93752	mg/Kg	44	75	125			M2
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	25	U	11.4533	mg/Kg	46	75	125	5	20	M2
L66006-03SDL	SDL	06/24/21 17:13			U	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.0125		.01196	mg/L	96	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.0012	0.0012			

Arsenic, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.05065	mg/L	101	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.0006	0.0006			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.001001		.00101	mg/L	101	70	130			
WG521881ICSA	ICSA	06/24/21 16:51				U	mg/L		-0.001	0.001			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02002		.02023	mg/L	101	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-1.5	1.5			
WG520903LCSS	LCSS	06/24/21 17:00	PCN58899	1540		1590.5227	mg/Kg		1232	1848			
WG520903LCSSD	LCSSD	06/24/21 17:02	PCN58899	1540		1578.5442	mg/Kg		1232	1848	1	20	
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	125.125	7.1	120.32464	mg/Kg	90	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	125.125	7.1	128.19521	mg/Kg	97	75	125	6	20	
L66006-03SDL	SDL	06/24/21 17:13			5.15	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.1001		.09805	mg/L	98	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.0006	0.0006			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Barium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.969	mg/L	98	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.021	0.021			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.035		.0375	mg/L	107	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-21	21			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	792		857.5	mg/Kg		663.6	950.4			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	792		928	mg/Kg		663.6	950.4	8	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	251.2515	911	1116.228	mg/Kg	82	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	251.2515	911	1078.152	mg/Kg	67	75	125	3	20	M3
L66006-02SDL	SDL	06/18/21 17:53			895	969.435	mg/Kg				8	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.9721	mg/L	97	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.021	0.021			

Beryllium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.048417	mg/L	97	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.00024	0.00024			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.00025025		.000242	mg/L	97	70	130			
WG521881ICSA	ICSA	06/24/21 16:51				U	mg/L		-0.00025	0.00025			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02002		.019701	mg/L	98	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.6	0.6			
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	125.25	1.72	116.371508	mg/Kg	92	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	125.25	1.72	118.357315	mg/Kg	93	75	125	2	20	
L66006-03SDL	SDL	06/24/21 17:13			1.76	5.051045	mg/Kg				187	10	ZG
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.1001		.097815	mg/L	98	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.00024	0.00024			

Boron, total (3050) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520991													
WG520991ICV	ICV	06/14/21 23:35	II210524-1	2		1.985	mg/L	99	90	110			
WG520991ICB	ICB	06/14/21 23:39				U	mg/L		-0.09	0.09			
WG520991PQV	PQV	06/14/21 23:43	II210603-2	.1001		.109	mg/L	109	70	130			
WG520688PBS	PBS	06/15/21 0:02				U	mg/Kg		-9	9			
WG520688LCSS1	LCSS	06/15/21 0:06	PCN63585	87.5		90.274	mg/Kg		62.5	113			
WG520688LCSSD1	LCSSD	06/15/21 0:10	PCN63585	87.5		90.42	mg/Kg		62.5	113	0	20	
L65916-01MS	MS	06/15/21 0:24	II210601-2	50.05	U	47.62	mg/Kg	95	75	125			
L65916-01MSD	MSD	06/15/21 0:28	II210601-2	50.5505	U	48.702	mg/Kg	96	75	125	2	20	
WG520991CCV1	CCV	06/15/21 0:39	II210607-1	1		.986	mg/L	99	90	110			
WG520991CCB1	CCB	06/15/21 0:43				U	mg/L		-0.09	0.09			
WG520991CCV2	CCV	06/15/21 1:24	II210607-1	1		1.005	mg/L	101	90	110			
WG520991CCB2	CCB	06/15/21 1:28				U	mg/L		-0.09	0.09			
L66006-02SDL	SDL	06/15/21 1:43			10.8	U	mg/Kg					10	
WG520991CCV3	CCV	06/15/21 1:51	II210607-1	1		.993	mg/L	99	90	110			
WG520991CCB3	CCB	06/15/21 1:54				U	mg/L		-0.09	0.09			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Cadmium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.052233	mg/L	104	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.00015	0.00015			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.00025025		.000238	mg/L	95	70	130			
WG521881ICSA	ICSA	06/24/21 16:51		.000065		.000065	mg/L		-0.00025	0.00025			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02002		.019052	mg/L	95	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.375	0.375			
WG520903LCSS	LCSS	06/24/21 17:00	PCN58899	12.3		12.301728	mg/Kg		9.84	14.8			
WG520903LCSSD	LCSSD	06/24/21 17:02	PCN58899	12.3		12.372604	mg/Kg		9.84	14.8	1	20	
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	125.25	1.69	121.651165	mg/Kg	96	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	125.25	1.69	125.80871	mg/Kg	99	75	125	3	20	
L66006-03SDL	SDL	06/24/21 17:13			1.61	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.1001		.094422	mg/L	94	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.00015	0.00015			

Calcium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	100		99.58	mg/L	100	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.3	0.3			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.5006		.52	mg/L	104	70	130			
WG521398ICSAB	ICSAB	06/18/21 17:09	II210419-3	500.15		487.4	mg/L	97	80	120			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-300	300			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	9640		10370	mg/Kg		7712	11568			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	9640		11130	mg/Kg		7712	11568	7	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	34084.69833	35400	69989.7	mg/Kg	101	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	34084.69833	35400	67584.9	mg/Kg	94	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			31600	31713.3	mg/Kg				0	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	50		49.28	mg/L	99	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.3	0.3			

Chromium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.941	mg/L	97	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.06	0.06			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.0502		.057	mg/L	114	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-60	60			
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	249.498	U	323.145	mg/Kg	130	75	125			M1
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	249.498	U	324.648	mg/Kg	130	75	125	0	20	M1
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg				0	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.961	mg/L	96	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.06	0.06			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Copper, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.941	mg/L	97	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.03	0.03			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.0502		.05	mg/L	100	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-30	30			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	3420		3610	mg/Kg		2736	4104			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	3420		3895	mg/Kg		2736	4104	8	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	250.5	U	275.55	mg/Kg	110	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	250.5	U	268.536	mg/Kg	107	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg					10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.961	mg/L	96	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.03	0.03			

Fluoride, soluble (Water) SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521080													
WG521080ICV	ICV	06/15/21 12:35	WC210609-3	2.002		2.14	mg/L	107	90	110			
WG521080ICB	ICB	06/15/21 12:40				U	mg/L		-0.3	0.3			
WG521114													
WG521114ICV	ICV	06/15/21 15:15	WC210609-3	2.002		1.88	mg/L	94	90	110			
WG521114ICB	ICB	06/15/21 15:20				U	mg/L		-0.3	0.3			
WG521114PQV	PQV	06/15/21 15:24	WC210528-8	.35105		.33	mg/L	94	70	130			
WG521114LFB	LFB	06/15/21 15:29	WC201221-2	5.015		4.73	mg/L	94	90	110			
WG520870PBS	PBS	06/15/21 15:34				U	mg/L		-1.5	1.5			
L66006-03AS	AS	06/15/21 15:51	WC201221-2	25.075	2.48	26.16	mg/L	94	90	110			
L66006-03DUP	DUP	06/15/21 15:54			2.48	2.88	mg/L				15	20	RA
WG521114CCV	CCV	06/15/21 15:57	WC210609-3	2.002		2.03	mg/L	101	90	110			
WG521114CCB	CCB	06/15/21 16:03				U	mg/L		-0.3	0.3			

Iron, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.974	mg/L	99	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.18	0.18			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.15027		.156	mg/L	104	70	130			
WG521398ICSAB	ICSAB	06/18/21 17:09	II210419-3	200.02		188.5	mg/L	94	80	120			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-180	180			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	43200		46865	mg/Kg		34560	51840			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	43200		50200	mg/Kg		34560	51840	7	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	501.5511	34400	33421.71	mg/Kg	-195	75	125			M3
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	501.5511	34400	32304.48	mg/Kg	-418	75	125	3	20	M3
L66006-02SDL	SDL	06/18/21 17:53			34000	34418.7	mg/Kg				1	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.982	mg/L	98	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.18	0.18			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Lead, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.05377	mg/L	108	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.0003	0.0003			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.0005005		.00049	mg/L	98	70	130			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02002		.01998	mg/L	100	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.75	0.75			
WG520903LCSS	LCSS	06/24/21 17:00	PCN58899	5520		4514.2358	mg/Kg		4416	6624			
WG520903LCSSD	LCSSD	06/24/21 17:02	PCN58899	5520		4480.8199	mg/Kg		4416	6624	1	20	E6
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	125.125	12.6	139.92302	mg/Kg	102	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	125.125	12.6	139.43301	mg/Kg	101	75	125	0	20	
L66006-03SDL	SDL	06/24/21 17:13			10.1	10.8001	mg/Kg				7	10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.25025		.22855	mg/L	91	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.0003	0.0003			

Magnesium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	100		98.48	mg/L	98	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.6	0.6			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	1.0001		.92	mg/L	92	70	130			
WG521398ICSAB	ICSAB	06/18/21 17:09	II210419-3	500.05		508.7	mg/L	102	80	120			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-600	600			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	7340		6845	mg/Kg		5872	8808			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	7340		7410	mg/Kg		5872	8808	8	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	25078.77243	14300	39523.89	mg/Kg	101	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	25078.77243	14300	38381.61	mg/Kg	96	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			13200	10889.25	mg/Kg				18	10	ZG
WG521398CCV	CCV	06/18/21 18:00	II210607-1	50		48.43	mg/L	97	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.6	0.6			

Manganese, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.941	mg/L	97	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.03	0.03			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.05005		.051	mg/L	102	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-30	30			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	2140		2314.5	mg/Kg		1712	2568			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	2140		2497	mg/Kg		1712	2568	8	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	250.5	565	786.57	mg/Kg	88	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	250.5	565	764.025	mg/Kg	79	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			559	573.645	mg/Kg				3	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.968	mg/L	97	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.03	0.03			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury by Direct Combustion AA M7473 CVAAS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG517611													
WG517611ICV4	ICV	04/16/21 12:06	HG210414-4	10000		9840	ng/g	98	90	110			
WG520078													
WG520078ICV1	ICV	05/28/21 9:33	HG210414-3	100		108	ng/g	108	90	110			
WG520078ICV2	ICV	05/28/21 9:43	HG210414-3	100		105	ng/g	105	90	110			
WG520078ICV3	ICV	05/28/21 9:50	HG210414-2	1000		1010	ng/g	101	90	110			
WG520078ICV4	ICV	05/28/21 10:03	HG210414-4	10000		9790	ng/g	98	90	110			
WG520078PBS	PBS	05/28/21 10:52				U	ng/g		-5.7	5.7			
WG520078LCSS	LCSS	05/28/21 11:01	PCN60050	90		80.6	ng/g		80	120			
WG520078LCSSD	LCSSD	05/28/21 11:10	PCN60050	90		80.4	ng/g		80	120	0	20	
L65916-01MS	MS	05/28/21 11:27	HG210414-2				ng/g	67	80	120			M2
L65916-02DUP	DUP	05/28/21 11:44			24.4	18.2	ng/g				29	20	RA
WG520078CCV1	CCV	05/28/21 12:18	HG210414-2	1000		934	ng/g	93	80	120			
WG520078CCV2	CCV	05/28/21 13:53	HG210414-2	1000		926	ng/g	93	80	120			
WG520078CCV3	CCV	05/28/21 14:26	HG210414-2	1000		924	ng/g	92	80	120			

Molybdenum, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		2.02	mg/L	101	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.06	0.06			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.1002		.103	mg/L	103	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-60	60			
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	251.2515	U	275.049	mg/Kg	109	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	251.2515	U	259.017	mg/Kg	103	75	125	6	20	
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg					10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		1.003	mg/L	100	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.06	0.06			

Nickel, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.98	mg/L	99	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.024	0.024			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.04016		.0389	mg/L	97	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-24	24			
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	250.2495	U	279.558	mg/Kg	112	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	250.2495	U	262.023	mg/Kg	105	75	125	6	20	
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg					10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.9928	mg/L	99	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.024	0.024			

Brown and Caldwell

ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Potassium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	20		19.84	mg/L	99	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.6	0.6			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	1.004		.98	mg/L	98	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-600	600			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	21700		23290	mg/Kg		17360	26040			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	21700		26020	mg/Kg		17360	26040	11	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	50104.7094	19500	71142	mg/Kg	103	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	50104.7094	19500	69087.9	mg/Kg	99	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			18300	21392.7	mg/Kg				17	10	ZG
WG521398CCV	CCV	06/18/21 18:00	II210607-1	10		9.97	mg/L	100	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.6	0.6			

Selenium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.05129	mg/L	103	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.0003	0.0003			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.00025		.00024	mg/L	96	70	130			
WG521881ICSA	ICSA	06/24/21 16:51				U	mg/L		-0.00025	0.00025			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02		.01982	mg/L	99	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.75	0.75			
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	62.5625	U	58.30018	mg/Kg	93	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	62.5625	U	59.20769	mg/Kg	95	75	125	2	20	
L66006-03SDL	SDL	06/24/21 17:13			U	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.25		.24307	mg/L	97	90	110			
WG521881CCB1	CCB	06/24/21 17:16				.00019	mg/L		-0.0003	0.0003			

Silica, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521506													
WG521506ICV	ICV	06/21/21 23:42	II210620-2	42.8		43.08	mg/L	101	90	110			
WG521506ICB	ICB	06/21/21 23:46				U	mg/L		-0.6	0.6			
WG521506PQV	PQV	06/21/21 23:50	II210603-2	1.07075		1.11	mg/L	104	70	130			
WG520903PBS	PBS	06/22/21 0:10				6120	mg/Kg		-600	600			B1
WG520903LCSS	LCSS	06/22/21 0:14	PCN58899	665540		661500	mg/Kg		532432	798648			
WG520903LCSSD	LCSSD	06/22/21 0:18	PCN58899	665540		659500	mg/Kg		532432	798648	0	20	
L66006-01MS	MS	06/22/21 0:26	II20XSOIL	10700	728000	760500	mg/Kg	304	75	125			M3
L66006-01MSD	MSD	06/22/21 0:30	II20XSOIL	10700	728000	744600	mg/Kg	155	75	125	2	20	M3
L66006-03SDL	SDL	06/22/21 0:41			625000	685500	mg/Kg				10	10	
WG521506CCV1	CCV	06/22/21 0:45	II210607-1	21.4		21.82	mg/L	102	90	110			
WG521506CCB1	CCB	06/22/21 0:49				U	mg/L		-0.6	0.6			

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ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silver, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	1		.996	mg/L	100	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.03	0.03			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.0251		.028	mg/L	112	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-30	30			
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	250.5	U	275.049	mg/Kg	110	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	250.5	U	331.662	mg/Kg	132	75	125	19	20	MA
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg					10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	.5		.49	mg/L	98	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.03	0.03			

Sodium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	100		99.16	mg/L	99	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.6	0.6			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.998		1.04	mg/L	104	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-600	600			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	8940		10320	mg/Kg		7152	10728			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	8940		11715	mg/Kg		7152	10728	13	20	RL
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	50103.1062	23500	74548.8	mg/Kg	102	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	50103.1062	23500	72544.8	mg/Kg	98	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			22000	28306.5	mg/Kg				29	10	ZG
WG521398CCV	CCV	06/18/21 18:00	II210607-1	50		49.2	mg/L	98	90	110			
WG521398CCB1	CCB	06/18/21 18:04				.27	mg/L		-0.6	0.6			

Solids, Percent D2216-80

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520083													
L65764-25DUP	DUP	05/28/21 16:16			99.8	99.8	%				0	20	
WG520083PBS	PBS	06/01/21 8:00				U	%		-0.1	0.1			

Strontium, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.948	mg/L	97	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.027	0.027			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.045225		.0474	mg/L	105	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-27	27			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	255		282	mg/Kg		204	306			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	255		304.5	mg/Kg		204	306	8	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	251.2515	534	782.061	mg/Kg	99	75	125			
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	251.2515	534	758.013	mg/Kg	89	75	125	3	20	
L66006-02SDL	SDL	06/18/21 17:53			487	546.09	mg/Kg				12	10	ZG
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.9644	mg/L	96	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.027	0.027			

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ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sulfur, total (3050) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG520991													
WG520991ICV	ICV	06/14/21 23:35	II210524-1	50.05		50.6	mg/L	101	90	110			
WG520991ICB	ICB	06/14/21 23:39				U	mg/L		-0.75	0.75			
WG520991PQV	PQV	06/14/21 23:43	II210603-2	1.25125		1.34	mg/L	107	70	130			
WG520688PBS	PBS	06/15/21 0:02				U	mg/Kg		-75	75			
L65916-01MS	MS	06/15/21 0:24	II210601-2	500.5	119	616.8	mg/Kg	99	75	125			
L65916-01MSD	MSD	06/15/21 0:28	II210601-2	505.505	119	619.33	mg/Kg	99	75	125	0	20	
WG520991CCV1	CCV	06/15/21 0:39	II210607-1	25.025		25.52	mg/L	102	90	110			
WG520991CCB1	CCB	06/15/21 0:43				U	mg/L		-0.75	0.75			
WG520991CCV2	CCV	06/15/21 1:24	II210607-1	25.025		26.09	mg/L	104	90	110			
WG520991CCB2	CCB	06/15/21 1:28				U	mg/L		-0.75	0.75			
L66006-02SDL	SDL	06/15/21 1:43			3640	3787.5	mg/Kg				4	10	
WG520991CCV3	CCV	06/15/21 1:51	II210607-1	25.025		25.72	mg/L	103	90	110			
WG520991CCB3	CCB	06/15/21 1:54				U	mg/L		-0.75	0.75			
WG521048													
WG521048ICV	ICV	06/15/21 22:17	II210524-1	50.05		51.92	mg/L	104	90	110			
WG521048ICB	ICB	06/15/21 22:20				U	mg/L		-0.75	0.75			
WG521048PQV	PQV	06/15/21 22:24	II210603-2	1.25125		1.36	mg/L	109	70	130			
WG520688PBS	PBS	06/15/21 22:44				U	mg/Kg		-75	75			
L65916-01MS	MS	06/15/21 22:59	II210601-2	500.5	121	623.5	mg/Kg	100	75	125			
L65916-01MSD	MSD	06/15/21 23:02	II210601-2	505.505	121	628.42	mg/Kg	100	75	125	1	20	
L65960-02SDL	SDL	06/15/21 23:10			34.9	U	mg/Kg					10	
WG521048CCV1	CCV	06/15/21 23:21	II210607-1	25.025		24.33	mg/L	97	90	110			
WG521048CCB1	CCB	06/15/21 23:25				U	mg/L		-0.75	0.75			
WG521048CCV2	CCV	06/16/21 0:03	II210607-1	25.025		25.68	mg/L	103	90	110			
WG521048CCB2	CCB	06/16/21 0:06				U	mg/L		-0.75	0.75			

Thallium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.0517	mg/L	103	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.0003	0.0003			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.0005		.00047	mg/L	94	70	130			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02		.02002	mg/L	100	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.75	0.75			
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	125.125	U	123.68936	mg/Kg	99	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	125.125	U	124.02424	mg/Kg	99	75	125	0	20	
L66006-03SDL	SDL	06/24/21 17:13			U	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.1		.09063	mg/L	91	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.0003	0.0003			

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ACZ Project ID: ***L66006***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Uranium, total (3052) M6020B ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521881													
WG521881ICV	ICV	06/24/21 16:46	MS210503-1	.05		.05145	mg/L	103	90	110			
WG521881ICB	ICB	06/24/21 16:48				U	mg/L		-0.0003	0.0003			
WG521881PQV	PQV	06/24/21 16:50	MS210526-2	.0005		.00049	mg/L	98	70	130			
WG521881ICSA	ICSA	06/24/21 16:51				U	mg/L		-0.0005	0.0005			
WG521881ICSAB	ICSAB	06/24/21 16:53	MS210610-4	.02		.02091	mg/L	105	80	120			
WG520903PBS	PBS	06/24/21 16:58				U	mg/Kg		-0.75	0.75			
WG520903LCSS	LCSS	06/24/21 17:00	PCN58899	9.11		7.75288	mg/Kg		7.28	10.9			
WG520903LCSSD	LCSSD	06/24/21 17:02	PCN58899	9.11		7.78494	mg/Kg		7.28	10.9	0	20	E6
L66006-02MS	MS	06/24/21 17:07	MS25XSOILS	62.5	1.89	66.70132	mg/Kg	104	75	125			
L66006-02MSD	MSD	06/24/21 17:09	MS25XSOILS	62.5	1.89	66.6954	mg/Kg	104	75	125	0	20	
L66006-03SDL	SDL	06/24/21 17:13			2.19	U	mg/Kg					10	
WG521881CCV1	CCV	06/24/21 17:14	MS210521-8	.1		.09072	mg/L	91	90	110			
WG521881CCB1	CCB	06/24/21 17:16				U	mg/L		-0.0003	0.0003			

Zinc, total (3052) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG521398													
WG521398ICV	ICV	06/18/21 16:58	II210524-1	2		1.989	mg/L	99	90	110			
WG521398ICB	ICB	06/18/21 17:01				U	mg/L		-0.06	0.06			
WG521398PQV	PQV	06/18/21 17:05	II210603-2	.05015		.054	mg/L	108	70	130			
WG520903PBS	PBS	06/18/21 17:26				U	mg/Kg		-60	60			
WG520903LCSS	LCSS	06/18/21 17:29	PCN58899	4180		4564	mg/Kg		3344	5016			
WG520903LCSSD	LCSSD	06/18/21 17:33	PCN58899	4180		4918	mg/Kg		3344	5016	7	20	
L66006-01MS	MS	06/18/21 17:41	II10XSOIL	247.5942	U	346.692	mg/Kg	140	75	125			M1
L66006-01MSD	MSD	06/18/21 17:45	II10XSOIL	247.5942	U	326.652	mg/Kg	132	75	125	6	20	M1
L66006-02SDL	SDL	06/18/21 17:53			U	U	mg/Kg				0	10	
WG521398CCV	CCV	06/18/21 18:00	II210607-1	1		.976	mg/L	98	90	110			
WG521398CCB1	CCB	06/18/21 18:04				U	mg/L		-0.06	0.06			

Brown and Caldwell

ACZ Project ID: ***L66006***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66006-01	WG521398	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Barium, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Beryllium, total (3052)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521398	Chromium, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521114	Fluoride, soluble (Water)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520078	Mercury by Direct Combustion AA	M7473 CVAAS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Molybdenum, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Potassium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521506	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Silver, total (3052)	M6010D ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Strontium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520991	Sulfur, total (3050)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control

Brown and Caldwell

ACZ Project ID: ***L66006***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521398	Zinc, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell

ACZ Project ID: ***L66006***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66006-02	WG521398	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Barium, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Beryllium, total (3052)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521398	Chromium, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521114	Fluoride, soluble (Water)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520078	Mercury by Direct Combustion AA	M7473 CVAAS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Molybdenum, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Potassium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521506	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Silver, total (3052)	M6010D ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Strontium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520991	Sulfur, total (3050)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control

Brown and Caldwell

ACZ Project ID: ***L66006***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521398	Zinc, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L66006-03	WG521398	Aluminum, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Antimony, total (3052)	M6020B ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Barium, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521881	Beryllium, total (3052)	M6020B ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521398	Chromium, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521114	Fluoride, soluble (Water)	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Iron, total (3052)	M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG520078	Mercury by Direct Combustion AA	M7473 CVAAS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M7473 CVAAS	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG521398	Molybdenum, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Nickel, total (3052)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Potassium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521506	Silica, total (3052)	M6010D ICP	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
			M6010D ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG521398	Silver, total (3052)	M6010D ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
		Sodium, total (3052)	M6010D ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Strontium, total (3052)	M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG521048	Sulfur, total (3050)	M6010D ICP	ZQ	Analyte was not evaluated in the laboratory control

Brown and Caldwell

ACZ Project ID: ***L66006***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG521398	Zinc, total (3052)	M6010D ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.

Brown and Caldwell ACZ Project ID: ***L66006***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Sulfur, total (3050)	M6010D ICP

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	D2216-80

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Fluoride, soluble (Water)	SM4500F-C

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Brown and Caldwell

ACZ Project ID: L66006
Date Received: 05/24/2021 14:41
Received By:
Date Printed: 5/25/2021

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?		X	

Sampled time not available

Sampled time not available

Sampled time not available

Sampled time not available

Sampled time not available

Sampled time not available

7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

The 'Relinquished By' field on the COC was not completed. The project manager is contacting the client.

Client Contact Remarks

Shipping Containers

REPAD LPII 2012-03

Sample Receipt

Brown and Caldwell

ACZ Project ID: L66006
Date Received: 05/24/2021 14:41
Received By:
Date Printed: 5/25/2021

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
UNKNOWN		NA		

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L66006

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kelly Donahue	Address: 1527 Cole Blvd, Suite 300
Company: Brown and Caldwell	Lakewood, CO 80401
E-mail: kdonahue@brwncald.com	Telephone: 575-418-7069

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Same as above	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: _____ Sampler's Site Information State_____ Zip code_____ Time Zone_____

*Sampler's Signature: _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: 3052-SOIL-2021

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	3052-SOIL-2021							
WBA-480-720	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
WHTA-640-710	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
TLCHT-670-720	5/3/21	SO	1	☒	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
		[illegible] 5/24/21	14:42

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L66006 Chain of Custody

X-ray Fluorescence and X-ray Diffraction

April 1, 2021
Lab no. 221071

Ms. Kelly Donahue
Brown and Caldwell
1527 Cole Blvd, Suite 300
Golden, Colorado 80401

Dear Ms. Donahue:

Enclosed are the x-ray fluorescence (XRF) and x-ray diffraction (XRD) results for three “Soquel” samples received earlier this week. This report will be mailed and emailed to you.

The samples were air-dried before grinding and analysis. A representative portion of each air-dried sample was ground to approximately -400 mesh in a steel swing mill and then analyzed by our standard XRF procedure for 31 major, minor and trace elements. The relative precision/accuracy for this procedure is ~5-10% for major-minor elements and ~10–15% for trace elements (those elements listed in ppm) at levels greater than twice the detection limit in samples of average geologic composition. A replicate sample and a standard reference material ("GSP-2", a USGS standard rock) were analyzed with the samples to demonstrate analytical reproducibility for your samples and analytical accuracy for a geologic standard, respectively. The accepted ("known") values for the quality control standard are listed with the XRF results.

A representative portion of each ground sample was packed into a well-type holder and then scanned with the diffractometer over the range, 3-61°2θ using Cu-Kα radiation. The results of the scans are summarized as approximate mineral weight percent concentrations on the enclosed table. Estimates of mineral concentrations were made using our XRF-determined elemental compositions and the relative peak areas on the XRD scans. The detection limit for an average mineral in these samples is ~1-3% and the analytical reproducibility is approximately equal to the square root of the amount. "Unidentified" accounts for that portion of the scan which could not be resolved and a “?” indicates doubt in both mineral identification and amount.

Thank you for the opportunity to be of continuing service to Brown and Caldwell.

Sincerely,

Peggy Dalheim

Brown & Caldwell

April 1, 2021

XRF Results for Samples Received with Project ID: Soquel

Lab no. 221071

(Sample Labels Listed Below)

	Wt %											
IDENT	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	S	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	BaO
1	2.82	2.07	12.2	65.7	0.23	0.53	< 0.02	2.07	4.22	0.41	0.06	4.19	0.09
2	2.85	1.94	11.7	66.1	0.23	0.39	< 0.02	2.08	4.04	0.44	0.07	4.64	0.09
3	2.16	1.51	9.42	53.5	0.26	0.64	< 0.02	1.80	14.91	0.38	0.15	3.88	0.08
Quality Control - Replicate (R) sample and standard reference material (GSP-2) analyzed with samples													
1(R)	2.82	2.08	12.2	65.8	0.24	0.53	< 0.02	2.06	4.21	0.41	0.06	4.19	0.09
GSP-2-XRF	3.13	1.11	14.5	66.0	0.33	< 0.05	0.07	5.41	2.13	0.59	0.04	4.36	0.14
GSP-2-known	2.78	0.96	14.9	66.6	0.29	----	----	5.38	2.10	0.66	0.04	4.90	0.15

	PPM											
IDENT	V	Cr	Co	Ni	W	Cu	Zn	As	Sn	Pb	Mo	Sr	U
1	71	125	< 10	26	< 10	22	53	< 20	< 20	< 10	< 10	428	< 10
2	79	142	< 10	24	< 10	61	73	23	< 20	23	< 10	426	< 10
3	76	107	< 10	20	< 10	16	48	< 20	< 20	< 10	< 10	409	< 10
Quality Control													
1(R)	70	134	< 10	26	< 10	29	52	< 20	< 20	< 10	< 10	431	< 10
GSP-2-XRF	39	14	< 10	12	< 10	40	105	< 20	< 20	39	< 10	208	< 10
GSP-2-known	52	20	7	17	--	43	120	--	--	42	--	240	2

	PPM					-- Sample Labels --	
Ident	Th	Nb	Zr	Rb	Y	Ident	
1	< 10	< 10	101	55	16	1	WBA-480-720
2	< 10	< 10	116	59	16	2	WHTA-640-710
3	< 10	< 10	103	54	21	3	TLCHT-670-720
Quality Control							
1(R)	< 10	< 10	103	54	17	1(R)	WBA-480-720
GSP-2-XRF	102	24	522	207	30		
GSP-2-known	105	27	550	245	28		

Initial_____

Date_____

Analysis Performed By The Mineral Lab, Inc

Brown and Caldwell
XRD Results for for “Soquel” Samples

April 1, 2021
Lab no. 221071

Mineral Name	Chemical Formula	Approx. Wt % WBA-480-720	WHTA-640-710	TLCHT-670-720
Quartz	SiO_2	36	37	30
Plagioclase feldspar	$(Na,Ca)Al(Si,Al)_3O_8$	39	39	28
K-feldspar	$KAlSi_3O_8$	12	13	9
Clinoamphibole	$(Na,K)(Ca,Na)_2(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$	<3	<3	<3
Mica/illite	$(K,Na,Ca)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH,F)_2$	<3	<3?	<3
Chlorite	$(Mg,Fe,Al)_6(Si,Al)_4O_{10}(OH)_8$	<2?	<2?	—
Calcite	$CaCO_3$	<2	<2	23
Magnetite	$(Fe,Mg,Zn,Cu,Ni)(Fe,Al,Cr)_2O_4$	<5	<5	<3
Pyrite	FeS_2	<2	<1	<2
Apatite	$Ca_5(PO_4,CO_3)_3(OH,F,Cl)$	—	<1?	—
“Unidentified”	?	<5	<5	<5

Initial _____

Date _____

Analysis performed by The Mineral Lab, Inc

Appendix H: Tracer Study Preliminary Plan

Appendix H includes a draft preliminary plan for the tracer study. SqCWD will update this draft preliminary plan as a draft formal workplan to submit to DDW in 2023. The workplan will be finalized based on DDW review for approval in 2023. The workplan will include changes to the approach described in Appendix H, as described in Section 14.7.

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MONTGOMERY
& ASSOCIATES
Water Resource Consultants

December 17, 2020

Tracer Study Preliminary Plan for Soquel Creek Water District's Pure Water Soquel Project

DRAFT

Prepared for:

Soquel Creek Water District

5180 Soquel Drive, Soquel, California 95073

Prepared by:

Montgomery & Associates

1970 Broadway, Suite 225, Oakland, California 94612

MONTGOMERY & ASSOCIATES

Contents

1 PROJECT OVERVIEW 1
1.1 Summary of Pure Water Soquel Program 1
1.2 Regulatory Requirements for Tracer Study 2
1.3 Goals of Tracer Study 3
2 HYDROGEOLOGY 4
3 MONITORING WELLS 6
4 TRACER STUDY PROGRAM 15
4.1 Purified Water Chemistry 15
4.2 Aquifer Chemistry 16
4.3 Added Tracer 17
4.3.1 Fluorescent Dye 17
4.4 Intrinsic Tracers 18
4.4.1 Conductivity and Temperature 18
4.4.2 Major Ions and Total Dissolved Solids 18
5 TRACER STUDY IMPLEMENTATION 19
5.1 Background Sampling 19
5.2 Implementation Schedule 19
5.3 Sampling Frequency and Logic 20
5.3.1 Purisima A Aquifer Unit 20
5.3.2 Purisima BC Aquifer Unit 21
5.3.3 Long-Term Monitoring 22
5.4 Sampling Methodology 22
5.4.1 Fluorescein dye 23
5.4.2 Conductivity and Temperature 23
5.4.3 Major Ions and Total Dissolved Solids 23
6 REFERENCES 24
7 ACRONYMS & ABBREVIATIONS 25

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MONTGOMERY & ASSOCIATES

Tables

Table 1. Monitoring Well Construction Designs 13
Table 2. Water Quality from Advanced Water Purification Facilities (AWPF) 15
Table 3. Water Quality from TLC Isolated Aquifer Zone Sampling and Nearby Production Wells 16

Figures

Figure 1. PWS System and SWIP Well Locations 1
Figure 2. Hydrostratigraphic Cross-Section with SWIP Wells Circled 5
Figure 3. Purisima BC Monitoring Well Locations and Modeled Underground Retention Times 7
Figure 4. Purisima A Monitoring Well Locations and Modeled Underground Retention Times 8
Figure 5. Monitoring Well Locations and Cross-Section Lines 9
Figure 6. Cross-Section A-A' 10
Figure 7. Cross-Section B-B' 11
Figure 8. Cross Section C-C' 12

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1 PROJECT OVERVIEW

Montgomery & Associates (M&A) has prepared this preliminary plan for Soquel Creek Water District's (SqCWD) Pure Water Soquel (PWS) program to describe the approach to meet Groundwater Replenishment Reuse Program (GRRP) requirements for a tracer study. Under the GRRP, SqCWD is required to implement a tracer study to quantify underground retention times associated with recharge of purified water at the seawater intrusion prevention (SWIP) wells. This protocol summarizes the regulatory requirements, approach, and planned implementation for a GRRP tracer testing program.

A subsequent tracer study work plan will be submitted to the California Department of Drinking Water (DDW) for review and approval prior to implementation of the tracer study.

1.1 Summary of Pure Water Soquel Program

The PWS program will utilize effluent water from the Santa Cruz Wastewater Treatment Facility (SCWWTF), purify it at the Chanticleer advanced water purification facility, and recharge the purified water into three SWIP wells (Figure 1). The program is designed to prevent seawater intrusion to protect the District's water supply. The PWS program's goal is to recharge 1,500 acre-feet per year between the three SWIP wells (approximately 930 gallons per minute in total).

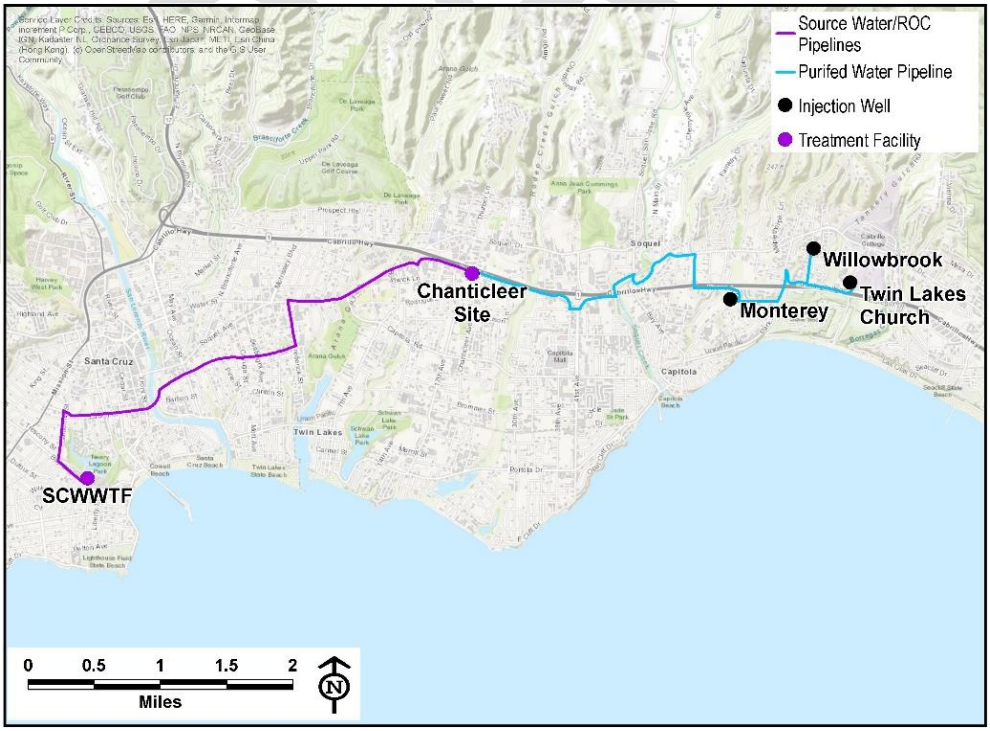

Figure 1. PWS System and SWIP Well Locations

1.2 Regulatory Requirements for Tracer Study

A tracer study is required to be conducted for each aquifer to which purified water is recharged in accordance with California Code of Regulations (CCR), Title 22, Division 4, Chapter 3, and Article 5.2 of the State Water Resources Control Board (SWRCB) Regulations Related to Recycled Water (Title 22 regulations, 2018).

Recharged water will be retained underground after being recharged and prior to extraction from any drinking water well. The length of this period, referred to as the underground retention time, is used to meet regulatory requirements in the following areas:

- Pathogenic microorganism control as quantified by pathogen log-reduction values (LRV) described in Section 60320.208 of the Title 22 regulations. PWS is designed to have an underground retention time of at least six months to contribute the maximum of six LRV from underground retention time.

- Response retention time (RRT), which is the adequate response time to identify potential treatment failures and implement appropriate actions to protect public health as described in Section 60320.224 of the SWRCB regulations. The RRT calculated for PWS is 7.5 months.

Both Sections 60320.208 and 60320.224 of the SWRCB 2018 regulations require a tracer study to demonstrate that underground retention time meets PWS requirements for LRV and RRT. The tracer study must be implemented "under hydraulic conditions representative of normal GRRP operations" and initiated within the first three months of PWS operation.

Tracer studies utilize existing or introduced variation in groundwater chemistry to provide information about flow velocity, flow direction, and other aquifer parameters. Tracer studies can involve introducing a foreign tracer to the recharged water (added tracer), or by utilizing natural or anthropogenic groundwater chemistry variations (intrinsic tracer). The type of test, selected tracer(s), monitoring program, and data analysis are all key components of a tracer study.

An added tracer refers to a substance intentionally added to the recharged water, with measurable characteristics that can be readily identified in the groundwater downgradient of the SWIP well. An intrinsic tracer refers to a substance or attribute already present or absent in the recharged water at levels different from the receiving groundwater, which can be distinctly and sufficiently detected in the groundwater downgradient of the SWIP well.

The GRRP requirements specify use of an added tracer but provide for testing using an intrinsic tracer with prior DDW approval. Calculation of underground retention times are also weighted depending on the type of tracer study conducted. The data collected using an intrinsic tracer

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study is considered conservatively so is assigned a partial credit. Specifically, each month of retention time observed based on an intrinsic tracer is credited a maximum of 0.67 month underground retention time. Tracer studies using an added tracer, by contrast, are credited for one full month underground retention time for each month observed during the testing program.

The GRRP requirements for tracer studies state that underground retention time shall be the time between application of the tracer and either 2% of the initially introduced tracer concentration has reached the downgradient monitoring point, or 10% of the peak tracer concentration at the downgradient monitoring point is observed at the downgradient monitoring point.

1.3 Goals of Tracer Study

The PWS tracer study will involve forced-gradient divergent flow, where water is recharged into a well and the effects are monitored at nearby non-pumping monitoring wells.

The tracer study protocol outlined herein is intended to evaluate whether the underground retention time is at least the 7.5-month response retention time described in the project's Title 22 engineering report (B&C, 2020a). The tracer study would also be used to establish pathogen reduction credits equivalent to six months of underground retention time. A combination of added and intrinsic tracers will be utilized.

The Title 22 regulations allow that changes in hydrogeological or climate conditions that have occurred since the tracer study was conducted may result in a request to reperform tracer testing and demonstrate continued compliance. The protocols outlined herein are additionally designed to allow for repetition of the tracer study should it be needed in the future.

The use of an added tracer will provide full underground retention time credit. Demonstrating that a concurrent intrinsic tracer study provides consistent results to the added tracer study should establish full underground retention time credit for future use of intrinsic tracers. Being able to use intrinsic tracers with a full underground retention time credit would provide cost savings should tracer studies be required to be repeated in the future. Should added tracer and intrinsic tracer results differ, added tracer results will be used to estimate underground retention times.

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2 HYDROGEOLOGY

In accordance with Title 22 regulations, the tracer study must include a program to evaluate underground retention times in each aquifer to which purified water is recharged. Figure 2 provides a hydrogeologic cross-section with applicable aquifer units and actual or proposed screen intervals for the three SWIP wells.

The three SWIP wells associated with the PWS program include Twin Lakes Church (TLC), Monterey, and Willowbrook (see Figure 1). The TLC SWIP well was installed in 2019 as a pilot recharge well and redeveloped to be a SWIP well in 2020. The Willowbrook SWIP well was installed in 2020. Installation of the Monterey SWIP well is planned for winter and spring of 2021.

The TLC SWIP well is completed with screened intervals in two aquifer units, including the Purisima BC (shallower) and Purisima A (deeper) aquifer units. A spinner (flowmeter) survey was conducted at the TLC SWIP well in May 2019 during constant rate injection testing to evaluate relative injection capabilities in both the Purisima A and Purisima BC units. The average injection rate during the test was 470 gallons per minute. Analysis of the spinner log concluded that approximately 7% of injected water was accepted by the upper Purisima BC unit and 93% was accepted by the lower Purisima A screened interval (B&C, 2020b). The tracer study associated with the TLC SWIP well must include evaluation of both the Purisima BC and Purisima A units.

The Willowbrook SWIP well was screened only in the Purisima A (deeper) aquifer unit. Likewise, Monterey SWIP well is anticipated to include screened intervals only in the Purisima A unit. The tracer studies associated with these wells need only evaluate the Purisima A aquifer unit.

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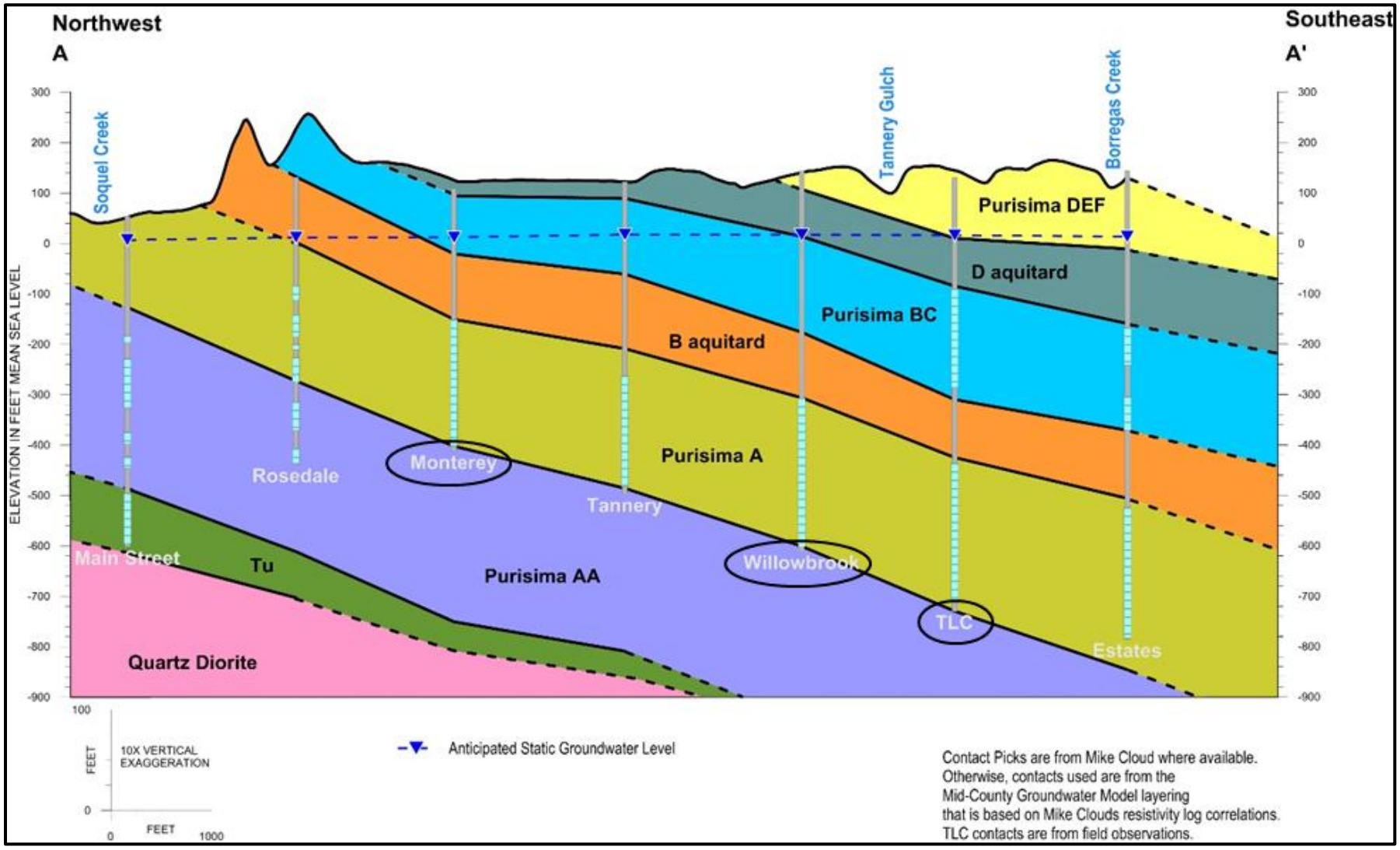

Figure 2. Hydrostratigraphic Cross-Section with SWIP Wells Circled

3 MONITORING WELLS

Monitoring wells will be used to collect groundwater samples for the purpose of documenting the underground retention time, and also to monitor groundwater quality between the point of recharge (SWIP well) and the nearest downgradient drinking water well(s). A minimum of two monitoring wells are required to be constructed downgradient of the point of recharge and in each applicable aquifer. The Title 22 regulations includes the following with regards to the location of monitoring wells:

- At least one monitoring well shall be located no less than two weeks but not more than six months of travel time from the point of recharge and at least 30 days upgradient of the nearest drinking water well.
- At least one monitoring well shall be located between the point of recharge and the nearest downgradient drinking water well.
- At least one monitoring well should provide a response retention time of no less than two months, so the monitoring well needs to be at least two months upgradient of the nearest drinking water well.

Monitoring wells are required for each aquifer receiving recharge water to meet tracer study requirements. As discussed above, this includes both the Purisima BC and Purisima A aquifer units at the TLC SWIP well, and just the Purisima A aquifer unit at both Monterey and Willowbrook SWIP Wells.

A total of eight monitoring wells are expected to be installed to meet Title 22 regulations in support of the PWS program, including four near TLC, two near Monterey, and two near Willowbrook. In addition, a fifth monitoring well is being considered at the TLC SWIP well. The additional well is not required to meet the requirements of Title 22. These monitoring well locations are supported by analytical estimates and groundwater model results for underground retention times of recharged water (M&A, 2020a) and further discussed in the draft Title 22 engineering report (B&C, 2020a). Monitoring well locations and modeled travel times are shown on Figure 3 and Figure 4. Figure 5 shows the SWIP wells and monitoring wells with lines for cross-sections shown in Figure 6 through Figure 8. The exact location of these monitoring wells is pending property access negotiations. Monitoring well installation will occur more than one year before initiation of recharge at the PWS SWIP wells.

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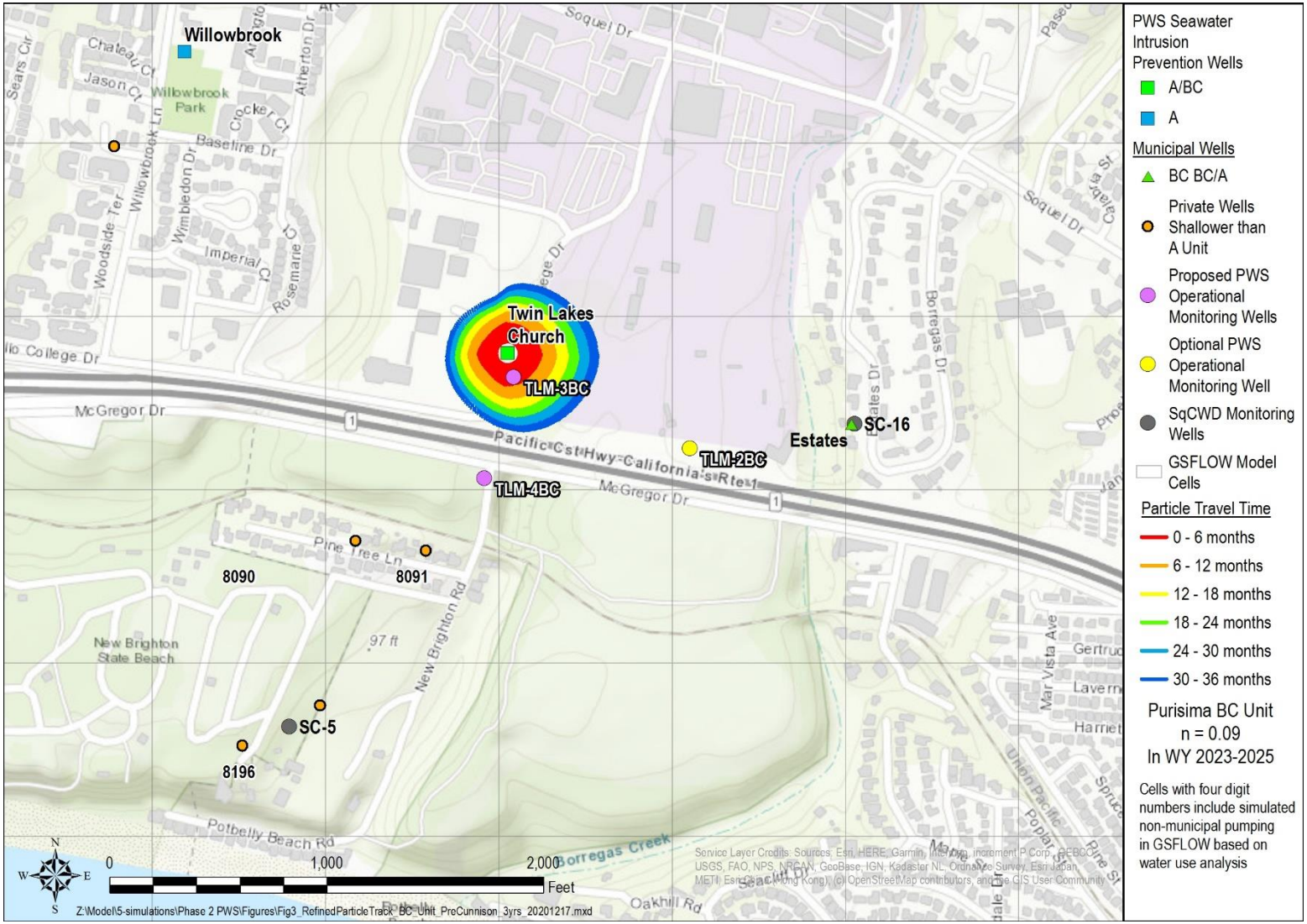

Figure 3. Purisima BC Monitoring Well Locations and Modeled Underground Retention Times

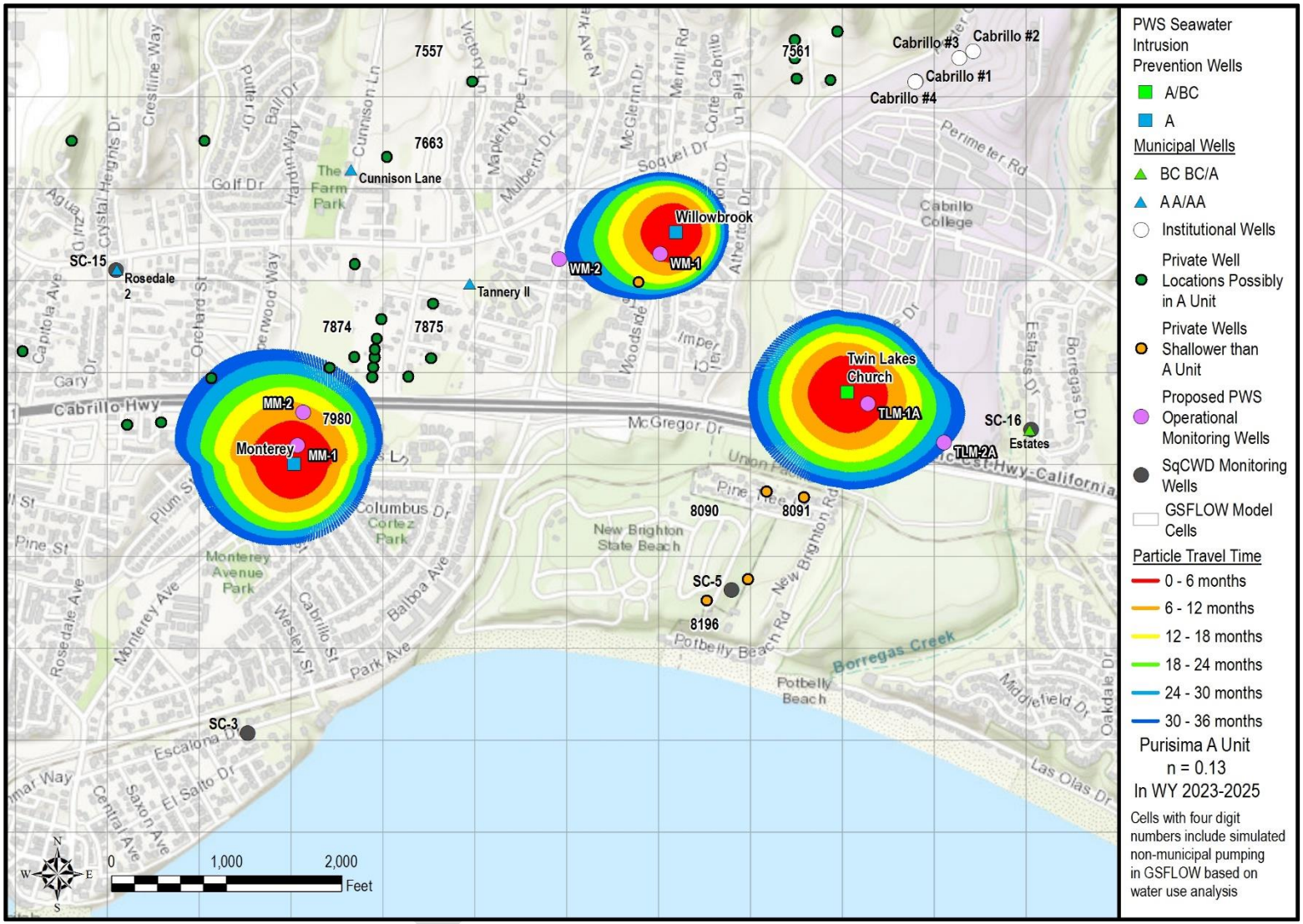

Figure 4. Purisima A Monitoring Well Locations and Modeled Underground Retention Times

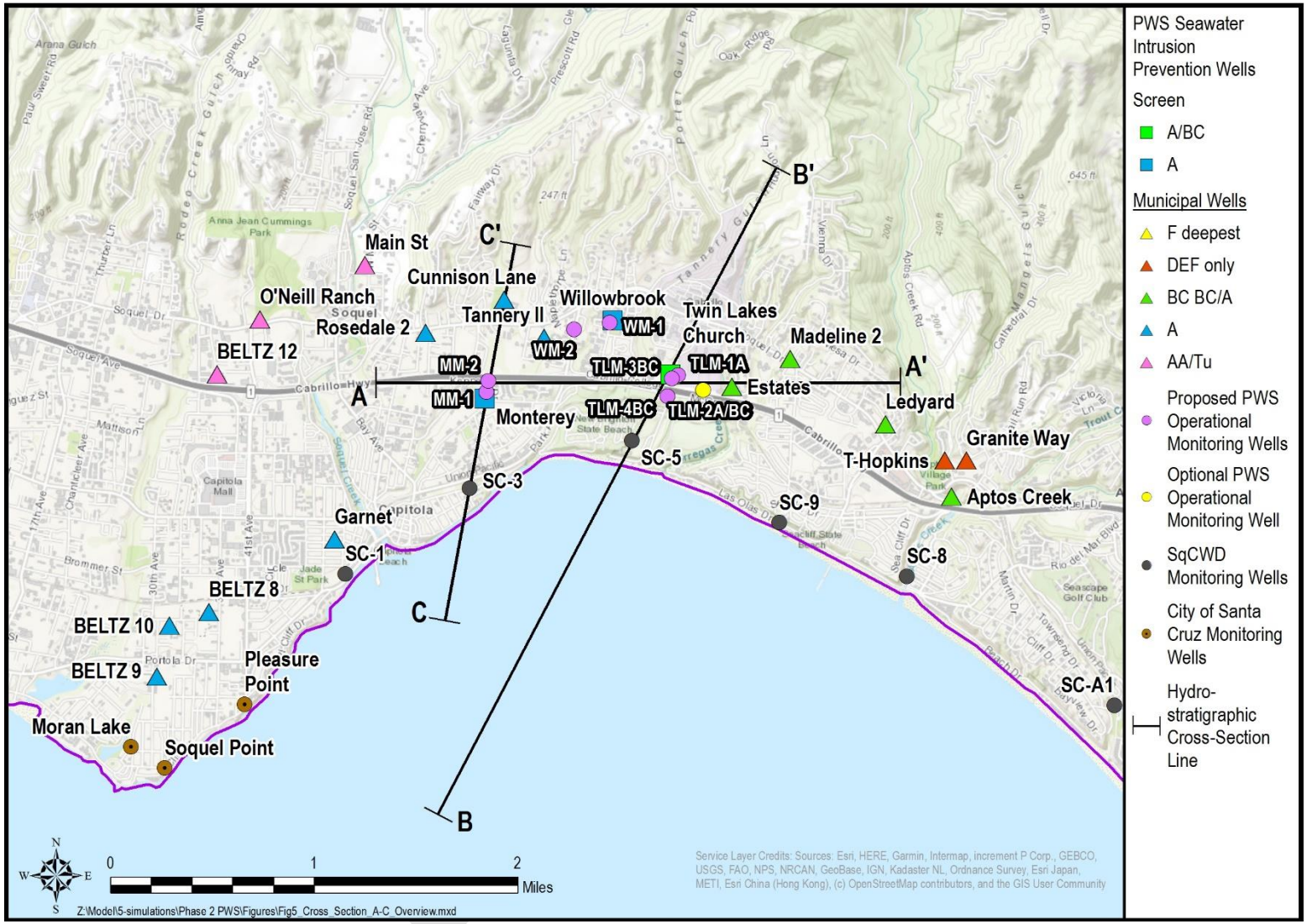

Figure 5. Monitoring Well Locations and Cross-Section Lines

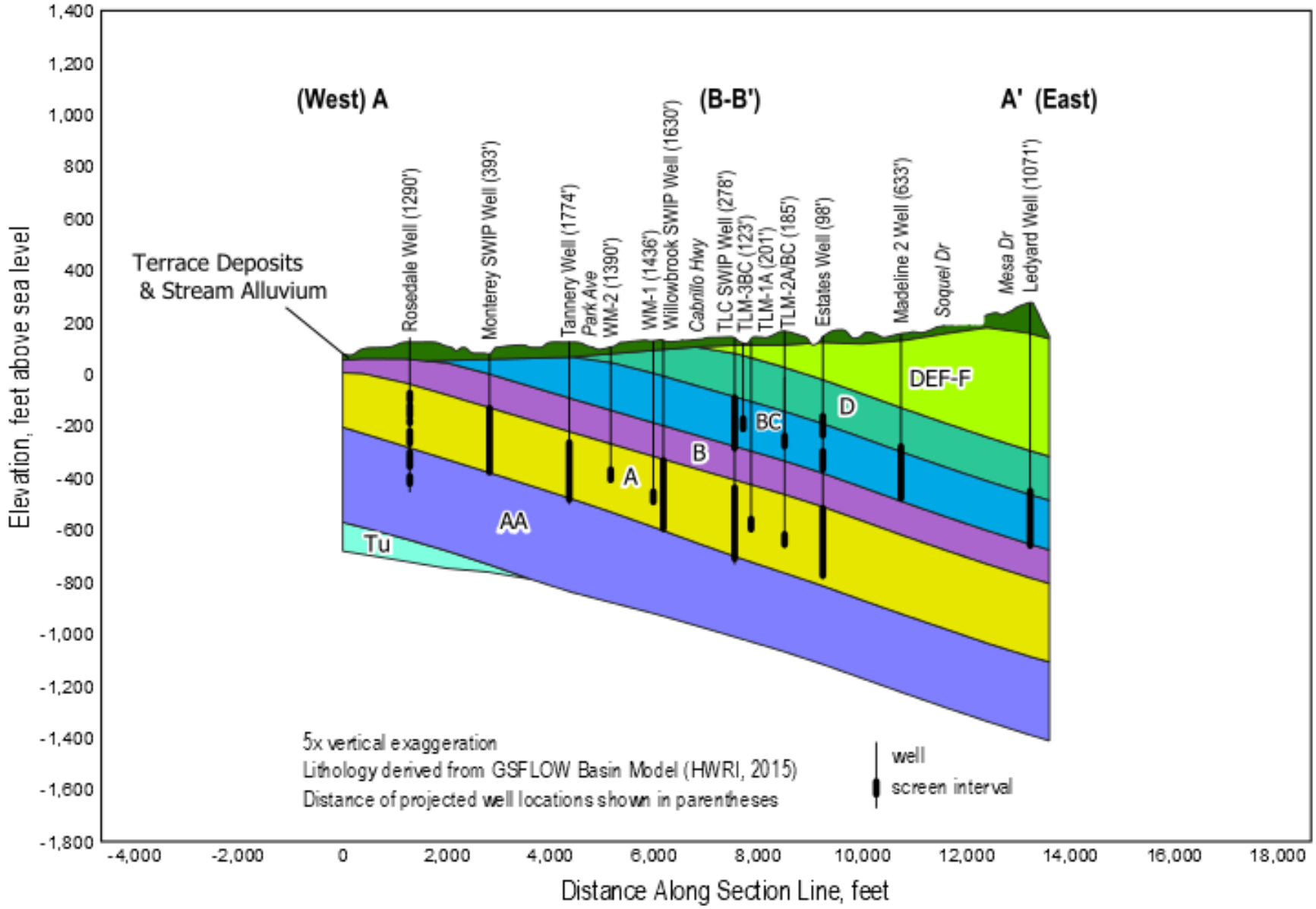

Figure 6. Cross-Section A-A'

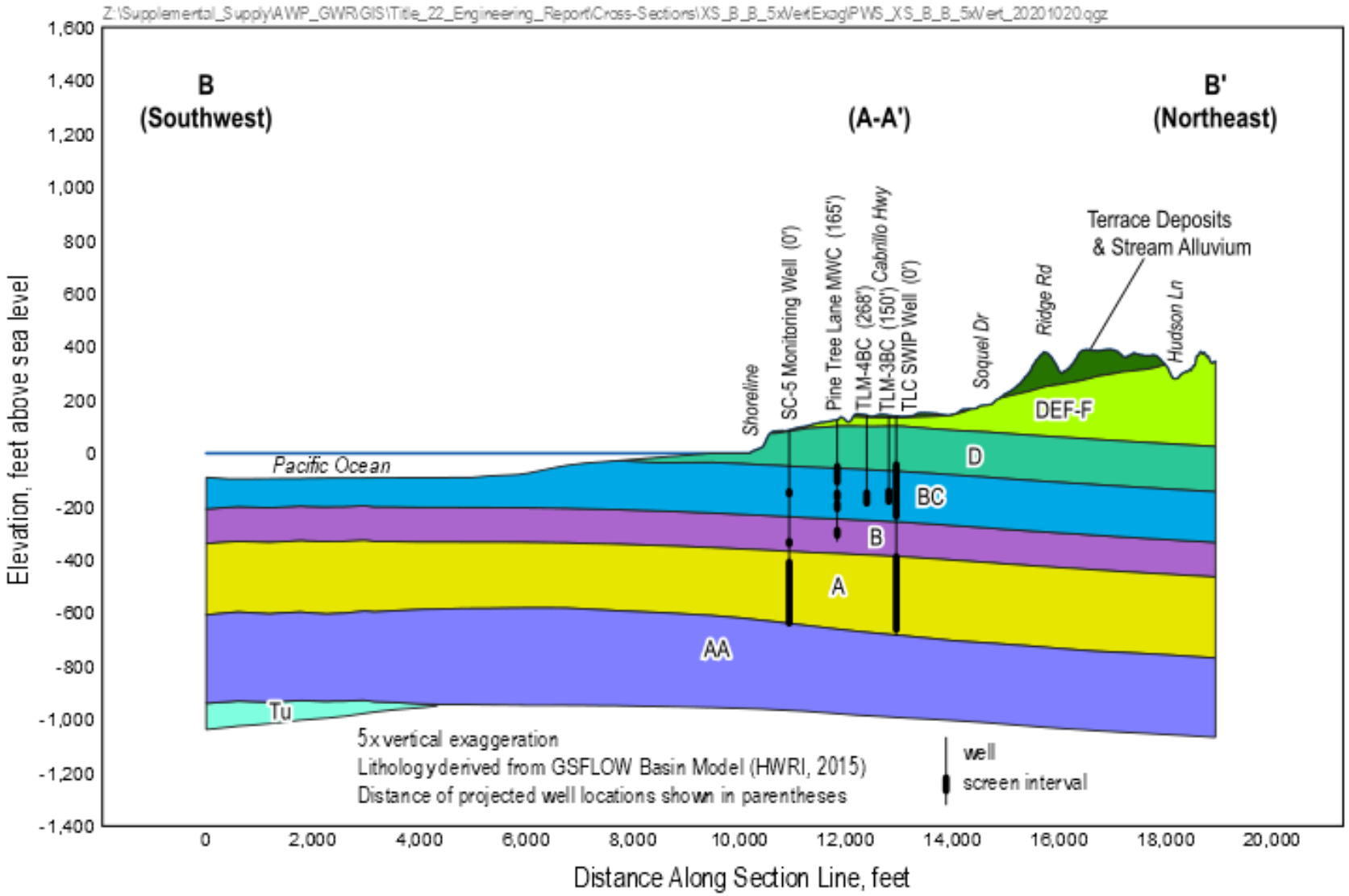

Figure 7. Cross-Section B-B'

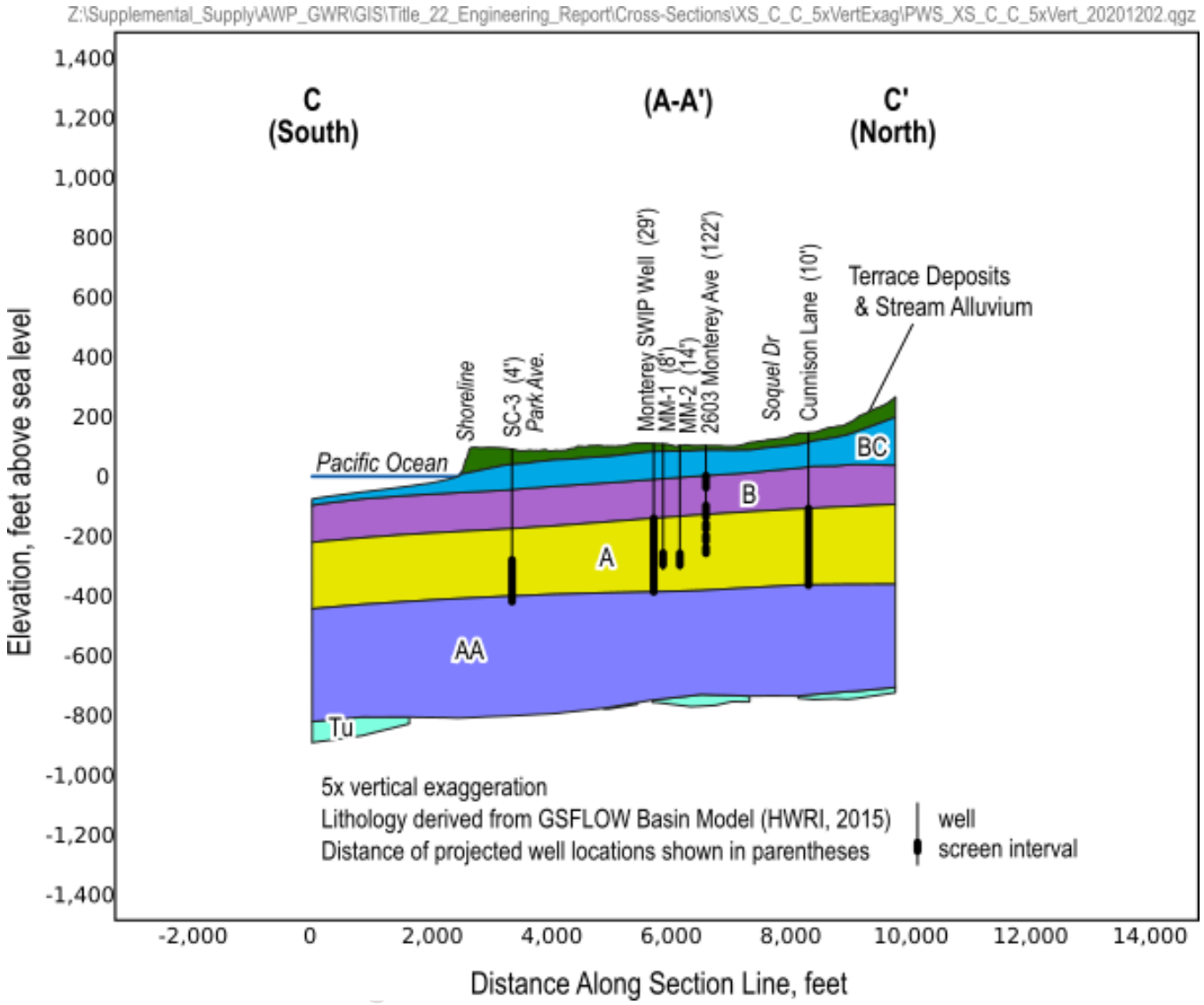

Figure 8. Cross Section C-C'

The three wells southwest of the TLC SWIP well labeled as "Private Wells Shallower than A Unit" in Figure 3 are known to provide potable domestic supply, while the similarly labeled well southwest of the Willowbrook SWIP well is an irrigation well only. The wells labeled as "Private Wells Possibly in A Unit" in Figure 4 are locations identified by Brown and Caldwell (2019) to have wells assumed to provide potable supply for domestic use. However, not all locations have been verified to provide domestic supply.

The underground retention time to the downgradient monitoring wells demonstrated from the tracer study will be used to evaluate whether underground retention times to downgradient drinking water wells meet LRV and RRT requirements. The tracer study additionally will be used to verify the accuracy of the groundwater model and serve as a basis to re-calibrate the groundwater flow model if deemed necessary. The groundwater model can then be used to simulate future variable operating and hydrologic conditions to estimate minimum underground retention time of purified recycled water to the nearest downgradient drinking water wells.

Conceptual monitoring well designs are shown in Table 1 below. Details are based on interpolation of model layer elevations; the actual depth and screened intervals will be determined based on borehole information collected during drilling activities. It is anticipated that each well will include approximately 40 feet of screened interval placed in a highly transmissive portion of the aquifer. This approach is intended to monitor the groundwater with the highest horizontal velocity, as representative of the injection water which arrives soonest following injection. Each monitoring well is anticipated to be 4 inches in diameter and be completed in their own boreholes.

Table 1. Monitoring Well Construction Designs

Monitoring Well Name	**Purisima Unit**	**Unit Top** (ft bgs)	**Unit Bottom** (ft bgs)	**Unit Thickness** (ft)	**Estimated Travel Time** (months unless indicated weeks)
Twin Lakes Church					
TLM-1A	A	554	851	297	9 weeks
TLM-2A	A	643	948	305	32
TLM-2BC[a]	BC	323	513	190	252
TLM-3BC	BC	207	397	190	4
TLM-4BC	BC	191	381	190	94
Monterey					
MM-1	A	259	511	252	5 weeks
MM-2	A	254	505	251	9
Willowbrook					
WM-1	A	454	748	294	4
WM-2	A	354	626	272	46

[a] Monitoring Well TLM-2BC is an optional well that SqCWD is considering. The installation of this well is not required to meet Title 22 regulations.

The tracer study is anticipated to last 12 months. Therefore, the tracer study will evaluate whether monitoring wells are located where travel times are between two weeks and six months as required. The monitoring wells located to meet this requirement based on groundwater flow model results (M&A, 2020a) are the Monterey SWIP monitoring well MM-1 (estimated travel time of five weeks), Willowbrook SWIP monitoring well WM-1 (four months), and TLC SWIP monitoring wells TLM-1A (nine weeks) and TLM-3BC (four months). The tracer study will also evaluate the shortest travel time between a SWIP well and a monitoring well used to calculate RRT in the Title 22 engineering report (B&C, 2020a). The RRT calculation applies 0.25 credit to the shortest travel time of five weeks estimated by the groundwater flow model so 20 weeks is used in the RRT calculation.

Monitoring of the remaining monitoring wells with longer estimated travel times will evaluate whether underground retention times to the nearest drinking water wells are met because these monitoring wells are between the SWIP wells and drinking water wells. If travel times to these monitoring wells exceed 7.5 months, LRV and RRT requirements for underground retention times to the drinking wells are met. The shortest estimated time from a SWIP well to one of these monitoring wells is nine months to Monterey SWIP monitoring well MM-2. MM-2 is between the Monterey SWIP well and the nearest drinking water well to any of the SWIP wells. Particle tracking using the groundwater flow model estimates the underground retention time to this private drinking water well as 33 months (Figure 4).

Anticipated travel times estimated using the groundwater flow model and analytical equations (M&A, 2020a) indicate that tracers may not arrive at certain monitoring wells within the 12-month timeframe, and the absence of tracer appearance may need to be used to verify retention times in certain cases. Those monitoring wells with estimated travel times close to or greater than 12 months (52 weeks) include the proposed Willowbrook SWIP monitoring well WM-2 (46 months), and TLC SWIP monitoring wells TLM-2A (32 months), TLM-2BC (252 months) and TLM-4BC (94 months). Note the values provided in Table 1 are based on particle tracking results where possible, which was completed to 36 months after start of injection. Timelines which exceed 36 months are estimated using analytical equations. If tracer study shows absence of tracer arrival at these monitoring wells as well as MM-2 in 12 months, underground retention times of greater than 7.5 months at the nearest drinking water wells to the SWIP wells will be verified. As shown in Figure 3 and Figure 4, the underground retention times to nearest drinking water wells to the Willowbrook SWIP and TLC SWIP wells are estimated by the groundwater flow model to be greater than 36 months.

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4 TRACER STUDY PROGRAM

As discussed in Section 1.2, the GRRP requirements specify use of an added tracer but provide for testing using an intrinsic tracer with prior approval. A combination of both added and intrinsic tracers will be utilized for the PWS tracer study and include the following:

- Fluorescent dye (added tracer)
- Conductivity and temperature (intrinsic tracers)
- Major ions and total dissolved solids (intrinsic tracers)

This approach is recommended because of the redundancies included and the ability to test both added and intrinsic tracers at the same time. These two types of tracer also provide added data from various stages in the testing program. Passively measuring conductivity and temperature, and regular sampling for major ions and total dissolved solids, can begin prior to injection start-up to assess influences on monitoring wells as compared to background conditions. Fluorescent dye, by contrast, is added after injection has been continued for sufficient time to establish a steady-state flow field.

4.1 Purified Water Chemistry

The Chanticleer advanced water purification facility is not yet constructed and water chemistry of purified water samples from it are therefore not yet available. However, soil leaching evaluations (B&C, 2020c) utilized samples collected from three existing advanced purified water facilities as potentially representative of expected purified water chemistry from the Chanticleer facility. These data, adapted from the referenced report, are summarized in Table 2 below.

Table 2. Water Quality from Advanced Water Purification Facilities (AWPF)

Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF3 (mg/L)
pH (std. units)	8.0	7.9	7.9
Total Alkalinity	199	42	41.5
Bicarbonate as HCO_3	199	42	41.5
Carbonate as $CaCO_3$	<2	<2	<2
Aluminum	<0.05	<0.05	<0.05
Antimony	<0.0008	<0.0008	<0.0008
Arsenic	<0.0004	<0.0004	<0.0004
Barium	0.008	0.007	0..007
Beryllium	<0.0002	<0.0002	<0.0002
Boron	0.24	0.2	0.23
Cadmium	<0.0001	<0.0001	<0.0001
Calcium	71.3	13.7	<0.1
Chloride	10	4.2	3.5

DRAFT

Analyte (mg/L)	AWPF1 (mg/L)	AWPF2 (mg/L)	AWPF3 (mg/L)
Chromium	<0.001	<0.001	<0.001
Copper	0.08	<0.01	<0.01
Fluoride	0.3	<0.1	0.2
Iron	<0.03	<0.03	<0.03
Lead	<0.0002	<0.0002	<0.0002
Magnesium	1	<0.2	<0.2
Manganese	0.03	<0.01	<0.01
Mercury	<0.0002	<0.0002	<0.0002
Molybdenum	< 0.02	< 0.02	< 0.02
Nickel	<0.008	<0.008	<0.008
Potassium	1	0.4	0.5
Selenium	<0.0002	<0.0002	<0.0002
Silica	1.7	0.3	<0.2
Silver	<0.0002	<0.0002	<0.0002
Sodium	8.2	4.5	17.7
Strontium	0.195	<0.009	<0.009
Sulfate	<1	<1	<1
Thallium	<0.0002	<0.0002	<0.0002
Uranium	<0.0002	<0.0002	<0.0002
Zinc	0.01	<0.01	<0.01

These samples were used to evaluate potential tracer testing approaches in lieu of Chanticleer advanced water purification facility samples.

4.2 Aquifer Chemistry

As stated previously, tracer testing is applicable to two aquifers as a result of TLC SWIP well construction. These include the Purisima BC (shallower) and Purisima A (deeper) aquifers. The TLC pilot well construction included isolated aquifer zone sampling of the pilot borehole, with one sample collected from the Purisima BC and two from the Purisima A. The results of these isolated aquifer sone samples are included alongside water quality results from nearby production wells in the below Table 3.

Table 3. Water Quality from TLC Isolated Aquifer Zone Sampling and Nearby Production Wells

Analyte (mg/L)	Unit	MCL	Zone 1 (A Unit)	Zone 2 (A Unit)	Zone 3 (BC Unit)	Monterey Well (A Unit)	Tannery 2 Well (A Unit)	Estates Well (A and BC Unit)
Date Sampled			2/28/19	3/4/19	3/7/19	10/20/04	10/15/19	10/23/19
pH (Laboratory)	pH units	-	7.6	7.7	8.8	8.1	7.5	7.7
Alkalinity, Total (as $CaCO_3$)	mg/L	-	289	230	145	250	252	243

Analyte (mg/L)	Unit	MCL	Zone 1 (A Unit)	Zone 2 (A Unit)	Zone 3 (BC Unit)	Monterey Well (A Unit)	Tannery 2 Well (A Unit)	Estates Well (A and BC Unit)
Bicarbonate (as HCO_3)	mg/L	-	353	281	177	250 (2/12/04)	307	296
Carbonate (as $CaCO_3$)	mg/L	-	<10	<10	<10	<1	<1 (10/27/09)	<1 (10/21/09)
Hydroxide	mg/L	-	<0.010	<0.010	<0.010	<1 (2/12/04)	<1 (10/27/09)	<1 (10/21/09)
Hardness (as $CaCO_3$)	mg/L	-	307	185	32	300	313	222
Dissolved Arsenic	mg/L	0.01	0.0005	<0.0005	0.0014	---	---	---
Total Arsenic	mg/L	0.01	0.0006	0.0006	0.0013	<0.002	0.0006	<0.0005
Calcium	mg/L	-	89	55	11	84	91	62
Chloride	mg/L	250[a]	48	54	60	62	63.7	48.2
Chromium VI	mg/L	-	<0.00005	<0.00005	<0.00005	0.002 (10/7/03)	<0.001 (5/25/04)	<0.005 (8/7/02)
Total Copper	mg/L	1[a]	<0.010	<0.010	<0.010	<0.050	<0.005	<0.005
Fluoride	mg/L	2[a]	0.3	0.2	0.1	0.4	0.3	0.3
Dissolved Iron	mg/L	0.3[a]	0.057	0.046	0.023	---	---	---
Total Iron	mg/L	0.3[a]	0.224	0.157	0.356	0.3	0.227	0.2
Magnesium	mg/L	-	20	12	1	21	20.8	16.4
Dissolved Manganese	mg/L	0.05[a]	0.223	0.048	<0.003	---	---	---
Total Manganese	mg/L	0.05[a]	0.234	0.047	<0.010	0.25	0.152	0.096
Nitrate as N	mg/L	10	<0.1	<0.1	0.1	---	<0.01	0.1
Potassium	mg/L	-	8.4	5.9	2.4	8	7.4	6.7
Sodium	mg/L	-	69	104	193	64	61	78
Sulfate	mg/L	250[a]	96	110	227	100	114	74
Total Dissolved Solids (TDS)	mg/L	500[a]	572	554	618	550	496	500
Total Zinc	mg/L	5*	0.015	<0.010	<0.010	<0.050	<0.010	<0.010

[a] = secondary MCL

These samples were contrasted with the above advanced water purification facility samples to evaluate tracer testing options.

4.3 Added Tracer

4.3.1 Fluorescent Dye

Fluorescent dyes are relatively low-cost tracers with low toxicity and the ability to be detected at concentrations in the parts per billion range. They are added to the injected water stream at the start of the test and monitored in the surrounding monitoring wells, commonly with charcoal samplers which are placed in the wells for continuous sampling. The monitoring program will involve collection of samples from wells on a pre-prescribed basis, detailed below, and shipment

DRAFT

to the appropriate laboratory. The fluorescent dye planned for the study is fluorescein, a yellow green dye with moderately low absorption rates.

4.4 Intrinsic Tracers

4.4.1 Conductivity and Temperature

Conductivity and temperature are both inexpensively measured at a high data collection frequently using down-well dataloggers. Purified water injected into the SWIP wells is anticipated to have a significantly lower conductivity than the groundwater, making conductivity an inexpensive and potentially effective tracer. Temperature as a tracer has the potential to be problematic but has proven to be useful in many applications and is collected with the same datalogger as conductivity. Water levels will additionally be measured in the same datalogger.

4.4.2 Major Ions and Total Dissolved Solids

As presented above, the anticipated inorganic ion concentrations are expected to be significantly lower in the purified injected water (Table 2) as compared with the groundwater (Table 3). These ion concentrations can therefore be used as what are commonly termed inverse ionic tracers, where the concentration in the injection water is lower than that of the receiving water. Presence of purified water will be based on reduction of inorganic ion concentrations in samples from monitoring wells. Several ions may prove useful, but it is expected sulfate and chloride will provide ideal tracers. The specific intrinsic tracers will be submitted with the work plan.

DRAFT

5 TRACER STUDY IMPLEMENTATION

Implementation of the tracer studies will include both background and injection phase sampling. It is anticipated that tracer studies for all three wells will begin at the same time; however, individual wells may be on different schedules as PWS overall project construction progresses. The schedules and procedures outlined below will be followed regardless of start-up date for individual wells.

5.1 Background Sampling

Background data will provide the basis for comparison with data collected after injection of advanced purified water begins. The monitoring wells will be installed at least a year in advance of the tracer study and sampled quarterly for major ions and total dissolved solids. Down-well dataloggers will be deployed in the monitoring wells at installation. Dataloggers deployed in each monitoring well will monitor background conductivity, temperature, and groundwater levels. It is anticipated non-vented In-Situ AquaTROLL 200 dataloggers will be used and monitoring frequency will be set to a 6-hour interval. Pressure transducers will also be deployed in the SWIP wells to record groundwater levels at a 6-hour frequency. Barometric compensation will be accomplished with a centrally located BaroTROLL barometer.

In addition to quarterly sampling of the monitoring wells after well installation, three rounds of background sampling will be completed in all nine monitoring wells prior to PWS program start-up to collect data on background groundwater conditions. Three groundwater sampling events will be performed at all nine wells consistent with the sampling methodology discussed below. It is anticipated these events will occur biweekly, though that may change based on overall project schedule. Sampling will include background fluorescence (charcoal and water sample), major ions, and total dissolved solids. Three samples will also be collected from representative advanced purified water and analyzed for the same constituents listed above, excluding charcoal sampling.

5.2 Implementation Schedule

Tracer studies are required to begin within three months of the onset of injection at each SWIP well. Implementation of tracer studies with both added and intrinsic tracers will occur after PWS recharge begins but the added and intrinsic tracer studies will have different starting points.

The intrinsic tracer will begin at the same time injection starts for a given well. Dataloggers will remain deployed following the background sampling effort; monitoring well dataloggers will maintain a logging frequency of 6 hours, and pressure transducers in SWIP wells will be adjusted

DRAFT

to a 1-hour logging frequency as fluctuations in water level are expected to be greater in the SWIP wells than monitoring wells.

The added tracer program will begin at the time fluorescein dye is added to the injection stream for each well. Fluorescein dye will be added as one pulse injection when steady-state has been achieved at each well. Instantaneous, in this case, simply indicates the application period of the pulse injection will last minutes or hours and therefore is short in duration in comparison to the rest of the test. Injection will be considered steady-state when injection rate has stabilized to within +/-5% of the target for a period of 12 hours and the water level in the nearest monitoring well fluctuates by less than 1-foot for a period of not less than 6 hours (with hourly measurements).

5.3 Sampling Frequency and Logic

As shown in Table 1, expected arrival times to monitoring wells vary widely, with the closest monitoring wells expecting to see purified water within weeks and the farthest wells not expecting arrival of tracer for purified for several years. The sampling frequency reflects these arrival variations.

Sampling for the added tracer includes sampling of water samples and charcoal samplers. Water samples are grab samples that provide results specific to the sample time so it is possible that the water samples may miss the pulse of added tracer as it passes. As the charcoal sampler is placed in wells continuously, the sampler provides cumulative results that will detect arrival of the added tracer that water samples may miss. Sampling for the intrinsic tracer will be for water samples but as intrinsic tracer is in all recharged purified water, periodic water samples should detect the tracer.

Private domestic wells or municipal supply wells may be added to this program as appropriate and sampled for intrinsic or added tracers accordingly.

5.3.1 Purisima A Aquifer Unit

Two monitoring wells will be installed downgradient from each SWIP well with screened intervals in the Purisima A unit. The nearest of these monitoring wells at each site represents the fastest anticipated relative arrival time of purified water, including nine weeks at TLC (TLM-1A), five weeks at Monterey (MM-1) and four months at Willowbrook (WM-1). Arrival times at the farther monitoring wells for each SWIP well are anticipated to be much longer, including 32 months at TLC (TLM-2A), eight months at Monterey (MM-2) and 51 months at Willowbrook (WM-1).

DRAFT

5.3.1.1 Added Tracer

Active sampling for fluorescein dye will include the following:

- Sampling of only inner wells TLM-1A, MM-1 and WM-1 weekly from start to week 20 to evaluate whether retention time to all wells is at least 2 weeks and whether retention time is less than 20 weeks used for response retention time calculation based on applying 0.25 credit to modeled five weeks from Monterey SWIP well to MM-1.
- Sampling of all six wells semi-monthly for months 5-8 to ensure inner wells have retention time of less than 6 months and to evaluate whether outer wells and therefore nearest drinking water wells have retention time greater than response retention time of 7.5 months.
- Sampling of all six wells monthly for months 9-12 (end of test).

Sampling will include both charcoal and water sample collection, described in later sections. This sampling program is estimated based on calculated arrival times, but sampling of outer wells will begin when fluorescein dye is detected in the corresponding close well if prior to 12 weeks.

5.3.1.2 Intrinsic Tracer

Each of the six monitoring wells will have a datalogger passively recording conductivity, temperature, and water level on 6-hour intervals throughout the 12-month testing period. This monitoring for intrinsic tracers will continue uninterrupted. Sample collection for analysis of major ions and total dissolved solids will occur at a frequency to match sampling of the added tracer.

Downloading of datalogger data will be performed at each sampling event. This sampling program is estimated based on expected arrival times, but sampling of outer wells will begin sooner if dataloggers indicate a change in the corresponding close well.

5.3.2 Purisima BC Aquifer Unit

Three monitoring wells will be installed in the Purisima BC unit near the TLC well. The nearest of these monitoring wells, TLM-3BC, represents the fastest anticipated relative arrival time of purified water at approximately seven months. Monitoring wells TLM-2BC and TLM-4BC have anticipated arrival times of 94 and 252 months, respectively, both of which are beyond the 12-month duration of this tracer study.

5.3.2.1 Added Tracer

Active sampling for fluorescein dye will include the following:

- Sampling of well TLM-3BC:
    - weekly for weeks 1-4 to evaluate whether retention time to this well is at least 2 weeks.
    - monthly for months 2 to month 12 to evaluate whether retention time to this well is less than 6 months.
- Sampling of wells TLM-2BC and TLM-4BC
    - semi-monthly until month 8 from the first dye detection in TLM-3BC if detection is at month 7 or earlier to evaluate whether outer wells and therefore nearest drinking water wells in the Purisima BC unit have retention time greater than response retention time of 7.5 months.
    - monthly from month 8 to month 12

Sampling will include both charcoal and water sample collection, described in later sections.

5.3.2.2 Intrinsic Tracer

Each of the three monitoring wells will have a datalogger passively recording conductivity, temperature, and water level on 6-hour intervals throughout the 12-month testing period. This monitoring for intrinsic tracers will continue uninterrupted. Sample collection for analysis of major ions and total dissolved solids will occur at frequency to match sampling of added tracer.

5.3.3 Long-Term Monitoring

In consideration of the long travel times anticipated for some of the monitoring wells, dataloggers will remain in all nine monitoring wells for an additional nine years following the completion of the 12-month tracer study, for a total of 10 years. Data collection frequency will be reduced from 6 hours to 24 hours and will be retrieved and reviewed quarterly for indication of the arrival of purified water or changes to groundwater quality at locations where purified water has already arrived.

5.4 Sampling Methodology

Sampling methodology and procedures will be detailed in a sampling and analysis plan but are described in general here. When multiple types of samples are to be collected from a monitoring well during the same visit the following order of operations will be observed:

1. Manual measurement of depth to water
2. Download of datalogger data

DRAFT

3. Collection of charcoal sampler and fluorescein dye water sample
4. Collection of major ions and total dissolved solids sample

5.4.1 Fluorescein dye

Dye sampling will be completed using charcoal samplers and water samples. All sampling equipment will be provided by the laboratory and handled according to their recommendations. Charcoal samples are deployed in the water column and left for the duration of time between sampling events. Water samples are collected at the same time as collection of the charcoal sampler using the dedicated pump.

5.4.2 Conductivity and Temperature

Measurements of conductivity, temperature, and water level are passively measured with the deployed dataloggers. Data will be downloaded each time the well is visited for sample collection. At the time of download, a manual water level measurement will be collected and the datalogger will be examined to ensure appropriate battery and memory remain.

5.4.3 Major Ions and Total Dissolved Solids

Sampling for major ions and total dissolved solids will be completed through SqCWD's standard low-flow purge sampling methods. Samples will be retained in laboratory supplied containers.

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DRAFT

7 ACRONYMS & ABBREVIATIONS

AWPF .....Advanced Water Purification Facilities
B&C .....Brown and Caldwell
CCR.....California Code of Regulations
DDW .....California Division of Drinking Water
ft bgs.....Feet Below Ground Surface
GRRP .....Groundwater Replenishment Reuse Program
LRV.....log-reduction value
M&A .....Montgomery and Associates
mg/L .....Milligram per Liter
PWS .....Pure Water Soquel
RRT.....response retention time
SCWWTF .....Santa Cruz Wastewater Treatment Facility
SqCWD .....Soquel Creek Water District
SWIP .....Seawater Intrusion Prevention
SWRCB.....State Water Resources Control Board
TDS .....Total Dissolved Solids
TLC .....Twin Lakes Church

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Appendix I: Injection Well Site Typical Process and Instrumentation Diagram

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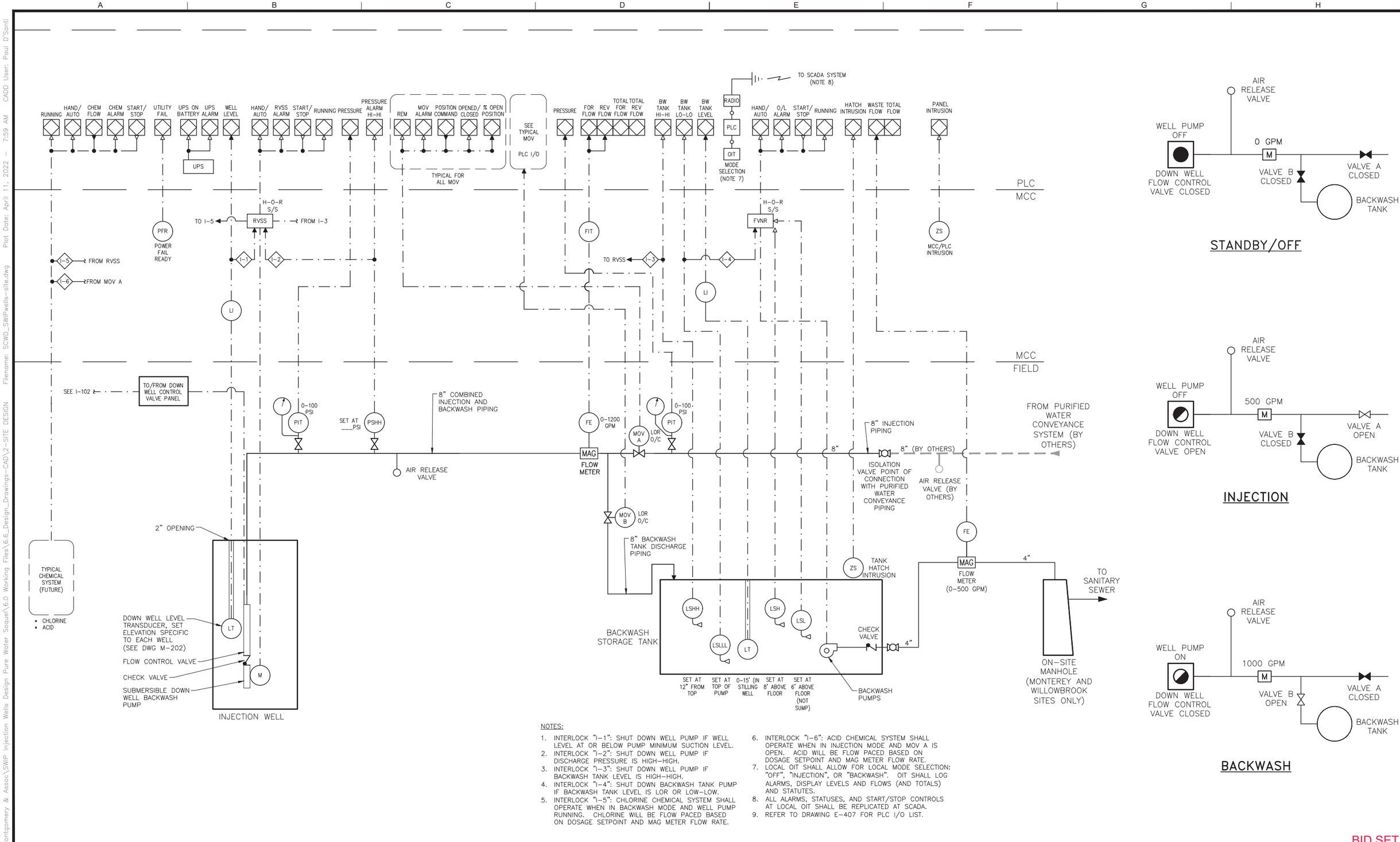
Path: W:\3.0 Projects\Montgomery & Assoc\SWIP Injection Wells Design Pure Water Soquel\6.0 Working Files\6.6_Design_Drawings-CAD\2-SITE DESIGN Filename: SCWD_SWIPwells-site.dwg Plot Date: April 11, 2022 - 7:59 AM CADD User: Paul D'Santi



NOTES:

1. INTERLOCK "I-1": SHUT DOWN WELL PUMP IF WELL LEVEL AT OR BELOW PUMP MINIMUM SUCTION LEVEL.
2. INTERLOCK "I-2": SHUT DOWN WELL PUMP IF DISCHARGE PRESSURE IS HIGH-HIGH.
3. INTERLOCK "I-3": SHUT DOWN WELL PUMP IF BACKWASH TANK LEVEL IS HIGH-HIGH.
4. INTERLOCK "I-4": SHUT DOWN BACKWASH TANK PUMP IF BACKWASH TANK LEVEL IS LOR OR LOW-LOW.
5. INTERLOCK "I-5": CHLORINE CHEMICAL SYSTEM SHALL OPERATE WHEN IN BACKWASH MODE AND WELL PUMP RUNNING. CHLORINE WILL BE FLOW PACED BASED ON DOSAGE SETPOINT AND MAG METER FLOW RATE.
6. INTERLOCK "I-6": ACID CHEMICAL SYSTEM SHALL OPERATE WHEN IN INJECTION MODE AND MOV A IS OPEN. ACID WILL BE FLOW PACED BASED ON DOSAGE SETPOINT AND MAG METER FLOW RATE.
7. LOCAL OIT SHALL ALLOW FOR LOCAL MODE SELECTION: "OFF", "INJECTION", OR "BACKWASH". OIT SHALL LOG ALARMS, DISPLAY LEVELS AND FLOWS (AND TOTALS) AND STATUTES.
8. ALL ALARMS, STATUSES, AND START/STOP CONTROLS AT LOCAL OIT SHALL BE REPLICATED AT SCADA.
9. REFER TO DRAWING E-407 FOR PLC I/O LIST.

BID SET

REV	DATE	BY	DESCRIPTION

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED MJG
DRAWN PMD
CHECKED JWL
SCALE AS NOTED

PREPARED BY:
MICHAEL GOYMERAC, RCE No.: C84894
DATE

REGISTERED PROFESSIONAL ENGINEER MICHAEL JAMES GOYMERAC NO. C84894 Exp. 3/31/24 CIVIL STATE OF CALIFORNIA

WSC
805 AEROVISTA PLACE, SUITE 201
SAN LUIS OBISPO, CA 93401
PHONE: (805) 457-8833 FAX: (805) 888-2764

SOQUEL CREEK WATER DISTRICT
P.O. BOX 158
SOQUEL, CA 95073
PHONE: (831) 475-8500
FAX: (831) 475-4291

APPROVED:
4/8/2022
TAJ DUFOUR, PE – ENGINEERING MANAGER/CHIEF ENGINEER DATE

SEAWATER INTRUSION PREVENTION - CWO 20-3000
WELL SITE EQUIPPING AND DEVELOPMENT

INJECTION WELL SITE TYPICAL P&ID

DRAWING
I-101
SHEET 71 OF 72
PROJECT # –

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