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ANNUAL GROUNDWATER MONITORING REPORT FOR 2022

COLORADO SPRINGS UTILITIES' CLEAR SPRING RANCH
Coal Combustion Residuals Landfill
El Paso County, Colorado

January 31, 2023

Prepared For:
40 CFR Part 257.90(e)
and
Colorado Department of Public Health and Environment
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1.0 EXECUTIVE SUMMARY

During the 2022 reporting period, Colorado Springs Utilities' (Utilities') Clear Spring Ranch (CSR) Coal Combustion Residuals (CCR) Landfill was operating pursuant to the assessment monitoring program set forth in 40 CFR §257.95. The landfill entered assessment monitoring in 2018.

During 2022, the following monitoring wells were determined to have a statistically significant increase over background for the following EPA CCR Rule Appendix III constituents pursuant to 40 CFR §257.94(e):

- Boron within monitoring wells SC-11 and SC-12
- Fluoride within monitoring wells SC-12 and SC-13

As previously reported in the Annual Groundwater Monitoring Report for 2021, EPA CCR Rule Appendix IV constituent selenium was measured in downgradient well SC-10 at a statistically significant level exceeding the Groundwater Protection Standards (GWPS) during the second semi-annual (2021) sampling event. Utilities completed an Alternate Source Demonstration in April 2022, in accordance with §257.95(g)(3)(ii). During 2022, no EPA CCR Rule Appendix IV constituents were measured at a statistically significant level exceeding the GWPS.

2.0 INTRODUCTION

This annual report summarizes the groundwater monitoring activities performed during 2022 in association with the CCR Landfill at Utilities' CSR. The landfill is located west-southwest of the intersection of Interstate 25 and Ray Nixon Road (Exit 125) in El Paso County, Colorado. CCR from Utilities' Ray Nixon Power Plant is placed in the landfill. CCR from Utilities' Martin Drake Power Plant was being placed in the landfill; however, the Martin Drake Power Plant ceased operation of its coal-burning units in Fall 2021 and CCR is no longer being generated at this power plant.

The CCR Landfill is regulated by the U.S. Environmental Protection Agency (EPA), the Colorado Department of Public Health & Environment (CDPHE), and El Paso County. The land-use is authorized via a Certificate of Designation (CD) obtained from El Paso County (CD #004-001).

The groundwater monitoring activities were performed for compliance with the EPA's Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (40 CFR §257.50 through §257.107) (EPA CCR Rule) and the CDPHE's Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1, Section 2.2 - Ground Water Monitoring).

The groundwater monitoring activities were conducted in general accordance with the Coal Combustion Residuals Landfill Groundwater Detection Monitoring Plan (AECOM 2017). This Monitoring Plan was approved by the CDPHE on November 14, 2017 (CDPHE 2017).

This report fulfills the EPA's, CDPHE's, and El Paso County's annual reporting requirements.

2.1 Groundwater Classification and Management

From its inception in the late 1970's, the CCR Landfill has been designed and operated to protect the Fountain Creek Alluvial Aquifer, which is the closest aquifer to the site used for drinking water purposes. The CCR Landfill is located approximately 0.5 miles upgradient of a Retention Dam, described below. The

Fountain Creek Alluvial Aquifer is located approximately 0.5 miles downgradient of the Retention Dam. There are no drinking water or agricultural wells within the CD Area, in which the CCR Landfill is located. To protect the Fountain Creek Alluvial Aquifer, groundwater associated with the CCR Landfill is managed via a Retention Dam and pump back system. The Retention Dam was constructed downgradient of the CCR Landfill in 1978 to inhibit the off-site migration of surface water and groundwater. The dam has a bentonite core and is keyed into the underlying Pierre Shale bedrock. To improve the dam's performance, in the 1990s, Utilities installed a bentonite barrier wall along the upgradient toe of the dam, and a french drain and pump back system downgradient of the dam. The french drain captures water seepage through the dam. The drain extends for approximately 525 feet along the southern portion of the dam. The french drain's collection trench is gravel filled and slopes towards a sump located at the northern end of the trench. An extraction well and pump remove water collected in the sump and pump it back to the upgradient Retention Dam pond. The dam is registered with and inspected by the Office of the State Engineer - Division of Water Resources - Dam Safety Branch (Dam I.D. #100401). A site plan is presented in Appendix A.

3.0 GROUNDWATER FLOW ANALYSIS AND GEOLOGIC PROFILE

The CCR Landfill is located within a small, west-east trending topographic depression that is underlain with, and bounded to the north and south, by Pierre Shale. An investigation of CSR involving laboratory hydraulic conductivity tests on cores of un-weathered Pierre Shale indicated that the Pierre Shale is essentially impermeable (Haley & Aldrich 1994). The surficial geology consists of approximately 4 to 50 feet of alluvial sediments deposited on top of the Pierre Shale (Layne Western 1977).

The alluvial sediments overlying the Pierre Shale formation include the Piney Creek, Broadway, Louviers, and Slocum Alluviums. The alluvium is concentrated in low areas and drainages with Pierre Shale generally present near the ground surface ridges. The groundwater bearing matrix generally consists of silt, sand, clay, gravel, sandy clay, silty sand, sand with silt, clayey gravel, and sand with clay. Most of this alluvium is poorly-sorted and fine-grained with silt-sized materials predominating. The exploratory boreholes and monitoring wells installed to date suggest that groundwater does not occur as a continuous saturated zone beneath the CD area. It is localized along the historic and current ephemeral channels with little to no groundwater present on the bedrock ridges that border the site (Haley & Aldrich 1995).

Groundwater elevation measurements collected the week of October 24, 2022, were used to interpolate a potentiometric groundwater surface, which is depicted within Appendix A – Figure 2. The groundwater surface data suggests that groundwater beneath the CCR Landfill generally flows in an east / southeasterly direction towards the Retention Dam.

4.0 GROUNDWATER QUALITY SAMPLING AND ANALYSIS

As detailed in the CCR Landfill Groundwater Detection Monitoring Plan, the current groundwater quality monitoring well network for the CCR Landfill is comprised of five background wells (CC-1, FC-1, FC-2, FC-3A, & FC-3B), four downgradient wells (SC-10, SC-11, SC-12, & SC-13) along the eastern edge of the landfill, and one cross gradient well (SC-14) on the south side of the landfill. Two rounds of semi-annual Appendix III Detection Monitoring and Appendix IV Assessment Monitoring groundwater samples were collected from these wells in March 2022 and September 2022. The locations of the monitoring wells are depicted within Appendix A – Figure 2.

Groundwater samples were collected in general accordance with the 2017 CCR Landfill Groundwater Detection Monitoring Plan. The monitoring wells were purged using dedicated bladder pumps with tubing; after which, the groundwater samples were collected from the discharge tube of the bladder pump directly into laboratory-supplied sample containers. The sample containers were then labeled and placed into an insulated ice-chilled sample cooler. Samples were hand delivered to the analytical laboratory.

In 2018, Utilities' CCR Landfill migrated from Detection Monitoring to Assessment Monitoring. Assessment Monitoring is required whenever a statistically significant increase over background levels has been detected for one or more of the Detection Monitoring constituents. Assessment Monitoring must continue until concentrations of all Detection and Assessment Monitoring constituents are determined to be at or below background values using statistical procedures for two consecutive sampling events.

Boron and fluoride have been measured at concentrations estimated statistically as being significantly higher than background and have not been determined to be at or below background values using statistical procedures for two consecutive sampling events. Therefore, both Detection Monitoring and Assessment Monitoring continued throughout 2022.

4.1 Detection Monitoring

During 2022, Utilities collected groundwater samples semi-annually from the monitoring wells listed in Section 4.0 above and analyzed the samples using EPA and/or industry accepted methods for the Detection Monitoring constituents listed in Appendix III of the EPA CCR Rule (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids). The laboratory analytical results and sampling dates are summarized in the table presented in Appendix B. Copies of the analytical reports and chain of custody documentation are presented in Appendix C.

4.2 Assessment Monitoring

During 2022, Utilities collected groundwater samples semi-annually from the monitoring wells listed in Section 4.0 above and analyzed the samples using EPA and/or industry accepted methods for the Assessment Monitoring constituents listed in Appendix IV of the EPA CCR Rule (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, radium 226 + 228, selenium, and thallium). The laboratory analytical results and sampling dates are summarized in the table presented in Appendix B. Copies of the analytical reports and chain of custody documentation are presented in Appendix C.

4.3 Quality Assurance / Quality Control

Quality assurance and quality control (QA/QC) measures were implemented to ensure the reliability and validity of field and analytical data. Appendix C contains copies of the laboratory analytical reports along with QA/QC data. The QA/QC data includes duplicate samples (identified as Well ID Duplicate), equipment / decontamination blanks (identified by Equip-Blk), method blanks (identified as LRB – Lab Reagent Blank), matrix spike sample results, and laboratory control sample results.

The equipment blanks were collected using laboratory-provided distilled water. Analytes were not detected in the equipment blank samples. During the March 2022 sampling event a duplicate sample was collected from monitoring well SC-11, and during the September 2022 sampling event a duplicate sample was collected from monitoring well SC-12.

Utilities reviewed the analytical results for laboratory QC samples. Review included chain-of-custody record and laboratory-receipt form to verify custody, sample holding-times were met, and samples were properly handled from collection through laboratory analysis. Utilities verified that the laboratory reporting limits for analytes were below applicable regulatory limits (MCL and CCR Rule standards). Laboratory quality control activities were included and are discussed in the Appendix C laboratory report case narratives. Significant QA/QC anomalies were not identified, and all data was determined to be useable.

4.4 Monitoring Well Installation, Repair, and Abandonment

In November 2022, Utilities initiated additional activities as a result of the CCR Landfill ASD for Selenium. Activities included installation of three additional background groundwater monitoring wells. The additional activities are described in the attached August 9, 2022, *Additional Information* letter, reviewed and accepted by the CDPHE on August 10, 2022, see Appendix F. No CCR landfill monitoring wells were repaired or abandoned in 2022.

5.0 STATISTICAL ANALYSIS RESULTS SUMMARY

The methods used to statistically analyze the Detection and Assessment Monitoring groundwater data, the rationale for the analytical methods, and the results of the 2022 statistical analysis are presented in Appendix D.

The 2022 groundwater sampling results suggest that the following EPA CCR Rule Appendix III constituents are present at concentrations estimated as being a statistically significant increase above background:

- Boron within monitoring wells SC-11 and SC-12
- Fluoride within monitoring wells SC-12 and SC-13

As previously reported in the Annual Groundwater Monitoring Report for 2021, EPA CCR Rule Appendix IV constituent selenium was measured in downgradient well SC-10 at a statistically significant level exceeding the Groundwater Protection Standards (GWPS) during the second semi-annual (2021) sampling event. Utilities completed an ASD in April 2022. The ASD concluded that the 2021 elevated concentrations of selenium in well SC-10 are due to background conditions and not related to the presence or operation of the CCR Landfill. The ASD is included as Appendix E.

During 2022, no EPA CCR Rule Appendix IV constituents were measured at a statistically significant level exceeding the GWPS.

6.0 GROUNDWATER PROTECTION STANDARDS (GWPS)

GWPS were established in accordance with §257.95(d)(2) of the EPA CCR Rule. The Rule states in §257.95(h) that the GWPS shall be:

(1) For constituents for which a maximum contaminant level (MCL) has been established under §141.62 and §141.66 of this title, the MCL for that constituent;

(2) For the following constituents:
(i) Cobalt 6 micrograms per liter (ug/l);
(ii) Lead 15 ug/l;

(iii) Lithium 40 ug/l;
(iv) Molybdenum 100 ug/l.

(3) For constituents for which the background level is higher than the levels identified under paragraphs (h)(1) and (h)(2) of this section, the background concentration.

To create the GWPS, an upper tolerance limit (UTL) was calculated for each of the EPA CCR Rule Appendix IV constituents to establish their background concentration. Each UTL was then compared to the corresponding MCL or EPA CCR Rule standard. If a UTL was greater than the MCL or standard, then the UTL was used as the GWPS.

GWPS were calculated for the 2022 semi-annual sampling events and are provided in the statistical analysis report provided in Appendix D. A summary of the GWPS resulting from the 2022 sampling are presented in the table below:

GROUNDWATER PROTECTION STANDARDS

Appendix IV Constituent	MCL (ug/l)	EPA CCR Rule Standard (ug/l)	Background Higher than MCL or Standard *	Upper Tolerance Limit (ug/l)	GWPS (ug/l)
Antimony	**6**	-	No	1.36	**6**
Arsenic	10	-	Yes	**12**	**12**
Barium	**2000**	-	No	36.8	**2000**
Beryllium	**4**	-	No	0.2	**4**
Cadmium	**5**	-	No	0.921	**5**
Chromium	**100**	-	No	6.35	**100**
Cobalt	-	6	Yes	**6.05**	**6.05**
Fluoride	**4 mg/L**	-	No	0.75 mg/L	**4 mg/L**
Lead	-	**15**	No	2.01	**15**
Lithium	-	40	Yes	**1160**	**1160**
Mercury	**2**	-	No	0.009	**2**
Molybdenum	-	**100**	No	10.6	**100**
Selenium	50	-	Yes	**216**	**216**
Thallium	**2**	-	No	1.79	**2**
Radium 226 and 228 Combined	**5 pCi/l**	-	No	4.75 pCi/l	**5 pCi/l**

* Upper tolerance limit calculated for the constituents and compared to the MCL or the EPA CCR Rule standard. If the UTL was greater than the MCL or standard, then the UTL was used as the GWPS.

Once GWPS have been calculated, §257.95(g)(3) requires that the owner / operator determine if any of the Appendix IV constituents are present at a statistically significant level exceeding the GWPS. To determine such, a confidence interval was calculated for each constituent and compared to the GWPS. The confidence interval calculations for 2022 are provided in Appendix D. The confidence interval calculations indicate that no Appendix IV constituents exceeded the GWPS at a statistically significant level in 2022.

7.0 SUMMARY OF FINDINGS

Comparison of the groundwater flow to those historically measured shows de minimis differences in the groundwater flow regime beneath the site. Groundwater associated with the CCR Landfill continues to flow in an east / southeasterly direction towards the Retention Dam, which inhibits its migration off-site.

Statistical analysis suggests that boron concentrations at compliance groundwater monitoring wells SC-11 and SC-12 and fluoride concentrations at compliance groundwater monitoring well SC-12 and SC-13 exhibit a statistically significant increase over background concentrations; therefore, the CCR Landfill will continue with Assessment Monitoring.

No EPA CCR Rule Appendix IV constituents were measured at a statistically significant level exceeding the GWPS during 2022.

The overall CCR Landfill groundwater monitoring program was reviewed. No notable problems were encountered during 2022. In consideration of the complex geology and other constraints, Utilities believes that the current Professional Engineer-certified and CDPHE-approved Coal Combustion Residuals Landfill Groundwater Detection Monitoring Plan continues to be appropriate for the site and compliant with the EPA CCR Rule. In November 2022, Utilities initiated additional activities as a result of the CCR Landfill ASD for Selenium. Activities included installation of three additional background monitoring wells. The additional activities are described in the attached August 9, 2022, *Additional Information* letter, reviewed and accepted by the CDPHE on August 10, 2022, see Appendix F.

7.1 Risk

Utilities believes that the risk posed by the CCR Landfill to human health and the environment via the groundwater exposure pathway continues to be low for the following reasons:

- Groundwater underlying the CSR CD Area (which includes the CCR Landfill) is not used for domestic or agricultural purposes. There are no drinking water or agricultural wells within the CD Area and is no reasonable potential for future domestic or agricultural uses of groundwater within this area, as it is owned and controlled by Utilities.

- Previously evaluated groundwater quality data indicates that groundwater upgradient of and underlying the CSR CD Area, in which the CCR Landfill is located, has a total dissolved solids (TDS) concentration exceeding 10,000 mg/l. The EPA, in their Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy, classifies groundwater with TDS concentrations greater than or equal to 10,000 mg/l as Class III water (EPA 1988). Class III is defined as "groundwater not a potential source of drinking water and/or limited beneficial use." The high TDS of groundwater upgradient of and beneath the CD Area discourages its use for domestic or agricultural purposes.

- The CSR Retention Dam inhibits the off-site migration of stormwater and groundwater associated with the CCR Landfill; therefore, limiting the potential for exposure. The Retention Dam largely hydrologically disconnects the CCR Landfill associated groundwater from the downgradient Fountain Creek Alluvial Aquifer (i.e. the closest drinking water source).

7.2 Activities for 2023

For 2023, Utilities plans to continue with Detection Monitoring and Assessment Monitoring. Utilities will also continue conducting the activities described in the attached August 9, 2022, *Additional Information* letter. See Appendix F.

8.0 REFERENCES

AECOM Technical Services. 2017. Coal Combustion Residuals (CCR) Ash Monofill Groundwater Detection Monitoring Plan Clear Spring Ranch, El Paso County, Colorado Revision 0. October 2017.

CDPHE. 2017. E-Mail from Jill Parisi / CDPHE to Patti Zietlow / Colorado Springs Utilities Re: Clear Spring Ranch CCR Landfill Groundwater Detection Monitoring Plan. November 14, 2017.

Haley & Aldrich. 1994. Hannah Ranch Dam Seepage Analysis Preliminary Engineering Report. April 1994.

Haley & Aldrich. 1995. Hanna Ranch Supernatant Dam Design Summary Report. February 1995.

Layne Western. 1977. Ash Disposal Site, R.D. Nixon Power Plant. Carl Nuzman, Bruce Maxwell & Carl Larson. August 1977.

Title 40 of the Code of Federal Regulations (CFR) Part 257 Subpart D.

U.S. EPA. 1988. Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy. Office of Groundwater Protection. June 1988.

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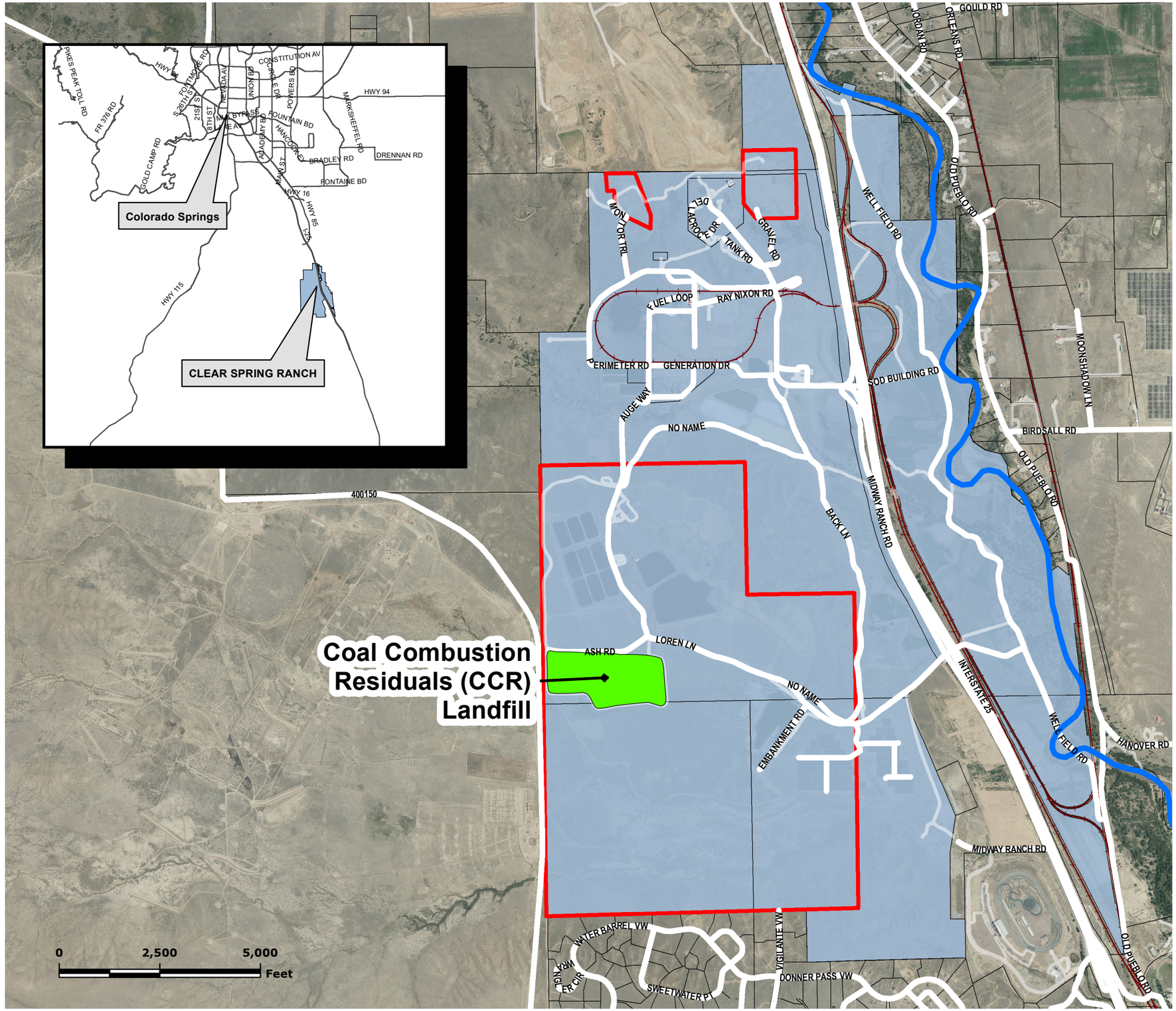
Report Distribution List:

- Ashley Lawrence / Colorado Department of Public Health and Environment
- Jill Parisi / Colorado Department of Public Health and Environment
- Nina Ruiz / El Paso County Planning Department
- Ian Gavin / Colorado Springs Utilities - Electric Plants
- Colorado Springs Utilities' CCR Landfill Website

APPENDIX A

Vicinity Map and Groundwater Elevation Contours



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Environmental Services
121 South Tejon Street, Fourth Floor
Colorado Springs, Colorado 80903

Orientation:

N W E S

Legend:

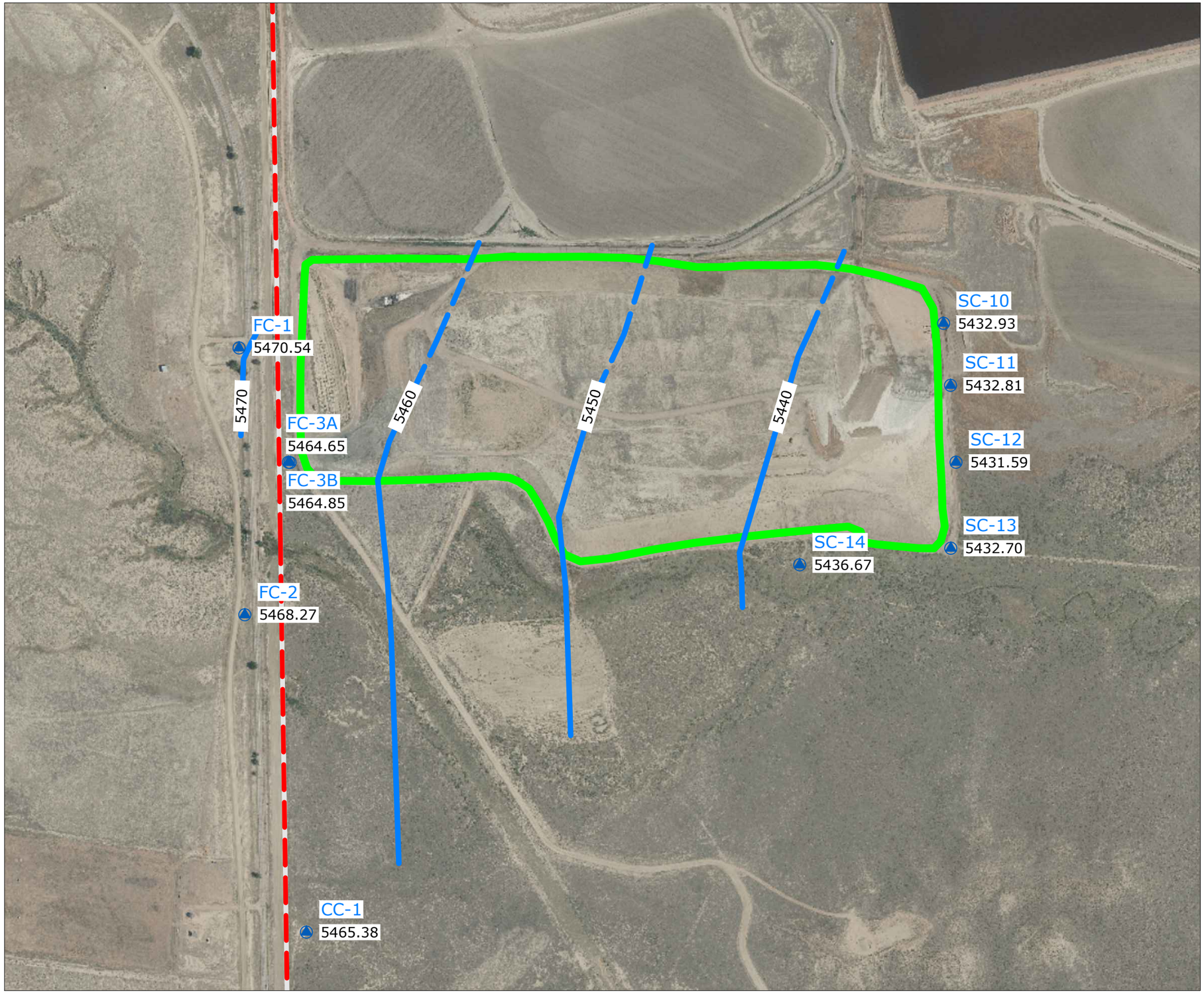
- Fountain Creek
- Boundary - Certificate of Designation CD-04-001
- Boundary - Clear Spring Ranch

VICINITY MAP

Clear Spring Ranch
Coal Combustion Residuals Landfill
El Paso County

Project No:	550-504-7
Prepared By:	Environmental Services
Date:	January 20, 2023

Figure Number 1



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Environmental Services
121 South Tejon Street, Fourth Floor
Colorado Springs, Colorado 80903

Orientation:

Legend:

- Coal Combustion Residuals (CCR) Landfill
- Boundary - Clear Spring Ranch Property
- Boundary - Certificate of Designation
- Groundwater Potentiometric Surface (Dashed portions are estimated)
- Groundwater Monitoring Well Location
- ## Groundwater Elevation - Feet (Above mean sea level)

Notes:

- Groundwater Elevation Measurements Collected October 24-27, 2022.
- Regarding Groundwater Potentiometric Surface, see also Appendix E / CCR Landfill Alternative Source Demonstration Revision 0 / Figures 4 and 5.

Scale:

0 450 Feet 900 Feet

1 Inch = 450 Feet

GROUNDWATER ELEVATION CONTOURS - 2022

Clear Spring Ranch

Coal Combustion Residuals Landfill
El Paso County

Project No: 550-504-7	**Figure Number 2**
Prepared By: Environmental Services	
Date: January 20, 2023	

APPENDIX B

Groundwater Laboratory Analytical Results and Groundwater Depths / Elevations

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CCR LANDFILL
Groundwater Laboratory Analytical Results

Monitoring Well ID	Sample Date	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	pH	Radium 226 + Radium 228	Selenium	Sulfate	Thallium	Total Dissolved Solids
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	SU	pCi/L	ug/L	mg/L	ug/L	mg/L
CC-1	3/14/2022	<0.50	10.4	5.4	<0.20	952	<0.50	84100	1660	4.7	<5.00	0.58	0.60	738	0.005	0.97	7.2	2.63	106	20100	<0.50	34200
	9/27/2022	<0.50	18.2	7.3	<0.20	1000	<0.50	377000	1680	2.3	6.83	0.23	1.8	879	0.005	1.3	7.1	5.50	224	20400	0.51	35100
FC-1	3/14/2022	<0.50	<1.0	8.7	<0.20	922	<0.50	66100	778	2.7	<5.00	0.18	<0.50	978	0.002	2.0	7.3	1.54	4.3	13200	<0.50	18000
	9/27/2022	<0.50	4.9	9.3	<0.20	990	<0.50	383000	770	1.2	<5.00	0.12	<0.50	1190	0.002	2.1	7.3	4.12	17.6	12800	<0.50	21500
FC-2	3/14/2022	<0.50	<1.0	6.5	<0.20	969	<0.50	366000	100	2.0	<5.00	0.71	<0.50	294	0.003	2.8	7.4	0.656	35.5	6150	<0.50	9800
	9/27/2022	<0.50	2.0	8.6	<0.20	988	<0.50	408000	104	1.2	<5.00	0.52	<0.50	300	0.007	2.9	7.5	2.18	37.0	5920	<0.50	10000
FC-3A	3/14/2022	<0.50	<1.0	10.8	<0.20	1070	<0.50	405000	126	1.7	<5.00	0.62	<0.50	324	<0.002	7.2	7.5	0.448	39.4	5350	<0.50	8940
	9/27/2022	<0.50	3.7	14.9	<0.20	1060	<0.50	418000	130	1.5	<5.00	0.46	<0.50	334	0.003	7.0	7.5	1.63	51.2	5140	<0.50	9060
FC-3B	3/14/2022	<0.50	2.8	11.8	<0.20	1210	<0.50	221000	213	2.4	<5.00	0.62	<0.50	279	<0.002	1.3	7.5	1.21	<1.0	4050	<0.50	7240
	9/27/2022	<0.50	6.8	12.2	<0.20	1200	<0.50	203000	200	3.4	<5.00	0.48	0.81	286	0.003	2.3	7.7	2.96	6.2	4430	<0.50	6960
SC-10	3/15/2022	<0.50	4.8	9.3	<0.20	1170	<0.50	293000	956	2.7	<5.00	0.84	<0.50	781	0.011	3.6	7.4	2.47	246	9760	<0.50	17700
	9/26/2022	<0.50	8.3	43.6	<0.20	1210	<0.50	416000	960	7.3	<5.00	0.53	3.3	624	0.012	6.5	7.4	2.87	232	9170	<0.50	16700
SC-11	3/15/2022	<0.50	4.7	6.2	<0.20	2380	<0.50	436000	1140	3.0	<5.00	0.87	<0.50	630	0.010	2.6	7.4	1.11	218	7810	<0.50	14500
	3/15/2022 Dup.	<0.50	5.6	5.5	<0.20	2470	<0.50	442000	1130	3.3	<5.00	0.87	<0.50	638	0.010	3.0	7.4	0.551	206	8040	<0.50	14600
	9/26/2022	<0.50	11.4	40.5	<0.20	2510	<0.50	438000	1150	5.5	<5.00	0.57	2.4	532	0.012	3.5	7.4	1.97	240	7740	<0.50	15100
SC-12	3/15/2022	<0.50	<1.0	6.3	<0.20	4020	<0.50	376000	276	2.6	<5.00	1.43	<0.50	436	0.002	5.5	7.4	-0.0421	5.6	8880	<0.50	14500
	9/26/2022	<0.50	<1.0	22.8	<0.20	4370	<0.50	374000	288	2.6	<5.00	0.93	0.97	406	0.004	6.1	7.4	3.38	12.7	8550	<0.50	11100
	9/26/2022 Dup.	<0.50	1.8	16.7	<0.20	4420	<0.50	380000	301	2.1	<5.00	0.92	0.66	391	0.004	6.6	7.4	3.79	15.4	8440	<0.50	14300
SC-13	3/15/2022	<0.50	<1.0	6.7	<0.20	1490	<0.50	347000	164	2.4	<5.00	1.14	<0.50	352	0.002	3.6	7.4	0.183	25.0	7110	<0.50	11800
	9/26/2022	<0.50	<1.0	18.4	<0.20	1560	<0.50	378000	154	2.0	<5.00	0.78	0.65	288	0.004	3.8	7.5	1.71	23.9	6960	<0.50	11200
SC-14	3/15/2022	<0.50	<1.0	5.7	<0.20	1480	<0.50	366000	154	2.1	<5.00	1.11	<0.50	353	0.002	10.5	7.4	0.381	1.6	7220	<0.50	11500
	9/26/2022	<0.50	2.4	79.8	<0.20	1450	<0.50	362000	146	10.4	<5.00	0.74	5.4	276	0.011	11.0	7.5	4.84	6.1	6930	<0.50	11700

* Metals are Total Recoverable
* See laboratory reports for data qualifiers
< Indicates the constituent was not detected above the stated laboratory reporting limit
Dup = Duplicate

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CCR LANDFILL
Groundwater Depths / Elevations

Monitoring Well ID	CC-1		FC-1		FC-2		FC-3A		FC-3B		SC-10		SC-11		SC-12		SC-13		SC-14	
Measuring Point Elevation*	5478.67		5486.87		5483.00		5484.29		5483.75		5447.65		5444.54		5444.32		5445.98		5450.23	
Date Measured	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation	Depth to Water	Water Surface Elevation
6/22/2016	14.07	5,464.60	15.53	5,471.34	13.49	5,469.51	.	.	.	.	11.43	5,436.22	8.40	5,436.14	9.29	5,435.23	9.92	5,436.06	9.94	5,440.29
6/23/2016	.	.	.	.	.	.	17.91	5,466.38	48.85	5,434.90	.	.	.	.	.	.	.	.	.	.
8/2/2016	13.95	5,464.72	15.57	5,471.30	13.67	5,469.33	17.85	5,466.44	47.62	5,436.13	.	.	.	.	.	.	.	.	.	.
8/3/2016	.	.	.	.	.	.	.	.	.	.	11.40	5,436.25	8.15	5,436.39	9.56	5,434.96	10.30	5,435.68	10.21	5,440.02
9/19/2016	13.74	5,464.93	15.55	5,471.32	13.41	5,469.59	17.70	5,466.59	43.52	5,440.23	.	.	.	.	.	.	.	.	.	.
9/20/2016	.	.	.	.	.	.	.	.	.	.	11.28	5,436.37	8.28	5,436.26	9.70	5,434.82	10.50	5,435.48	10.54	5,439.69
10/12/2016	13.85	5,464.82	15.40	5,471.47	13.49	5,469.51	17.80	5,466.49	45.58	5,438.17	.	.	.	.	.	.	.	.	.	.
10/13/2016	.	.	.	.	.	.	.	.	.	.	11.39	5,436.26	8.30	5,436.24	9.79	5,434.73	10.49	5,435.49	10.52	5,439.71
11/15/2016	13.79	5,464.88	15.26	5,471.61	13.38	5,469.62	17.54	5,466.75	43.01	5,440.74	.	.	.	.	.	.	.	.	.	.
11/16/2016	.	.	.	.	.	.	.	.	.	.	11.15	5,436.50	8.07	5,436.47	9.51	5,435.01	10.15	5,435.83	10.08	5,440.15
1/18/2017	13.35	5,465.32	15.04	5,471.83	13.25	5,469.75	17.51	5,466.78	37.68	5,446.07	.	.	.	.	.	.	.	.	.	.
1/19/2017											11.40	5,436.25	8.44	5,436.10	9.42	5,435.10	9.87	5,436.11	9.56	5,440.67
2/14/2017	13.93	5,464.74	15.39	5,471.48	13.35	5,469.65	17.71	5,466.58	44.27	5,439.48	.	.	.	.	.	.	.	.	.	.
2/15/2017	.	.	.	.	.	.	.	.	.	.	11.78	5,435.87	8.74	5,435.80	9.38	5,435.14	9.88	5,436.10	9.64	5,440.59
2/28/2017	13.71	5,464.96	15.00	5,471.87	13.06	5,469.94	17.60	5,466.69	48.20	5,435.55	.	.	.	.	.	.	.	.	.	.
3/1/2017	.	.	.	.	.	.	.	.	.	.	12.03	5,435.62	9.05	5,435.49	9.57	5,434.95	9.95	5,436.03	9.83	5,440.40
11/13/2017	13.16	5,465.51	14.78	5,472.09	13.10	5,469.90	17.28	5,467.01	22.21	5,461.54	.	.	.	.	.	.	.	.	.	.
11/14/2017	.	.	.	.	.	.	.	.	.	.	10.82	5,436.83	7.85	5,436.69	9.05	5,435.47	9.54	5,436.44	9.32	5,440.91
2/14/2018	13.26	5,465.41	14.69	5,472.18	12.91	5,470.09	17.23	5,467.06	28.84	5,454.91	.	.	.	.	.	.	.	.	.	.
2/15/2018	.	.	.	.	.	.	.	.	.	.	11.15	5,436.50	8.13	5,436.41	9.04	5,435.48	9.40	5,436.58	8.94	5,441.29
9/25/2018	13.54	5,465.13	14.94	5,471.93	12.88	5,470.12	17.25	5,467.04	17.06	5,466.69	.	.	.	.	.	.	.	.	.	.
9/26/2018	.	.	.	.	.	.	.	.	.	.	11.24	5,436.41	8.28	5,436.26	9.45	5,434.87	10.39	5,435.59	10.30	5,439.93
5/14/2019	13.54	5,465.13	14.79	5,472.08	12.71	5,470.29	17.24	5,467.05	16.43	5,467.32	.	.	.	.	.	.	.	.	.	.
5/15/2019	.	.	.	.	.	.	.	.	.	.	11.85	5,435.80	8.87	5,435.67	9.11	5,435.21	9.44	5,436.54	9.14	5,441.09
9/24/2019	13.36	5,465.31	14.90	5,471.97	13.71	5,469.29	18.34	5,465.95	17.57	5,466.18	.	.	.	.	.	.	.	.	.	.
9/25/2019	.	.	.	.	.	.	.	.	.	.	12.62	5,435.03	9.50	5,435.04	10.89	5,433.43	11.41	5,434.57	11.69	5,438.54
4/6/2020	13.34	5,465.33	15.20	5,471.67	12.99	5,470.01	17.65	5,466.64	17.04	5,466.71	.	.	.	.	.	.	.	.	.	.
4/7/2020	.	.	.	.	.	.	.	.	.	.	13.06	5,434.59	10.07	5,434.47	10.38	5,433.94	10.35	5,435.63	10.32	5,439.91
11/16/2020	13.62	5,465.05	.	.	.	.	19.00	5,465.29	18.13	5,465.62	.	.	.	.	.	.	11.99	5,433.99	12.25	5,437.98
11/17/2020	.	.	15.52	5,471.35	14.09	5,468.91	.	.	.	.	13.45	5,434.20	10.45	5,434.09	11.65	5,432.67	.	.	.	.
3/24/2021	.	.	.	.	.	.	.	.	.	.	13.60	5,434.05	10.60	5,433.94	10.99	5,433.33	11.14	5,434.84	11.35	5,438.88
3/25/2021	13.35	5,465.32	15.51	5,471.36	13.32	5,469.68	18.14	5,466.15	17.62	5,466.13	.	.	.	.	.	.	.	.	.	.
9/29/2021	.	.	15.83	5,471.04	14.41	5,468.59	.	.	.	.	13.96	5,433.69	11.01	5,433.53	12.28	5,432.04	13.05	5,432.93	13.22	5,437.01
9/30/2021	13.56	5,465.11	.	.	.	.	19.48	5,464.81	18.57	5,465.18	.	.	.	.	.	.	.	.	.	.
3/14/2022	13.69	5,464.98	16.23	5,470.64	14.09	5,468.91	19.04	5,465.25	18.22	5,465.53	.	.	.	.	.	.	.	.	.	.
3/15/2022	.	.	.	.	.	.	.	.	.	.	14.52	5,433.13	11.51	5,433.03	11.72	5,432.60	11.78	5,434.20	12.01	5,438.22
9/26/2022	.	.	.	.	.	.	.	.	.	.	15.01	5,432.64	11.64	5,432.90	13.59	5,430.73	13.61	5,432.37	13.64	5,436.59
9/27/2022	15.36	5,463.31	17.00	5,469.87	14.80	5,468.20	19.88	5,464.41	21.91	5,461.84	.	.	.	.	.	.	.	.	.	.

Depth to Water = Feet

Water Surface Elevation = Feet Above Mean Sea Level

* Monitoring Well Top of Casings (Measuring Point Elevations) Re-surveyed in 2022

APPENDIX C

Laboratory Analytical Results

Colorado Springs Utilities

It's how we're all connected

Laboratory Report For:

Coal Combustion Residuals - Landfill

Colorado Springs Utilities Environmental Services

Report Authorized by: Wendy M Asay

Title: Environmental Specialist

Report Date: April 8, 2022

Report generated by: Wendy M. Asay

Colorado Springs Utilities Laboratory Services Section certifies that the test results meet all approved method and Laboratory Quality Assurance Plan requirements unless otherwise noted

Samples

468319	14-Mar-2022 12:37	Crooked Canyon Well #1
468320	14-Mar-2022 09:18	Fort Carson Well #1
468321	14-Mar-2022 10:44	Fort Carson Well #2
468322	14-Mar-2022 15:23	Fort Carson Well #3A
468323	14-Mar-2022 14:14	Fort Carson Well #3B
468324	14-Mar-2022 16:01	Equipment Blank
468325	15-Mar-2022 09:21	Sand Canyon Well #10
468326	15-Mar-2022 13:19	Sand Canyon Well #13
468327	15-Mar-2022 14:23	Sand Canyon Well #14
468328	15-Mar-2022 10:29	Sand Canyon Well #11
468329	15-Mar-2022 10:29	Sand Canyon Well #12
468330	15-Mar-2022 12:11	Sand Canyon Well #11

LIMS #: 468319

Sample Date: 3/14/2022 12:37:07 PM

Sample Point: CC_1

Sample Point Description: Crooked Canyon Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.6	degrees C	0.000			1
+	SM_2510_B	Conductivity	23700	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	37	mV	0			1
	SM_2130_B	Turbidity	2.8	NTU	0.05			1
	NA	Depth to Water	13.69	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	34200	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.58	mg/L	0.10			1
	EPA_300_0	Chloride	1660	mg/L	0.50	D	03/16/2022	1
		Sulfate	20100	mg/L	0.50	D	03/16/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	10.4	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	5.4	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	4.7	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	0.60	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	0.97	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	106	ug/L	1.0	D	03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	952	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	84100	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	738	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	0.005	ug/L	0.002	T	03/30/2022	1

LIMS #: 468320

Sample Date: 3/14/2022 9:18:07 AM

Sample Point: FC_1

Sample Point Description: Fort Carson Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.3	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.1	degrees C	0.000			1
+	SM_2510_B	Conductivity	18400	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	12	mV	0			1
	SM_2130_B	Turbidity	1.6	NTU	0.05			1
	NA	Depth to Water	16.23	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	18000	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.18	mg/L	0.10			1
	EPA_300_0	Chloride	778	mg/L	0.50	D	03/16/2022	1
		Sulfate	13200	mg/L	0.50	D	03/16/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	8.7	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	2.7	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	2.0	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	4.3	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	922	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	66100	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	978	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	0.002	ug/L	0.002	T	03/30/2022	1

LIMS #: 468321

Sample Date: 3/14/2022 10:44:07 AM

Sample Point: FC_2

Sample Point Description: Fort Carson Well #2

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	8290	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-11	mV	0			1
	SM_2130_B	Turbidity	6.9	NTU	0.05			1
	NA	Depth to Water	14.09	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	9800	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.71	mg/L	0.10			1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	6.5	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	2.0	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	2.8	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	35.5	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	969	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	366000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	294	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	0.003	ug/L	0.002	T	03/30/2022	1
	EPA_300_0	Chloride	100	mg/L	0.50	D	03/17/2022	1
		Sulfate	6150	mg/L	0.50	D	03/16/2022	1

LIMS #: 468322

Sample Date: 3/14/2022 3:23:07 PM

Sample Point: FC_3A

Sample Point Description: Fort Carson Well #3A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	7610	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-33	mV	0			1
	SM_2130_B	Turbidity	2.3	NTU	0.05			1
	NA	Depth to Water	19.04	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	8940	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.62	mg/L	0.10			1
	EPA_300_0	Chloride	126	mg/L	0.50	D	03/17/2022	1
		Sulfate	5350	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	10.8	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	1.7	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	7.2	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	39.4	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	1070	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	405000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	324	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	<0.002	ug/L	0.002	T	03/30/2022	1

LIMS #: 468323

Sample Date: 3/14/2022 2:14:07 PM

Sample Point: FC_3B

Sample Point Description: Fort Carson Well #3B

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	7570	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-188	mV	0			1
	SM_2130_B	Turbidity	2.1	NTU	0.05			1
	NA	Depth to Water	18.22	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	7240	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.62	mg/L	0.10			1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	2.8	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	11.8	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	2.4	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	1.3	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	1210	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	221000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	279	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	<0.002	ug/L	0.002	T	03/30/2022	1
	EPA_300_0	Chloride	213	mg/L	0.50	D	03/17/2022	1
		Sulfate	4050	mg/L	0.50	D	03/17/2022	1

LIMS #: 468324

Sample Date: 3/14/2022 4:01:07 PM

Sample Point: EQUIP_BLK

Sample Point Description: Equipment Blank

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	<10	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	<0.10	mg/L	0.10			1
	EPA_300_0	Chloride	<0.50	mg/L	0.50		03/16/2022	1
		Sulfate	<0.50	mg/L	0.50		03/16/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Barium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Chromium (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	<0.20	ug/L	0.20		03/22/2022	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	<20.0	ug/L	20.0		03/18/2022	1
		Calcium (Total Recoverable)	<100	ug/L	100		03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	<10.0	ug/L	10.0		03/18/2022	1
	EPA_1631	Mercury (Total)	<0.002	ug/L	0.002	T	03/30/2022	1

LIMS #: 468325

Sample Date: 3/15/2022 9:21:13 AM

Sample Point: SC_10

Sample Point Description: Sand Canyon Well #10

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	15900	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-64	mV	0			1
	SM_2130_B	Turbidity	33	NTU	0.05			1
	NA	Depth to Water	14.52	ft.	0.0000			1
	SM_4500_FC	Fluoride (Total)	0.84	mg/L	0.10			1
	EPA_300_0	Chloride	956	mg/L	0.50	D	03/17/2022	1
		Sulfate	9760	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Arsenic (Total Recoverable)	4.8	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	9.3	ug/L	0.20		03/24/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	2.7	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Molybdenum (Total Recoverable)	3.6	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	246	ug/L	1.0	D	03/24/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
	EPA_200_7	Boron (Total Recoverable)	1170	ug/L	20.0		03/22/2022	1
		Calcium (Total Recoverable)	293000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	781	ug/L	10.0	T	03/22/2022	1
	EPA_1631	Mercury (Total)	0.011	ug/L	0.002		03/30/2022	1
	SM_2540_C	Total Dissolved Solids	17700	mg/L	10			1

LIMS #: 468326

Sample Date: 3/15/2022 1:19:13 PM

Sample Point: SC_13

Sample Point Description: Sand Canyon Well #13

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.6	degrees C	0.000			1
+	SM_2510_B	Conductivity	9690	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-25	mV	0			1
	SM_2130_B	Turbidity	6.5	NTU	0.05			1
	NA	Depth to Water	11.78	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11800	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	1.14	mg/L	0.10			1
	EPA_300_0	Chloride	164	mg/L	0.50	D	03/17/2022	1
		Sulfate	7110	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	6.7	ug/L	0.20		03/21/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	2.4	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
		Molybdenum (Total Recoverable)	3.6	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	25.0	ug/L	1.0		03/22/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/22/2022	1
	EPA_200_7	Boron (Total Recoverable)	1490	ug/L	20.0		03/22/2022	1
		Calcium (Total Recoverable)	347000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	352	ug/L	10.0	T	03/22/2022	1
	EPA_1631	Mercury (Total)	0.002	ug/L	0.002		03/30/2022	1

LIMS #: 468327

Sample Date: 3/15/2022 2:23:13 PM

Sample Point: SC_14

Sample Point Description: Sand Canyon Well #14

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.1	degrees C	0.000			1
+	SM_2510_B	Conductivity	9640	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	119	mV	0			1
	SM_2130_B	Turbidity	0.70	NTU	0.05			1
	NA	Depth to Water	12.01	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	1.11	mg/L	0.10			1
	EPA_300_0	Chloride	154	mg/L	0.50	D	03/17/2022	1
		Sulfate	7220	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	5.7	ug/L	0.20		03/21/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	2.1	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Molybdenum (Total Recoverable)	10.5	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	1.6	ug/L	1.0		03/21/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
	EPA_200_7	Boron (Total Recoverable)	1480	ug/L	20.0		03/22/2022	1
		Calcium (Total Recoverable)	366000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	353	ug/L	10.0	T	03/22/2022	1
	EPA_1631	Mercury (Total)	0.002	ug/L	0.002		03/30/2022	1

LIMS #: 468328

Sample Date: 3/15/2022 10:29:13 AM

Sample Point: SC_11

Sample Point Description: Sand Canyon Well #11

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	13900	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	27	mV	0			1
	SM_2130_B	Turbidity	22	NTU	0.05			1
	NA	Depth to Water	11.51	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	14500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.87	mg/L	0.10			1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Arsenic (Total Recoverable)	4.7	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	6.2	ug/L	0.20	D	03/24/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	3.0	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Molybdenum (Total Recoverable)	2.6	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	218	ug/L	1.0	D	03/24/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
	EPA_200_7	Boron (Total Recoverable)	2380	ug/L	20.0		03/22/2022	1
		Calcium (Total Recoverable)	436000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	630	ug/L	10.0	T	03/22/2022	1
	EPA_1631	Mercury (Total)	0.010	ug/L	0.002		03/30/2022	1
	EPA_300_0	Chloride	1140	mg/L	0.50	D	03/16/2022	1
		Sulfate	7810	mg/L	0.50	D	03/17/2022	1

LIMS #: 468329

Sample Date: 3/15/2022 10:29:13 AM

Sample Point: SC_12

Sample Point Description: Sand Canyon Well #12

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.5	degrees C	0.000			1
+	SM_2510_B	Conductivity	12800	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	-16	mV	0			1
	SM_2130_B	Turbidity	1.8	NTU	0.05			1
	NA	Depth to Water	11.72	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	14500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	1.43	mg/L	0.10			1
	EPA_300_0	Chloride	276	mg/L	0.50	D	03/17/2022	1
		Sulfate	8880	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	6.3	ug/L	0.20		03/21/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	2.6	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Molybdenum (Total Recoverable)	5.5	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	5.6	ug/L	1.0		03/21/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
	EPA_200_7	Boron (Total Recoverable)	4020	ug/L	20.0		03/31/2022	1
		Lithium (Total Recoverable)	436	ug/L	10.0		03/31/2022	1
	EPA_200_7	Calcium (Total Recoverable)	376000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
	EPA_1631	Mercury (Total)	0.002	ug/L	0.002		03/30/2022	1

LIMS #: 468330

Sample Date: 3/15/2022 12:11:13 PM

Sample Point: SC_11

Sample Point Description: Sand Canyon Well #11

Collection Comments: SC_11 duplicate

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	14600	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.87	mg/L	0.10			1
	EPA_300_0	Chloride	1130	mg/L	0.50	D	03/17/2022	1
		Sulfate	8040	mg/L	0.50	D	03/17/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Arsenic (Total Recoverable)	5.6	ug/L	1.0		03/21/2022	1
		Barium (Total Recoverable)	5.5	ug/L	0.20		03/24/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20		03/21/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Chromium (Total Recoverable)	3.3	ug/L	1.0		03/21/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
		Molybdenum (Total Recoverable)	3.0	ug/L	0.20		03/21/2022	1
		Selenium (Total Recoverable)	206	ug/L	1.0	D	03/24/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		03/21/2022	1
	EPA_200_7	Boron (Total Recoverable)	2470	ug/L	20.0		03/22/2022	1
		Calcium (Total Recoverable)	442000	ug/L	100	T1/D	03/18/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		03/18/2022	1
		Lithium (Total Recoverable)	638	ug/L	10.0	T	03/22/2022	1
	EPA_1631	Mercury (Total)	0.010	ug/L	0.002		03/30/2022	1

Flags

*	Analysis performed by an external contract laboratory.
+	Analysis performed in the field.

Data Qualifiers

D - Value reported is multiplied by a dilution factor. The reporting limit is not.
T- MS recovery outside the established range. The recovery is matrix related, not method related.
T1 - The analyte concentration is disproportionate to the spike level and is outside the established range.

Glossary

DQ - Data Qualifer
RL – Reporting Limit
MDL – Method Detection Limit
Dil Fac – Dilution Factor

Case Narrative

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Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Upgradient Wells
Sample Date: 3/14/2022
QC Report Needed

Sampler: Foss

LOCATION	# Bottles	LIMS #	Sample Time	pH, Field (su) SM 4500 H	Temperature, Field (°C) SM 2550 B	Conductivity, Field (umhos/cm) SM 2510 B	Oxidation Reduction Potential, Field (mV)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Fluoride, SM 4500 F C	Total Dissolved Solids, SM 2540 C	Chloride, Sulfate EPA 300.0	EPA 200.7 (B, Ca, Co & Li - Total Recoverable)	EPA 200.8 (Sb, As, Ba, Be, Cd, Cr, Pb, Mo, Se & Tl - Total Recoverable)	Mercury, EPA 1631 (not collecte using clean-hands/dirty-hands)	Total Radium 226 & Radium 228 (Sent to Test America St. Louis)	Comments
				Please mark boxes that apply													
CC_1	8	468319	1237	7.15	12.6	23,744	36.7	2.81	13.69	X	X	X	X	X	X	X	
FC_1	8	468320	0918	7.28	13.1	18,387	11.9	1.58	16.23	X	X	X	X	X	X	X	
FC_2	8	468321	1044	7.45	12.8	8,286	-10.9	6.91	14.09	X	X	X	X	X	X	X	
FC_3A	8	468322	1523	7.50	13.2	7,609	-33.2	2.32	19.04	X	X	X	X	X	X	X	
FC_3B	8	468323	1414	7.48	13.2	7,568	-187.8	2.14	18.22	X	X	X	X	X	X	X	
EQUIP_BLK	6	468324	1601							X	X	X	X	X	X		
Total # of Bottles	46									1-500 mL GP	1-250 mL GP	1-250 mL GP	1-500 mL New Certified plastic	1-500 mL New Certified plastic	1-250 mL glass acid-rinsed	2-1000 mL plastic	

Signature/Print last name

Relinquished by: Foss — Date/Time: 3-14-22 @ 1730

Received by: Kelly Nelson Nelson — KAN 3/14 3/15/22 @ 0656

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

Note: Samples left in cooler on ice in locked storage area of sample receiving on 3/14/22

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Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Downgradient and Cross Gradient Wells

Sample Date: 3/15/2022

QC Report Needed

Sampler: Foss

LOCATION	# Bottles	LIMS #	Sample Time	pH, Field (su) SM 4500 H	Temperature, Field (°C) SM 2550 B	Conductivity, Field (umhos/cm) SM 2510 B	Oxidation Reduction Potential, Field (mV)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Fluoride, SM 4500 F C	Total Dissolved Solids, SM 2540 C	Chloride, Sulfate EPA 300.0	EPA 200.7 (B, Ca, Co & Li - Total Recoverable)	EPA 200.8 (Sb, As, Ba, Be, Cd, Cr, Pb, Mo, Se & Tl - Total Recoverable)	Mercury, EPA 1631 (not collected using clean-hands/dirty-hands)	Total Radium 226 & Radium 228 (Sent to Test America St. Louis)	Comments
				Please mark boxes that apply													
SC_10	8	~~468335~~ KAN	0921	7.38	13.9	15,942	-63.9	33.2	14.52	X	X	X	X	X	X	X	
SC_13	8	~~468326~~ KAN	1319	7.39	12.6	9,692	-25.0	6.48	11.78	X	X	X	X	X	X	X	
SC_14	8	468327	1423	7.38	12.1	9,636	119.3	0.70	12.01	X	X	X	X	X	X	X	
SC_11	8	468328	1029	7.36	13.8	13,925	27.4	22.3	11.51	X	X	X	X	X	X	X	
SC_11 Duplicate	8	468330	1029							X	X	X	X	X	X	X	
SC_12	8	468329	1211	7.37	14.5	12,792	-15.5	1.79	11.72	X	X	X	X	X	X	X	
Total # of Bottles	48									1-500 mL GP	1-250 mL GP	1-250 mL GP	1-500 mL New Certified plastic	1-500 mL New Certified plastic	1-250 mL glass acid-rinsed	2-1000 mL plastic	

Relinquished by — Signature/Print last name: Foss — Date/Time: 3-15-22 @ 1620

Received by — Kelly Nelson — Nelson — 3/16/22 @ 0705

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

*Note: Samples left in cooler on ice in locked storage area of sample receiving on 3/15/22

Colorado Springs Utilities

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Laboratory Services Section
QC Report

CCR Landfill Assessment
March 2022

Quality Assurance Approval: Lesley Susic Date: 4/10/2022

This report is for sample numbers 468319 – 468330.

Total Dissolved Solids by Standard Methods 2540 C

There are no anomalies to report for this analysis.

Fluoride by Standard Methods 4500 F C

There are no anomalies to report for this analysis.

Anions by EPA Method 300.0

There are no anomalies to report for this analysis.

Mercury by EPA 1631 E

The matrix spike recovery is outside the established range in sample 468323. The recovery is matrix related, not method related. Associated data are qualified.

EPA 200.7

The analyte concentration in the samples is disproportionate to the spike level for Total Recoverable Calcium in samples 468323 and 468328. The performance of the method is shown to be in control. Associated calcium data are qualified.

The matrix spike recovery is outside the established range for Lithium in sample 468328. The recovery is matrix related, not method related. Associated lithium data are qualified.

EPA 200.8

There are no anomalies to report for this analysis.

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 3/15/22
Sampled date: 3/14/22 for samples 468319 - 468324
Sampled date: 3/15/22 for samples 468326 – 468328 and 468330

Matrix QC performed on sample 468323

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	100	85 - 110		
Duplicate	Total Dissolved Solids			1	<10

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 3/21/22
Sampled date: 3/15/22 for samples 468325 and 468329

Matrix QC performed on sample 468325

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	101	85 - 110		
Duplicate	Total Dissolved Solids			1	<10

Method: Fluoride by Standard Methods 4500 F C
Batch Analysis date: 3/18/22
Sampled date: 3/14/22 for samples 468319 - 468324
Sampled date: 3/15/22 for samples 468325 - 468330

Matrix QC performed on samples 468326 and 468329

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Fluoride (Total)	104	90 - 110		
QCS	Fluoride (Total)	95	90 - 110		
MS	Fluoride (Total) (468326)	93	80 - 120		
MSD	Fluoride (Total) (468326)			<1	<20
MS	Fluoride (Total) (468329)	91	80 - 120		
MSD	Fluoride (Total) (468329)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Fluoride (Total)	<0.10 mg/L	0.10 mg/L

Method: Anions by EPA Method 300.0
Batch Analysis date: 3/16/22
Sampled date: 3/14/22 for samples 468319 - 468324
Sampled date: 3/15/22 for samples 468325 - 468330

Matrix QC performed on samples 468328 and 468321

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Chloride	102	50-150		
LFB	Chloride	100	90-110	<1	<20
LD	Chloride (468328)			<1	<20
LD	Chloride (468321)			11	<20
MS	Chloride (468328)	99	80-120		
MS	Chloride (468321)	101	80-120		
MRL	Sulfate	104	50-150		
LFB	Sulfate	102	90-110	<1	<20
LD	Sulfate (468328)			3	<20
LD	Sulfate (468321)			2	<20
MS	Sulfate (468328)	104	80-120		
MS	Sulfate (468321)	102	80-120		

QC Type	Analyte	Concentration	Limit
LRB	Chloride	<0.17 mg/L	0.17 mg/L
LRB	Sulfate	<0.17 mg/L	0.17 mg/L

Method: Mercury by EPA 1631 E
Batch Analysis date: 3/30/22
Sampled date: 3/14/22 for samples 468319 - 468324
Sampled date: 3/15/22 for samples 468325 - 468330

Matrix QC performed on samples 468323 and 468327

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Mercury (Total)	100	50-150		
QCS	Mercury (Total)	110	77-123		
MS	Mercury (Total) (468323)	***65**	71-125		
MSD	Mercury (Total) (468323)			4	<24
MS	Mercury (Total) (468327)	86	71-125		
MSD	Mercury (Total) (468327)			6	<24

QC Type	Analyte	Concentration	Limit
LRB	Mercury (Total)	<0.5 ng/L	0.5 ng/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 3/18/22 for all Ca and Co, B and Li only for samples 468319-468324
Digestion date: 3/17/22 for all Ca and Co, B and Li only for samples 468319-468324
Sampled date: 3/14/22 for samples 468319 - 468324
Sampled date: 3/15/22 for samples 468325 - 468330

Matrix QC performed on samples 468323 and 468328

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	103	50-150		
LFB	Boron (Total Recoverable)	104	85-115		
MS	Boron (Total Recoverable) (468323)	109	70-130		
MSD	Boron (Total Recoverable) (468323)			3	<20
MRL	Calcium (Total Recoverable)	109	50-150		
LFB	Calcium (Total Recoverable)	102	85-115		
MS	Calcium (Total Recoverable) (468323)	***214**	70-130		
MSD	Calcium (Total Recoverable) (468323)			3	<20
MS	Calcium (Total Recoverable) (468328)	***-787**	70-130		
MSD	Calcium (Total Recoverable) (468328)			18	<20
MRL	Cobalt (Total Recoverable)	99	50-150		
LFB	Cobalt (Total Recoverable)	102	85-115		
MS	Cobalt (Total Recoverable) (468323)	94	70-130		
MSD	Cobalt (Total Recoverable) (468323)			1	<20
MS	Cobalt (Total Recoverable) (468328)	79	70-130		
MSD	Cobalt (Total Recoverable) (468328)			9	<20
MRL	Lithium (Total Recoverable)	95	50-150		
LFB	Lithium (Total Recoverable)	102	85-115		
MS	Lithium (Total Recoverable) (468323)	93	70-130		
MSD	Lithium (Total Recoverable) (468323)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<7.57 ug/L	7.57 ug/L
LRB	Calcium (Total Recoverable)	<16.5 ug/L	16.5 ug/L
LRB	Cobalt (Total Recoverable)	<1.12 ug/L	1.12 ug/L
LRB	Lithium (Total Recoverable)	<8.27 ug/L	8.27 ug/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 3/30/22 for B and Li for sample 468329
Digestion date: 3/30/22 for B and Li for sample 468329
Sampled date: 3/15/22 for sample 468329

Matrix QC performed on samples 468329

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	106	50-150		
LFB	Boron (Total Recoverable)	102	85-115		
MS	Boron (Total Recoverable)	94	70-130		
MSD	Boron (Total Recoverable)			<1	<20
MRL	Lithium (Total Recoverable)	103	50-150		
LFB	Lithium (Total Recoverable)	99	85-115		
MS	Lithium (Total Recoverable)	102	70-130		
MSD	Lithium (Total Recoverable)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<7.57 ug/L	7.57 ug/L
LRB	Lithium (Total Recoverable)	<8.27 ug/L	8.27 ug/L

Method: EPA 200.7
Batch Analysis date: 3/22/22 for B and Li for samples 468325-468328 and 468330
Digestion date: 3/21/22 for B and Li for samples 468325-468328 and 468330
Sampled date: 3/15/22 for samples 468325-468328 and 468330

Matrix QC performed on samples 468328

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	107	50-150		
LFB	Boron (Total Recoverable)	106	85-115		
MS	Boron (Total Recoverable)	116	70-130		
MSD	Boron (Total Recoverable)			<1	<20
MRL	Lithium (Total Recoverable)	103	50-150		
LFB	Lithium (Total Recoverable)	105	85-115		
MS	Lithium (Total Recoverable)	***135**	70-130		
MSD	Lithium (Total Recoverable)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<7.57 ug/L	7.57 ug/L
LRB	Lithium (Total Recoverable)	<8.27 ug/L	8.27 ug/L

***See Narrative**

EPA Method: EPA 200.8
Digestion date: 3/18/22
Batch Analysis date: 3/22/22
Sampled date: 3/14/22 for samples 468319 - 468324

Matrix QC performed on sample 468323

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total Recoverable)	95	50-150		
LFB	Antimony (Total Recoverable)	94	85-115		
MS	Antimony (Total Recoverable)	106	70-130		
MSD	Antimony (Total Recoverable)			2	<20
MRL	Arsenic (Total Recoverable)	100	50-150		
LFB	Arsenic (Total Recoverable)	91	85-115		
MS	Arsenic (Total Recoverable)	103	70-130		
MSD	Arsenic (Total Recoverable)			<1	<20
MRL	Barium (Total Recoverable)	104	50-150		
LFB	Barium (Total Recoverable)	96	85-115		
MS	Barium (Total Recoverable)	119	70-130		
MSD	Barium (Total Recoverable)			<1	<20
MRL	Beryllium (Total Recoverable)	84	50-150		
LFB	Beryllium (Total Recoverable)	91	85-115		
MS	Beryllium (Total Recoverable)	80	70-130		
MSD	Beryllium (Total Recoverable)			1	<20
MRL	Cadmium (Total Recoverable)	96	50-150		
LFB	Cadmium (Total Recoverable)	94	85-115		
MS	Cadmium (Total Recoverable)	97	70-130		
MSD	Cadmium (Total Recoverable)			2	<20
MRL	Chromium (Total Recoverable)	109	50-150		
LFB	Chromium (Total Recoverable)	100	85-115		
MS	Chromium (Total Recoverable)	100	70-130		
MSD	Chromium (Total Recoverable)			1	<20
MRL	Lead (Total Recoverable)	96	50-150		
LFB	Lead (Total Recoverable)	94	85-115		
MS	Lead (Total Recoverable)	108	70-130		
MSD	Lead (Total Recoverable)			1	<20
MRL	Molybdenum (Total Recoverable)	98	50-150		
LFB	Molybdenum (Total Recoverable)	95	85-115		
MS	Molybdenum (Total Recoverable)	108	70-130		
MSD	Molybdenum (Total Recoverable)			<1	<20
MRL	Selenium (Total Recoverable)	108	50-150		
LFB	Selenium (Total Recoverable)	85	85-115		
MS	Selenium (Total Recoverable)	80	70-130		
MSD	Selenium (Total Recoverable)			3	<20
MRL	Thallium (Total Recoverable)	96	50-150		
LFB	Thallium (Total Recoverable)	93	85-115		
MS	Thallium (Total Recoverable)	106	70-130		
MSD	Thallium (Total Recoverable)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total Recoverable)	<0.18 ug/L	0.18 ug/L
LRB	Arsenic (Total Recoverable)	<0.36 ug/L	0.36 ug/L
LRB	Barium (Total Recoverable)	<0.10 ug/L	0.10 ug/L

LRB	Beryllium (Total Recoverable)	<0.12 ug/L	0.12 ug/L
LRB	Cadmium (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Chromium (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Lead (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Molybdenum (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L
LRB	Thallium (Total Recoverable)	<0.11 ug/L	0.11 ug/L

EPA Method: EPA 200.8
Digestion date: 3/17/22
Batch Analysis date: 3/21/22 for all except Ba and Se on samples 468325, 468628 and 468330
Batch Analysis date: 3/24/22 for all except Ba and Se on samples 468325, 468628 and 468330
Sampled date: 3/15/22 for samples 468325 - 468330

Matrix QC performed on sample 468328

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total Recoverable)	98	50-150		
LFB	Antimony (Total Recoverable)	96	85-115		
MS	Antimony (Total Recoverable)	114	70-130		
MSD	Antimony (Total Recoverable)			<1	<20
MRL	Arsenic (Total Recoverable)	96	50-150		
LFB	Arsenic (Total Recoverable)	87	85-115		
MS	Arsenic (Total Recoverable)	128	70-130		
MSD	Arsenic (Total Recoverable)			5	<20
MRL	Barium (Total Recoverable)	86	50-150		
LFB	Barium (Total Recoverable)	106	85-115		
MS	Barium (Total Recoverable)	89	70-130		
MSD	Barium (Total Recoverable)			2	<20
MRL	Beryllium (Total Recoverable)	116	50-150		
LFB	Beryllium (Total Recoverable)	87	85-115		
MS	Beryllium (Total Recoverable)	87	70-130		
MSD	Beryllium (Total Recoverable)			<1	<20
MRL	Cadmium (Total Recoverable)	98	50-150		
LFB	Cadmium (Total Recoverable)	96	85-115		
MS	Cadmium (Total Recoverable)	106	70-130		
MSD	Cadmium (Total Recoverable)			<1	<20
MRL	Chromium (Total Recoverable)	98	50-150		
LFB	Chromium (Total Recoverable)	105	85-115		
MS	Chromium (Total Recoverable)	110	70-130		
MSD	Chromium (Total Recoverable)			4	<20
MRL	Lead (Total Recoverable)	96	50-150		
LFB	Lead (Total Recoverable)	96	85-115		
MS	Lead (Total Recoverable)	122	70-130		
MSD	Lead (Total Recoverable)			<1	<20
MRL	Molybdenum (Total Recoverable)	113	50-150		
LFB	Molybdenum (Total Recoverable)	95	85-115		
MS	Molybdenum (Total Recoverable)	122	70-130		
MSD	Molybdenum (Total Recoverable)			<1	<20

MRL	Selenium (Total Recoverable)	86	50-150		
LFB	Selenium (Total Recoverable)	109	85-115		
MS	Selenium (Total Recoverable)	118	70-130		
MSD	Selenium (Total Recoverable)			<1	<20
MRL	Thallium (Total Recoverable)	98	50-150		
LFB	Thallium (Total Recoverable)	94	85-115		
MS	Thallium (Total Recoverable)	120	70-130		
MSD	Thallium (Total Recoverable)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total Recoverable)	<0.18 ug/L	0.18 ug/L
LRB	Arsenic (Total Recoverable)	<0.36 ug/L	0.36 ug/L
LRB	Barium (Total Recoverable)	<0.10 ug/L	0.10 ug/L
LRB	Beryllium (Total Recoverable)	<0.12 ug/L	0.12 ug/L
LRB	Cadmium (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Chromium (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Lead (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Molybdenum (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L
LRB	Thallium (Total Recoverable)	<0.11 ug/L	0.11 ug/L

EPA Method: EPA 200.8
Digestion date: 3/17/22
Batch Analysis date: 3/24/22
Sampled date: 3/15/22 for samples 468325, 468628 and 468330

Matrix QC performed on sample 468328

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Barium (Total Recoverable)	86	50-150		
LFB	Barium (Total Recoverable)	106	85-115		
MS	Barium (Total Recoverable)	89	70-130		
MSD	Barium (Total Recoverable)			2	<20
MRL	Selenium (Total Recoverable)	86	50-150		
LFB	Selenium (Total Recoverable)	109	85-115		
MS	Selenium (Total Recoverable)	118	70-130		
MSD	Selenium (Total Recoverable)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Barium (Total Recoverable)	<0.10 ug/L	0.10 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L

LD – Field Duplicate
LFB – Laboratory Fortified Blank
LRB – Laboratory Reagent Blank (Method Blank)
QCS – Quality Control Sample
MRL – Minimum Reporting Limit (Verification)
MS – Matrix Spike
MSD – Matrix Spike Duplicate
Underline – Data was outside the limit

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-44875-1
Client Project/Site: Radiochemistry Analysis

For:
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

Attn: Ms. Wendy Asay

Rhonda Ridenhower

Authorized for release by:
4/14/2022 11:18:28 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@et.eurofinsus.com

Table of Contents

Case Narrative

Client: Colorado Springs Utilities
Job ID: 160-44875-1
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-44875-1

Receipt
The samples were received on 3/17/2022 9:05 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved. The temperature of the cooler at receipt was 9.7º C.

RAD
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Method 904.0 Radium-228
The laboratory control sample recovery is outside the upper QC limit indicating a potential positive bias for that analyte. This analyte was not observed above the RL in the associated samples; therefore the sample data is not adversely affected by this excursion. The data have been reported with this narrative. (LCS 160-555928/1-A)

The detection goal was not met for the following sample(s). Sample was prepped at a reduced volume due to the presence of matrix interferences: 468325 SC_10 (160-44875-6). Analytical results are reported with the detection limit achieved.

The Ba Carrier recovery is outside the lower control limit (40%) for the following sample: 468325 SC_10 (160-44875-6). There was physical evidence of matrix interference apparent during the initial preparation of the sample. The QC samples associated with the batch have acceptable carrier recovery indicating the presence of matrix interference.

The following samples were prepared at a reduced aliquot due to Matrix: 468321 FC_2 (160-44875-3), 468325 SC_10 (160-44875-6), 468328 SC_11 (160-44875-9) and 468330 SC_11 (160-44875-11). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 903.0 Radium-226
The following samples were prepared at a reduced aliquot due to Matrix: 468321 FC_2 (160-44875-3), 468325 SC_10 (160-44875-6), 468328 SC_11 (160-44875-9) and 468330 SC_11 (160-44875-11). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

The barium carrier recovery is outside the lower control limit of 40% (24%) for the following sample due to matrix interferences noted during the initial precipitation: 468325 SC_10 (160-44875-6). The QC samples associated with the batch have acceptable carrier recovery indicating the presence of matrix interference.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045-1205
phone 314.298.8566 fax 314.298.8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☑ Other: Coal Combustion Rule

TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Wendy Asay	Site Contact:	Date:	COC No:
Colorado Springs Utilities	Tel/Fax: 719-649-7796	Lab Contact: Rhonda Ridenhower	Carrier:	____ of ____ COCs
701 E. Las Vegas St.	Analysis Turnaround Time			Sampler:
Colorado Springs, CO 80903	☑ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
(719) 668-4603 Phone	TAT if different from Below ____			Walk-in Client:
(xxx) xxx-xxxx FAX	☑ 2 weeks			Lab Sampling:
Project Name: Coal Combustion Rule	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Total Radium 226, EPA 903.0	Total Radium 228, EPA 904.0	Combined Ra 226 and Ra 228	Sample Specific Notes:
468319 CC_1	3/14/22	1237	G	GW	2	N		X	X	X	
468320 FC_1	3/14/22	0918	G	GW	2	N		X	X	X	
468321 FC_2	3/14/22	1044	G	GW	2	N		X	X	X	
468322 FC_3A	3/14/22	1523	G	GW	2	N		X	X	X	
468323 FC_3B	3/14/22	1414	G	GW	2	N		X	X	X	
468325 SC_10	3/15/22	0921	G	GW	2	N		X	X	X	
468326 SC_13	3/15/22	1319	G	GW	2	N		X	X	X	
468327 SC_14	3/15/22	1423	G	GW	2	N		X	X	X	
468328 SC_11	3/15/22	1029	G	GW	2	N		X	X	X	
468329 SC_12	3/15/22	1211	G	GW	2	N		X	X	X	
468330 SC_11	3/15/22	1029	G	GW	2	N		X	X	X	
						N					

160-44875 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments: Please be sure to use the listed method numbers.

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:		Cooler Temp. (°C): Obs'd: ____ Corr'd: ____		Therm ID No.: ____
Relinquished by: Kelly Nelson Kelly Nelson	Company: Colorado Springs Utilities	Date/Time: 3/16/22 0955	Received by: FED EX	Company:	Date/Time:
Relinquished by: FED EX	Company:	Date/Time:	Received by:	Company: FTA STL	Date/Time: MAR 17 2022 0905
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Autumn R. Johnson	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.18, dated 9/5/2018

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-44875-1

Login Number: 44875
List Number: 1
Creator: Johnson, Autumn R

List Source: Eurofins St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Colorado Springs Utilities
Job ID: 160-44875-1
Project/Site: Radiochemistry Analysis

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.
X	Carrier is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Colorado Springs Utilities
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Colorado Springs Utilities
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-44875-1	468319 CC_1	Water	03/14/22 12:37	03/17/22 09:05
160-44875-2	468320 FC_1	Water	03/14/22 09:18	03/17/22 09:05
160-44875-3	468321 FC_2	Water	03/14/22 10:44	03/17/22 09:05
160-44875-4	468322 FC_3A	Water	03/14/22 15:23	03/17/22 09:05
160-44875-5	468323 FC_3B	Water	03/14/22 14:14	03/17/22 09:05
160-44875-6	468325 SC_10	Water	03/15/22 09:21	03/17/22 09:05
160-44875-7	468326 SC_13	Water	03/15/22 13:19	03/17/22 09:05
160-44875-8	468327 SC_14	Water	03/15/22 14:23	03/17/22 09:05
160-44875-9	468328 SC_11	Water	03/15/22 10:29	03/17/22 09:05
160-44875-10	468329 SC_12	Water	03/15/22 12:11	03/17/22 09:05
160-44875-11	468330 SC_11	Water	03/15/22 10:29	03/17/22 09:05

Client Sample ID: 468319 CC_1

Date Collected: 03/14/22 12:37
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-1
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.491		0.138	0.145	1.00	0.104	pCi/L	03/18/22 10:28	04/11/22 20:02	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*03/18/22 10:28*	*04/11/22 20:02*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.14		0.464	0.504	1.00	0.532	pCi/L	03/18/22 13:09	03/28/22 19:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*03/18/22 13:09*	*03/28/22 19:53*	*1*
Y Carrier	*80.7*		*40 - 110*	*03/18/22 13:09*	*03/28/22 19:53*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.63		0.484	0.524	5.00	0.532	pCi/L		04/12/22 21:38	1

Client Sample ID: 468320 FC_1

Date Collected: 03/14/22 09:18
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-2
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.271		0.113	0.116	1.00	0.124	pCi/L	03/18/22 10:28	04/11/22 20:02	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*40 - 110*	*03/18/22 10:28*	*04/11/22 20:02*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.27		0.425	0.440	1.00	0.573	pCi/L	03/18/22 13:09	03/28/22 19:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*40 - 110*	*03/18/22 13:09*	*03/28/22 19:53*	*1*
Y Carrier	*78.9*		*40 - 110*	*03/18/22 13:09*	*03/28/22 19:53*	*1*

Client Sample ID: 468320 FC_1
Lab Sample ID: 160-44875-2
Date Collected: 03/14/22 09:18
Matrix: Water
Date Received: 03/17/22 09:05

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.54		0.440	0.455	5.00	0.573	pCi/L		04/12/22 21:38	1

Client Sample ID: 468321 FC_2
Lab Sample ID: 160-44875-3
Date Collected: 03/14/22 10:44
Matrix: Water
Date Received: 03/17/22 09:05

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.302		0.155	0.158	1.00	0.182	pCi/L	03/18/22 13:14	04/11/22 20:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:11*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.354	U *	0.377	0.378	1.00	0.615	pCi/L	03/18/22 13:41	04/06/22 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*
Y Carrier	*82.2*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.656		0.408	0.410	5.00	0.615	pCi/L		04/12/22 21:37	1

Client Sample ID: 468322 FC_3A
Lab Sample ID: 160-44875-4
Date Collected: 03/14/22 15:23
Matrix: Water
Date Received: 03/17/22 09:05

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.113	U	0.0898	0.0904	1.00	0.125	pCi/L	03/18/22 13:14	04/11/22 21:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*03/18/22 13:14*	*04/11/22 21:43*	*1*

Client Sample ID: 468322 FC_3A

Date Collected: 03/14/22 15:23
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-4
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.334	U *	0.336	0.337	1.00	0.545	pCi/L	03/18/22 13:41	04/06/22 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*
Y Carrier	*75.5*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.448	U	0.348	0.349	5.00	0.545	pCi/L		04/12/22 21:37	1

Client Sample ID: 468323 FC_3B

Date Collected: 03/14/22 14:14
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-5
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.352**		0.136	0.140	1.00	0.153	pCi/L	03/18/22 13:14	04/11/22 20:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.4*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:14*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.856**	*	0.317	0.327	1.00	0.436	pCi/L	03/18/22 13:41	04/06/22 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.4*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*
Y Carrier	*80.7*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:23*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.21**		0.345	0.356	5.00	0.436	pCi/L		04/12/22 21:37	1

Client Sample ID: 468325 SC_10

Date Collected: 03/15/22 09:21
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-6

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.548		0.319	0.323	1.00	0.429	pCi/L	03/18/22 13:14	04/11/22 20:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*61.1*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:14*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.92	U G	1.87	1.88	1.00	3.03	pCi/L	04/07/22 13:33	04/11/22 16:02	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*23.9*	*X*	*40 - 110*	*04/07/22 13:33*	*04/11/22 16:02*	*1*
Y Carrier	*82.2*		*40 - 110*	*04/07/22 13:33*	*04/11/22 16:02*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.47	U	1.90	1.91	5.00	3.03	pCi/L		04/12/22 21:37	1

Client Sample ID: 468326 SC_13

Date Collected: 03/15/22 13:19
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-7

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0610	U	0.0925	0.0926	1.00	0.159	pCi/L	03/18/22 13:14	04/11/22 20:15	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:15*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.122	U *	0.330	0.330	1.00	0.567	pCi/L	03/18/22 13:41	04/06/22 12:24	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*
Y Carrier	*79.3*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*

Client Sample ID: 468326 SC_13
Lab Sample ID: 160-44875-7
Date Collected: 03/15/22 13:19
Matrix: Water
Date Received: 03/17/22 09:05

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.183	U	0.343	0.343	5.00	0.567	pCi/L		04/12/22 21:37	1

Client Sample ID: 468327 SC_14
Lab Sample ID: 160-44875-8
Date Collected: 03/15/22 14:23
Matrix: Water
Date Received: 03/17/22 09:05

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.103	U	0.0917	0.0922	1.00	0.139	pCi/L	03/18/22 13:14	04/11/22 20:15	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.4*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:15*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.278	U *	0.263	0.264	1.00	0.424	pCi/L	03/18/22 13:41	04/06/22 12:24	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.4*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*
Y Carrier	*83.7*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.381	U	0.279	0.280	5.00	0.424	pCi/L		04/12/22 21:37	1

Client Sample ID: 468328 SC_11
Lab Sample ID: 160-44875-9
Date Collected: 03/15/22 10:29
Matrix: Water
Date Received: 03/17/22 09:05

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.151	U	0.125	0.126	1.00	0.184	pCi/L	03/18/22 13:14	04/11/22 20:15	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:15*	*1*

Client Sample ID: 468328 SC_11

Date Collected: 03/15/22 10:29
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-9
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.962**	*	0.503	0.511	1.00	0.764	pCi/L	03/18/22 13:41	04/06/22 12:24	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*
Y Carrier	*83.0*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:24*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.11**		0.518	0.526	5.00	0.764	pCi/L		04/12/22 21:37	1

Client Sample ID: 468329 SC_12

Date Collected: 03/15/22 12:11
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-10
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.110	U	0.124	0.124	1.00	0.201	pCi/L	03/18/22 13:14	04/11/22 20:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.8*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.152	U *	0.279	0.279	1.00	0.522	pCi/L	03/18/22 13:41	04/06/22 12:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.8*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:25*	*1*
Y Carrier	*78.9*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0421	U	0.305	0.305	5.00	0.522	pCi/L		04/12/22 21:37	1

Client: Colorado Springs Utilities
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Client Sample ID: 468330 SC_11

Date Collected: 03/15/22 10:29
Date Received: 03/17/22 09:05

Lab Sample ID: 160-44875-11

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.100	U	0.128	0.128	1.00	0.212	pCi/L	03/18/22 13:14	04/11/22 20:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.3*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.451	U *	0.424	0.426	1.00	0.686	pCi/L	03/18/22 13:41	04/06/22 12:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.3*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:25*	*1*
Y Carrier	*83.0*		*40 - 110*	*03/18/22 13:41*	*04/06/22 12:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.551	U	0.443	0.445	5.00	0.686	pCi/L		04/12/22 21:37	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-555908/23-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 555908

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.07167		0.0532	0.0536	1.00	0.0713	pCi/L	03/18/22 10:28	04/11/22 20:06	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.8*		*40 - 110*	*03/18/22 10:28*	*04/11/22 20:06*	*1*

Lab Sample ID: LCS 160-555908/1-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 555908

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.736		1.01	1.00	0.0740	pCi/L	86	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*93.6*		*40 - 110*

Lab Sample ID: MB 160-555927/15-A
Matrix: Water
Analysis Batch: 559791

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 555927

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.03232	U	0.0688	0.0688	1.00	0.124	pCi/L	03/18/22 13:14	04/11/22 20:12	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.8*		*40 - 110*	*03/18/22 13:14*	*04/11/22 20:12*	*1*

Lab Sample ID: LCS 160-555927/1-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 555927

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.87		1.16	1.00	0.117	pCi/L	96	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*90.6*		*40 - 110*

Lab Sample ID: LCSD 160-555927/2-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 555927

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.14		1.09	1.00	0.109	pCi/L	89	75 - 125	0.32	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCSD 160-555927/2-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 555927

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	96.1		40 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-555926/23-A
Matrix: Water
Analysis Batch: 557411

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 555926

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2216	U	0.208	0.209	1.00	0.334	pCi/L	03/18/22 13:09	03/28/22 19:53	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.8		40 - 110	03/18/22 13:09	03/28/22 19:53	1
Y Carrier	82.2		40 - 110	03/18/22 13:09	03/28/22 19:53	1

Lab Sample ID: LCS 160-555926/1-A
Matrix: Water
Analysis Batch: 557411

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 555926

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			0.876	0.6669		0.266	1.00	0.343	pCi/L	76	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	93.6		40 - 110
Y Carrier	78.9		40 - 110

Lab Sample ID: MB 160-555928/15-A
Matrix: Water
Analysis Batch: 558744

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 555928

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.01377	U	0.222	0.222	1.00	0.397	pCi/L	03/18/22 13:41	04/06/22 12:25	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.8		40 - 110	03/18/22 13:41	04/06/22 12:25	1
Y Carrier	80.7		40 - 110	03/18/22 13:41	04/06/22 12:25	1

Lab Sample ID: LCS 160-555928/1-A
Matrix: Water
Analysis Batch: 558729

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 555928

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			0.873	1.271	*	0.361	1.00	0.427	pCi/L	146	75 - 125		

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-555928/1-A
Matrix: Water
Analysis Batch: 558729

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 555928

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	90.6		40 - 110
Y Carrier	83.4		40 - 110

Lab Sample ID: LCSD 160-555928/2-A
Matrix: Water
Analysis Batch: 558729

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 555928

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			0.873	0.7173		0.266	1.00	0.340	pCi/L	82	75 - 125	0.88	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	96.1		40 - 110
Y Carrier	83.0		40 - 110

Lab Sample ID: MB 160-559120/10-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 559120

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.01386	U	0.201	0.201	1.00	0.362	pCi/L	04/07/22 14:49	04/11/22 16:02	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.8		40 - 110	04/07/22 14:49	04/11/22 16:02	1
Y Carrier	81.1		40 - 110	04/07/22 14:49	04/11/22 16:02	1

Lab Sample ID: LCS 160-559120/1-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 559120

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.72	6.901		0.850	1.00	0.356	pCi/L	79	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	108		40 - 110
Y Carrier	83.4		40 - 110

Lab Sample ID: LCSD 160-559120/2-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 559120

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.72	7.626		0.897	1.00	0.274	pCi/L	87	75 - 125	0.42	1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-559120/2-A
Matrix: Water
Analysis Batch: 559799

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 559120

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	107		40 - 110
Y Carrier	90.8		40 - 110

QC Association Summary

Client: Colorado Springs Utilities
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Rad

Prep Batch: 555908

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-44875-1	468319 CC_1	Total/NA	Water	PrecSep-21	
160-44875-2	468320 FC_1	Total/NA	Water	PrecSep-21	
MB 160-555908/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-555908/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 555926

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-44875-1	468319 CC_1	Total/NA	Water	PrecSep_0	
160-44875-2	468320 FC_1	Total/NA	Water	PrecSep_0	
MB 160-555926/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-555926/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Prep Batch: 555927

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-44875-3	468321 FC_2	Total/NA	Water	PrecSep-21	
160-44875-4	468322 FC_3A	Total/NA	Water	PrecSep-21	
160-44875-5	468323 FC_3B	Total/NA	Water	PrecSep-21	
160-44875-6	468325 SC_10	Total/NA	Water	PrecSep-21	
160-44875-7	468326 SC_13	Total/NA	Water	PrecSep-21	
160-44875-8	468327 SC_14	Total/NA	Water	PrecSep-21	
160-44875-9	468328 SC_11	Total/NA	Water	PrecSep-21	
160-44875-10	468329 SC_12	Total/NA	Water	PrecSep-21	
160-44875-11	468330 SC_11	Total/NA	Water	PrecSep-21	
MB 160-555927/15-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-555927/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-555927/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 555928

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-44875-3	468321 FC_2	Total/NA	Water	PrecSep_0	
160-44875-4	468322 FC_3A	Total/NA	Water	PrecSep_0	
160-44875-5	468323 FC_3B	Total/NA	Water	PrecSep_0	
160-44875-7	468326 SC_13	Total/NA	Water	PrecSep_0	
160-44875-8	468327 SC_14	Total/NA	Water	PrecSep_0	
160-44875-9	468328 SC_11	Total/NA	Water	PrecSep_0	
160-44875-10	468329 SC_12	Total/NA	Water	PrecSep_0	
160-44875-11	468330 SC_11	Total/NA	Water	PrecSep_0	
MB 160-555928/15-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-555928/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-555928/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 559120

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-44875-6	468325 SC_10	Total/NA	Water	PrecSep_0	
MB 160-559120/10-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-559120/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-559120/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: Radiochemistry Analysis

Job ID: 160-44875-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
160-44875-1	468319 CC_1	97.3
160-44875-2	468320 FC_1	95.6
160-44875-3	468321 FC_2	75.1
160-44875-4	468322 FC_3A	75.1
160-44875-5	468323 FC_3B	90.4
160-44875-6	468325 SC_10	61.1
160-44875-7	468326 SC_13	82.3
160-44875-8	468327 SC_14	88.4
160-44875-9	468328 SC_11	82.3
160-44875-10	468329 SC_12	82.8
160-44875-11	468330 SC_11	78.3
LCS 160-555908/1-A	Lab Control Sample	93.6
LCS 160-555927/1-A	Lab Control Sample	90.6
LCSD 160-555927/2-A	Lab Control Sample Dup	96.1
MB 160-555908/23-A	Method Blank	97.8
MB 160-555927/15-A	Method Blank	95.8

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
160-44875-1	468319 CC_1	97.3	80.7
160-44875-2	468320 FC_1	95.6	78.9
160-44875-3	468321 FC_2	75.1	82.2
160-44875-4	468322 FC_3A	75.1	75.5
160-44875-5	468323 FC_3B	90.4	80.7
160-44875-6	468325 SC_10	23.9 X	82.2
160-44875-7	468326 SC_13	82.3	79.3
160-44875-8	468327 SC_14	88.4	83.7
160-44875-9	468328 SC_11	82.3	83.0
160-44875-10	468329 SC_12	82.8	78.9
160-44875-11	468330 SC_11	78.3	83.0
LCS 160-555926/1-A	Lab Control Sample	93.6	78.9
LCS 160-555928/1-A	Lab Control Sample	90.6	83.4
LCS 160-559120/1-A	Lab Control Sample	108	83.4
LCSD 160-555928/2-A	Lab Control Sample Dup	96.1	83.0
LCSD 160-559120/2-A	Lab Control Sample Dup	107	90.8
MB 160-555926/23-A	Method Blank	97.8	82.2
MB 160-555928/15-A	Method Blank	95.8	80.7
MB 160-559120/10-A	Method Blank	97.8	81.1

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Colorado Springs Utilities

It's how we're all connected

Laboratory Report For:

Coal Combustion Residuals - Landfill

Colorado Springs Utilities Environmental Services

Report Authorized by: Wendy M Asay

Title: Environmental Specialist

Report Date: January 13, 2023
Revised to correct water levels that were recorded incorrectly on COC.

Report generated by: Wendy M. Asay

Colorado Springs Utilities Laboratory Services Section certifies that the test results meet all approved method and Laboratory Quality Assurance Plan requirements unless otherwise noted

Samples

474856	27-Sep-2022 14:06	Crooked Canyon Well #1
474857	27-Sep-2022 10:42	Fort Carson Well #1
474858	27-Sep-2022 11:56	Fort Carson Well #2
474859	27-Sep-2022 15:25	Fort Carson Well #3A
474860	27-Sep-2022 16:06	Fort Carson Well #3B
474861	27-Sep-2022 16:30	Equipment Blank
474862	26-Sep-2022 11:41	Sand Canyon Well #10
474863	26-Sep-2022 13:58	Sand Canyon Well #13
474864	26-Sep-2022 15:05	Sand Canyon Well #14
474865	26-Sep-2022 16:20	Sand Canyon Well #11
474866	26-Sep-2022 12:30	Sand Canyon Well #12
474867	26-Sep-2022 12:30	Sand Canyon Well #12

LIMS #: 474856

Sample Date: 9/27/2022 2:06:55 PM

Sample Point: CC_1

Sample Point Description: Crooked Canyon Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.1	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.1	degrees C	0.000			1
+	SM_2510_B	Conductivity	24100	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	176	mV	0			1
	SM_2130_B	Turbidity	12	NTU	0.05			1
	NA	Depth to Water	15.36	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	35100	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.23	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	1680	mg/L	0.50	D	09/29/2022	1
		Sulfate	20400	mg/L	0.50	D	09/29/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Arsenic (Total Recoverable)	18.2	ug/L	1.0	D	10/04/2022	1
		Barium (Total Recoverable)	7.3	ug/L	0.20	D	10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1/T/ISL	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Chromium (Total Recoverable)	2.3	ug/L	1.0	U1	10/04/2022	1
		Lead (Total Recoverable)	1.8	ug/L	0.50	D/ISL	10/04/2022	1
		Molybdenum (Total Recoverable)	1.3	ug/L	0.20	D	10/04/2022	1
		Selenium (Total Recoverable)	224	ug/L	1.0	D	10/04/2022	1
		Thallium (Total Recoverable)	0.51	ug/L	0.50	U1/ISL	10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	1000	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	377000	ug/L	100	D		1
		Cobalt (Total Recoverable)	6.83	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	879	ug/L	10.0		10/10/2022	1
	EPA_1631	Mercury (Total)	0.005	ug/L	0.002		10/13/2022	1

LIMS #: 474857

Sample Date: 9/27/2022 10:42:55 AM

Sample Point: FC_1

Sample Point Description: Fort Carson Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_1631	Mercury (Total)	0.002	ug/L	0.002		10/13/2022	1
+	SM_4500HB	pH	7.3	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	18300	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	83	mV	0			1
	SM_2130_B	Turbidity	0.75	NTU	0.05			1
	NA	Depth to Water	17.00	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	21500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.12	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	770	mg/L	0.50	D	09/29/2022	1
		Sulfate	12800	mg/L	0.50	D	09/29/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Arsenic (Total Recoverable)	4.9	ug/L	1.0	U1	10/04/2022	1
		Barium (Total Recoverable)	9.3	ug/L	0.20	D	10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1/T/ISL	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Chromium (Total Recoverable)	1.2	ug/L	1.0	U1	10/04/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50	U1/ISL	10/04/2022	1
		Molybdenum (Total Recoverable)	2.1	ug/L	0.20	D	10/04/2022	1
		Selenium (Total Recoverable)	17.6	ug/L	1.0	D	10/04/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1/ISL	10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	990	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	383000	ug/L	100	D		1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	1190	ug/L	10.0		10/10/2022	1

LIMS #: 474858

Sample Date: 9/27/2022 11:56:55 AM

Sample Point: FC_2

Sample Point Description: Fort Carson Well #2

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.7	degrees C	0.000			1
+	SM_2510_B	Conductivity	8160	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	229	mV	0			1
	SM_2130_B	Turbidity	8.0	NTU	0.05			1
	NA	Depth to Water	14.80	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	10000	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.52	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	104	mg/L	0.50	D	09/29/2022	1
		Sulfate	5920	mg/L	0.50	D	09/29/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Arsenic (Total Recoverable)	2.0	ug/L	1.0	U1	10/04/2022	1
		Barium (Total Recoverable)	8.6	ug/L	0.20	D	10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1/ISL/T	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Chromium (Total Recoverable)	1.2	ug/L	1.0	U1	10/04/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Molybdenum (Total Recoverable)	2.9	ug/L	0.20	D	10/04/2022	1
		Selenium (Total Recoverable)	37.0	ug/L	1.0	D	10/04/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	988	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	408000	ug/L	100	D		1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	300	ug/L	10.0		10/10/2022	1
	EPA_1631	Mercury (Total)	0.007	ug/L	0.002		10/06/2022	1

LIMS #: 474859

Sample Date: 9/27/2022 3:25:55 PM

Sample Point: FC_3A

Sample Point Description: Fort Carson Well #3A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.0	degrees C	0.000			1
+	SM_2510_B	Conductivity	7410	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	237	mV	0			1
	SM_2130_B	Turbidity	86	NTU	0.05			1
	NA	Depth to Water	19.88	ft.	0.0000			1
	SM_4500_FC	Fluoride (Total)	0.46	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	130	mg/L	0.50	D	09/30/2022	1
		Sulfate	5140	mg/L	0.50	D	09/29/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Arsenic (Total Recoverable)	3.7	ug/L	1.0	U1	10/04/2022	1
		Barium (Total Recoverable)	14.9	ug/L	0.20	D	10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	T/U1	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Chromium (Total Recoverable)	1.5	ug/L	1.0	U1	10/04/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Molybdenum (Total Recoverable)	7.0	ug/L	0.20	D	10/04/2022	1
		Selenium (Total Recoverable)	51.2	ug/L	1.0	D	10/04/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	1060	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	418000	ug/L	100	D	10/13/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	334	ug/L	10.0		10/10/2022	1
	EPA_1631	Mercury (Total)	0.003	ug/L	0.002		10/06/2022	1
	SM_2540_C	Total Dissolved Solids	9060	mg/L	10			1

LIMS #: 474860

Sample Date: 9/27/2022 4:06:55 PM

Sample Point: FC_3B

Sample Point Description: Fort Carson Well #3B

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.7	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.3	degrees C	0.000			1
+	SM_2510_B	Conductivity	7420	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	147	mV	0			1
	SM_2130_B	Turbidity	21	NTU	0.05			1
	NA	Depth to Water	21.91	ft.	0.0000			1
	SM_4500_FC	Fluoride (Total)	0.48	mg/L	0.10	T	09/28/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Arsenic (Total Recoverable)	6.8	ug/L	1.0	U1	10/04/2022	1
		Barium (Total Recoverable)	12.2	ug/L	0.20	D	10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1/T	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
		Chromium (Total Recoverable)	3.4	ug/L	1.0	U1	10/04/2022	1
		Lead (Total Recoverable)	0.81	ug/L	0.50	U1	10/04/2022	1
		Molybdenum (Total Recoverable)	2.3	ug/L	0.20	D	10/04/2022	1
		Selenium (Total Recoverable)	6.2	ug/L	1.0	U1	10/04/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	1200	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	203000	ug/L	100	D		1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	286	ug/L	10.0		10/10/2022	1
	EPA_1631	Mercury (Total)	0.003	ug/L	0.002		10/06/2022	1
	EPA_300_0	Chloride	200	mg/L	0.50	D	09/30/2022	1
		Sulfate	4430	mg/L	0.50	D	09/30/2022	1
	SM_2540_C	Total Dissolved Solids	6960	mg/L	10			1

LIMS #: 474861

Sample Date: 9/27/2022 4:30:55 PM

Sample Point: EQUIP_BLK

Sample Point Description: Equipment Blank

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	<10	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	<0.10	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	<0.50	mg/L	0.50		09/29/2022	1
		Sulfate	<0.50	mg/L	0.50		09/29/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		10/04/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		10/04/2022	1
		Barium (Total Recoverable)	<0.20	ug/L	0.20		10/04/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	T	10/04/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		10/04/2022	1
		Chromium (Total Recoverable)	<1.0	ug/L	1.0		10/04/2022	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		10/04/2022	1
		Molybdenum (Total Recoverable)	<0.20	ug/L	0.20		10/04/2022	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		10/04/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		10/04/2022	1
	EPA_200_7	Boron (Total Recoverable)	<20.0	ug/L	20.0		10/10/2022	1
		Calcium (Total Recoverable)	<100	ug/L	100		10/10/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/10/2022	1
		Lithium (Total Recoverable)	<10.0	ug/L	10.0		10/10/2022	1
	EPA_1631	Mercury (Total)	<0.002	ug/L	0.002		10/06/2022	1

LIMS #: 474862

Sample Date: 9/26/2022 11:41:09 AM

Sample Point: SC_10

Sample Point Description: Sand Canyon Well #10

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.5	degrees C	0.000			1
+	SM_2510_B	Conductivity	15000	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	242	mV	0			1
	SM_2130_B	Turbidity	180	NTU	0.05			1
	NA	Depth to Water	15.01	ft.	0.0000			1
	SM_4500_FC	Fluoride (Total)	0.53	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	960	mg/L	0.50	D	09/30/2022	1
		Sulfate	9170	mg/L	0.50	D	09/30/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	8.3	ug/L	1.0	D	10/03/2022	1
		Barium (Total Recoverable)	43.6	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	7.3	ug/L	1.0	D	10/03/2022	1
		Lead (Total Recoverable)	3.3	ug/L	0.50	D	10/03/2022	1
		Molybdenum (Total Recoverable)	6.5	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	232	ug/L	1.0	D	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	1210	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	416000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	624	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.012	ug/L	0.002		10/06/2022	1
	SM_2540_C	Total Dissolved Solids	16700	mg/L	10			1

LIMS #: 474863

Sample Date: 9/26/2022 1:58:09 PM

Sample Point: SC_13

Sample Point Description: Sand Canyon Well #13

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.4	degrees C	0.000			1
+	SM_2510_B	Conductivity	9630	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	222	mV	0			1
	SM_2130_B	Turbidity	93	NTU	0.05			1
	NA	Depth to Water	13.61	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11200	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.78	mg/L	0.10	T	09/28/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0	U1	10/03/2022	1
		Barium (Total Recoverable)	18.4	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	2.0	ug/L	1.0	U1	10/03/2022	1
		Lead (Total Recoverable)	0.65	ug/L	0.50	U1	10/03/2022	1
		Molybdenum (Total Recoverable)	3.8	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	23.9	ug/L	1.0	D	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	1560	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	378000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	288	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.004	ug/L	0.002		10/06/2022	1
	EPA_300_0	Chloride	154	mg/L	0.50	D	09/30/2022	1
		Sulfate	6960	mg/L	0.50	D	09/30/2022	1

LIMS #: 474864

Sample Date: 9/26/2022 3:05:09 PM

Sample Point: SC_14

Sample Point Description: Sand Canyon Well #14

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	8890	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	258	mV	0			1
	SM_2130_B	Turbidity	450	NTU	0.05			1
	NA	Depth to Water	13.64	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11700	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.74	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	146	mg/L	0.50	D	09/30/2022	1
		Sulfate	6930	mg/L	0.50	D	09/30/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	2.4	ug/L	1.0	U1	10/03/2022	1
		Barium (Total Recoverable)	79.8	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	10.4	ug/L	1.0	D	10/03/2022	1
		Lead (Total Recoverable)	5.4	ug/L	0.50	D	10/03/2022	1
		Molybdenum (Total Recoverable)	11.0	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	6.1	ug/L	1.0	U1	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	1450	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	362000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	276	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.011	ug/L	0.002		10/06/2022	1

LIMS #: 474865

Sample Date: 9/26/2022 4:20:09 PM

Sample Point: SC_11

Sample Point Description: Sand Canyon Well #11

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	15.0	degrees C	0.000			1
+	SM_2510_B	Conductivity	13500	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	158	mV	0			1
	SM_2130_B	Turbidity	140	NTU	0.05			1
	NA	Depth to Water	11.64	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	15100	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.57	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	1150	mg/L	0.50	D	09/30/2022	1
		Sulfate	7740	mg/L	0.50	D	09/30/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	11.4	ug/L	1.0	D	10/03/2022	1
		Barium (Total Recoverable)	40.5	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	5.5	ug/L	1.0	U1	10/03/2022	1
		Lead (Total Recoverable)	2.4	ug/L	0.50	U1	10/03/2022	1
		Molybdenum (Total Recoverable)	3.5	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	240	ug/L	1.0	D	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	2510	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	438000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	532	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.012	ug/L	0.002		10/06/2022	1

LIMS #: 474866

Sample Date: 9/26/2022 12:30:09 PM

Sample Point: SC_12

Sample Point Description: Sand Canyon Well #12

Collection Comments: Hg cap broke in field, replaced in SR

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	16.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	12400	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	70	mV	0			1
	SM_2130_B	Turbidity	55	NTU	0.05			1
	NA	Depth to Water	13.59	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11100	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.93	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	288	mg/L	0.50	D	09/30/2022	1
		Sulfate	8550	mg/L	0.50	D	09/30/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0	U1	10/03/2022	1
		Barium (Total Recoverable)	22.8	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	2.6	ug/L	1.0	U1	10/03/2022	1
		Lead (Total Recoverable)	0.97	ug/L	0.50	U1	10/03/2022	1
		Molybdenum (Total Recoverable)	6.1	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	12.7	ug/L	1.0	D	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	4370	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	374000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	406	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.004	ug/L	0.002		10/06/2022	1

LIMS #: 474867

Sample Date: 9/26/2022 12:30:09 PM

Sample Point: SC_12

Sample Point Description: Sand Canyon Well #12

Collection Comments: Duplicate

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	14300	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.92	mg/L	0.10	T	09/28/2022	1
	EPA_300_0	Chloride	301	mg/L	0.50	D	09/30/2022	1
		Sulfate	8440	mg/L	0.50	D	09/30/2022	1
	EPA_200_8	Antimony (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Arsenic (Total Recoverable)	1.8	ug/L	1.0	U1	10/03/2022	1
		Barium (Total Recoverable)	16.7	ug/L	0.20	D	10/03/2022	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	U1	09/30/2022	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
		Chromium (Total Recoverable)	2.1	ug/L	1.0	U1	10/03/2022	1
		Lead (Total Recoverable)	0.66	ug/L	0.50	U1	10/03/2022	1
		Molybdenum (Total Recoverable)	6.6	ug/L	0.20	D	10/03/2022	1
		Selenium (Total Recoverable)	15.4	ug/L	1.0	D	10/03/2022	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50	U1	10/03/2022	1
	EPA_200_7	Boron (Total Recoverable)	4420	ug/L	20.0		09/30/2022	1
		Calcium (Total Recoverable)	380000	ug/L	100	D/B1	09/30/2022	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		09/30/2022	1
		Lithium (Total Recoverable)	391	ug/L	10.0	D	09/30/2022	1
	EPA_1631	Mercury (Total)	0.004	ug/L	0.002		10/06/2022	1

Flags

*	Analysis performed by an external contract laboratory.
+	Analysis performed in the field.

Data Qualifiers

B1 - Detection in the blank but the analyte concentration in the sample is 10x greater.
D - Value reported is multiplied by a dilution factor. The reporting limit is not.
ISL – Internal Standard Low, data may be biased high.
T- MS recovery outside the established range. The recovery is matrix related, not method related.
U1 - Sample dilution required to minimize matrix effects, result is below the RL. MS/MSD results confirm accuracy.

Glossary

DQ - Data Qualifer
RL – Reporting Limit
MDL – Method Detection Limit
Dil Fac – Dilution Factor

Case Narrative

Colorado Springs Utilities

Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Upgradient Wells

Sample Date: ~~9/26/2022~~

QC Report Needed 9/27/2022 KAN 9/28/22

Sampler: DJM

LOCATION	# Bottles	LIMS #	Sample Time	pH, Field (su) SM 4500 H	Temperature, Field (°C) SM 2550 B	Conductivity, Field (umhos/cm) SM 2510 B	Oxidation Reduction Potential, Field (mV)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Fluoride, SM 4500 F C	Total Dissolved Solids, SM 2540 C	Chloride, Sulfate EPA 300.0	EPA 200.7 (B, Ca, Co & Li - Total Recoverable)	EPA 200.8 (Sb, As, Ba, Be, Cd, Cr, Pb, Mo, Se & Tl - Total Recoverable)	Mercury, EPA 1631 (not collected using clean-hands/dirty-hands)	Total Radium 226 & Radium 228 (Sent to Test America St. Louis)	Comments
				Please mark boxes that apply													
CC_1	8	474856 **	14:06	7.14	14.1	24,056	176.2	12.4	22.46	x	x	x	x	x	x	x	15.36
FC_1	8	474857 **	10:42	7.31	14.2	18,277	82.9	0.75	18.6	x	x	x	x	x	x	x	17.00
FC_2	8	474858 **	11:56	7.47	13.7	8,164	228.8	7.99	15.34	x	x	x	x	x	x	x	14.80
FC_3A	8	474859 **	15:25	7.54	14.0	7414	236.5	86.4	22.32	x	x	x	x	x	x	x	19.88
FC_3B	8	474860 **	16:06	7.69	14.3	7419	147.4	21.4	31.22	x	x	x	x	x	x	x	21.91
EQUIP_BLK	6	474861	16:30							x	x	x	x	x	x		
Total # of Bottles	46									1-500 mL GP	1-250 mL GP	1-250 mL GP	1-500 mL New Certified plastic	1-500 mL New Certified plastic	1-250 mL glass acid-rinsed	2-1000 mL plastic	

Signature/Print last name

Relinquished by: [signature] Aikalia — Date/Time: 9/27/22 @ 1708

Received by: Kelly Nelson Nelson — 9/28/22 @ 0720 *

Additional Comments / Sample Rejections / Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

** Field sampler recorded final water level rather than initial water level on COC. The corrected values are in the comments column. WMA 1/13/23

* Samples left in locked SR cabinets in coolers on ice overnight and received in the morning KAN 9/28/22

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Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Downgradient and Cross Gradient Wells

Sample Date: ~~9/27/2022~~ 9/26 DSR

QC Report Needed

Sampler: Dan Mikalian

	LOCATION	# Bottles	LIMS #	Sample Time	pH, Field (su) SM 4500 H	Temperature, Field (°C) SM 2550 B	Conductivity, Field (umhos/cm) SM 2510 B	Oxidation Reduction Potential, Field (mV)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Fluoride, SM 4500 F C	Total Dissolved Solids, SM 2540 C	Chloride, Sulfate EPA 300.0	EPA 200.7 (B, Ca, Co & Li - Total Recoverable)	EPA 200.8 (Sb, As, Ba, Be, Cd, Cr, Pb, Mo, Se & Tl - Total Recoverable)	Mercury, EPA 1631 (not collecte using clean-hands/dirty-hands)	Total Radium 226 & Radium 228 (Sent to Test America St. Louis)	Comments
					Please mark boxes that apply													
15.01	SC_10 KAN 9/27/22	~~7~~ 8	474862 **	11:41	7.43	14.5	14,979	241.9	179	15.38	x	x	x	x	x	x	x	10 min Pause in Purge. ~~glass~~ Bottle Lid Broke KAN 9/27/22
13.61	SC_13	8	474863 **	12:58	7.51	14.4	9,632	222.2	92.9	13.63	x	x	x	x	x	x	x	
13.64	SC_14	8	474864 **	15:05	7.49	12.2	8,887	258.0	44.8	13.88	x	x	x	x	x	x	x	
11.64	SC_11	8	474865 **	16:20	7.44	15.0	13,492	158.3	13.6	12.35	x	x	x	x	x	x	x	
13.59	SC_12	8	474866 **	12:30	7.45	16.8	12,401	70.4	55.2	15.79	x	x	x	x	x	x	x	10 min pause in purge - Hg lid broke * KAN 9/27/22
	SC_12 Duplicate	8	474867	12:30							x	x	x	x	x	x	x	
	Total # of Bottles	~~55~~ 48 KAN 9/27/22									1-500 mL GP	1-250 mL GP	1-250 mL GP	1-500 mL New Certified plastic	1-500 mL New Certified plastic	1-250 mL glass acid-rinsed	2-1000 mL plastic	

Relinquished by — Signature/Print last name: Mikalian — Date/Time: 9/26/22 @ 1830

Received by — Kelly Nelson Nelson — Date/Time: 9/27/22 @ 0729 **

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

** Field sampler recorded final water level rather than initial water level on COC. The corrected values are on the left side of the page. WMA 1/13/23

* Cap for Hg sample bottle broke. Replaced cap in Sample Receiving on 9/27/22. KAN 9/27/22

** Samples left in coolers on ice in locked SR cabinets overnight. KAN 9/27/22

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Laboratory Services Section
QC Report

CCR Landfill Assessment
September 2022

Quality Assurance Approval: Lesley Susic Date: 10/28/2022

This report is for sample numbers 474856 – 474867.

Total Dissolved Solids by Standard Methods 2540 C

There are no anomalies to report for this analysis.

Fluoride by Standard Methods 4500 F C

The matrix spike recovery is outside the established range in samples 474862 and 474865. The recovery is matrix related, not method related. Associated data are qualified.

Anions by EPA Method 300.0

There are no anomalies to report for this analysis.

Mercury by EPA 1631 E

There are no anomalies to report for this analysis.

EPA 200.7

Calcium was detected in the laboratory blank for sample 474862 – 474867. The sample concentrations are at least 10x greater than the blank concentration and the associated data are qualified.

EPA 200.8

The matrix spike recovery is outside the established range for Beryllium in sample 474860. The recovery is matrix related, not method related. Associated beryllium data are qualified.

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 9/28/22
Sampled date: 9/26/22 for samples 474862 – 474867
Sampled date: 9/27/22 for samples 474856 – 474861

Matrix QC performed on sample 474859 and 474562

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	99	85 - 110		
Duplicate	Total Dissolved Solids (474859)			6	<10
Duplicate	Total Dissolved Solids (474862)			4	<10

Method: Fluoride by Standard Methods 4500 F C
Batch Analysis date: 9/28/22
Sampled date: 9/26/22 for samples 474862 – 474867
Sampled date: 9/27/22 for samples 474856 – 474861

Matrix QC performed on samples 474862 and 474865

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Fluoride (Total)	100	90 - 110		
QCS	Fluoride (Total)	98	90 - 110		
MS	Fluoride (Total) (474862)	***63**	80 - 120		
MSD	Fluoride (Total) (474862)			<1	<20
MS	Fluoride (Total) (474865)	***64**	80 - 120		
MSD	Fluoride (Total) (474865)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Fluoride (Total)	<0.05 mg/L	0.05 mg/L

***See Narrative**

Method: Anions by EPA Method 300.0
Batch Analysis date: 9/29/22
Sampled date: 9/26/22 for samples 474862 – 474867
Sampled date: 9/27/22 for samples 474856 – 474861

Matrix QC performed on samples 474863 and 475058

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Chloride	99	50-150		
LFB	Chloride	96	90-110	<1	<20
LD	Chloride (474863)			<1	<20
LD	Chloride (475058)			3	<20
MS	Chloride (474863)	100	80-120		
MS	Chloride (475058)	100	80-120		
MRL	Sulfate	115	50-150		
LFB	Sulfate	96	90-110	<1	<20
LD	Sulfate (474863)			<1	<20
LD	Sulfate (475058)			3	<20
MS	Sulfate (474863)	118	80-120		
MS	Sulfate (475058)	109	80-120		

QC Type	Analyte	Concentration	Limit
LRB	Chloride	<0.17 mg/L	0.17 mg/L
LRB	Sulfate	<0.17 mg/L	0.17 mg/L

Method: Mercury by EPA 1631 E
Batch Analysis date: 10/6/22
Sampled date: 9/26/22 for samples 474862 – 474867
Sampled date: 9/27/22 for samples 474858 – 474861

Matrix QC performed on sample 474860

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Mercury (Total)	86	60-140		
QCS	Mercury (Total)	111	77-123		
MS	Mercury (Total)	75	71-125		
MSD	Mercury (Total)			4	<24

QC Type	Analyte	Concentration	Limit
LRB	Mercury (Total)	<0.5 ng/L	0.5 ng/L

Method: Mercury by EPA 1631 E
Batch Analysis date: 10/13/22
Sampled date: 9/27/22 for samples 474856 and 474857

Matrix QC performed on samples 474857

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Mercury (Total)	100	60-140		
QCS	Mercury (Total)	99	77-123		
MS	Mercury (Total)	82	71-125		
MSD	Mercury (Total)			11	<24

QC Type	Analyte	Concentration	Limit
LRB	Mercury (Total)	<0.5 ng/L	0.5 ng/L

Method: EPA 200.7
Batch Analysis date: 9/30/22
Digestion date: 9/28/22
Sampled date: 9/26/22 for samples 474862 - 474867

Matrix QC performed on sample 474866

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	103	50-150		
LFB	Boron (Total Recoverable)	102	85-115		
MS	Boron (Total Recoverable)	95	70-130		
MSD	Boron (Total Recoverable)			<1	<20
MRL	Calcium (Total Recoverable)	103	50-150		
LFB	Calcium (Total Recoverable)	99	85-115		
MS	Calcium (Total Recoverable)	75	70-130		
MSD	Calcium (Total Recoverable)			1	<20
MRL	Cobalt (Total Recoverable)	99	50-150		
LFB	Cobalt (Total Recoverable)	100	85-115		
MS	Cobalt (Total Recoverable)	88	70-130		
MSD	Cobalt (Total Recoverable)			<1	<20
MRL	Lithium (Total Recoverable)	95	50-150		
LFB	Lithium (Total Recoverable)	100	85-115		
MS	Lithium (Total Recoverable)	97	70-130		
MSD	Lithium (Total Recoverable)			3	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<4.80 ug/L	4.80 ug/L
LRB	Calcium (Total Recoverable)	***48.6 ug/L**	18.1 ug/L
LRB	Cobalt (Total Recoverable)	<2.00 ug/L	2.00 ug/L
LRB	Lithium (Total Recoverable)	<7.41 ug/L	7.41 ug/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 10/10/22
Digestion date: 10/4/22
Sampled date: 9/27/22 for samples 474856 - 474861

Matrix QC performed on sample 474860

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	108	50-150		
LFB	Boron (Total Recoverable)	105	85-115		
MS	Boron (Total Recoverable)	108	70-130		
MSD	Boron (Total Recoverable)			<1	<20
MRL	Calcium (Total Recoverable)	129	50-150		
LFB	Calcium (Total Recoverable)	102	85-115		
MS	Calcium (Total Recoverable)	107	70-130		
MSD	Calcium (Total Recoverable)			<1	<20
MRL	Cobalt (Total Recoverable)	103	50-150		
LFB	Cobalt (Total Recoverable)	102	85-115		
MS	Cobalt (Total Recoverable)	93	70-130		
MSD	Cobalt (Total Recoverable)			<1	<20
MRL	Lithium (Total Recoverable)	100	50-150		
LFB	Lithium (Total Recoverable)	102	85-115		
MS	Lithium (Total Recoverable)	123	70-130		
MSD	Lithium (Total Recoverable)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<4.80 ug/L	4.80 ug/L
LRB	Calcium (Total Recoverable)	<18.1 ug/L	18.1 ug/L
LRB	Cobalt (Total Recoverable)	<2.00 ug/L	2.00 ug/L
LRB	Lithium (Total Recoverable)	<7.41 ug/L	7.41 ug/L

EPA Method: EPA 200.8
Digestion date: 9/28/22
Batch Analysis date: 9/30/22 for all except Be
Batch Analysis date: 10/3/22 for Be
Sampled date: 9/26/22 for samples 474862 - 474867

Matrix QC performed on sample 474866

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total Recoverable)	106	50-150		
LFB	Antimony (Total Recoverable)	102	85-115		
MS	Antimony (Total Recoverable)	97	70-130		
MSD	Antimony (Total Recoverable)			1	<20
MRL	Arsenic (Total Recoverable)	104	50-150		
LFB	Arsenic (Total Recoverable)	103	85-115		
MS	Arsenic (Total Recoverable)	97	70-130		
MSD	Arsenic (Total Recoverable)			6	<20
MRL	Barium (Total Recoverable)	109	50-150		
LFB	Barium (Total Recoverable)	103	85-115		

MS	Barium (Total Recoverable)	92	70-130		
MSD	Barium (Total Recoverable)			1	<20
MRL	Beryllium (Total Recoverable)	106	50-150		
LFB	Beryllium (Total Recoverable)	99	85-115		
MS	Beryllium (Total Recoverable)	80	70-130		
MSD	Beryllium (Total Recoverable)			2	<20
MRL	Cadmium (Total Recoverable)	105	50-150		
LFB	Cadmium (Total Recoverable)	103	85-115		
MS	Cadmium (Total Recoverable)	94	70-130		
MSD	Cadmium (Total Recoverable)			3	<20
MRL	Chromium (Total Recoverable)	98	50-150		
LFB	Chromium (Total Recoverable)	100	85-115		
MS	Chromium (Total Recoverable)	94	70-130		
MSD	Chromium (Total Recoverable)			<1	<20
MRL	Lead (Total Recoverable)	102	50-150		
LFB	Lead (Total Recoverable)	100	85-115		
MS	Lead (Total Recoverable)	102	70-130		
MSD	Lead (Total Recoverable)			<1	<20
MRL	Molybdenum (Total Recoverable)	108	50-150		
LFB	Molybdenum (Total Recoverable)	102	85-115		
MS	Molybdenum (Total Recoverable)	102	70-130		
MSD	Molybdenum (Total Recoverable)			<1	<20
MRL	Selenium (Total Recoverable)	108	50-150		
LFB	Selenium (Total Recoverable)	106	85-115		
MS	Selenium (Total Recoverable)	96	70-130		
MSD	Selenium (Total Recoverable)			3	<20
MRL	Thallium (Total Recoverable)	93	50-150		
LFB	Thallium (Total Recoverable)	97	85-115		
MS	Thallium (Total Recoverable)	100	70-130		
MSD	Thallium (Total Recoverable)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total Recoverable)	<0.18 ug/L	0.18 ug/L
LRB	Arsenic (Total Recoverable)	<0.36 ug/L	0.36 ug/L
LRB	Barium (Total Recoverable)	<0.10 ug/L	0.10 ug/L
LRB	Beryllium (Total Recoverable)	<0.12 ug/L	0.12 ug/L
LRB	Cadmium (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Chromium (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Lead (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Molybdenum (Total Recoverable)	<0.12 ug/L	0.12 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L
LRB	Thallium (Total Recoverable)	<0.11 ug/L	0.11 ug/L

EPA Method: EPA 200.8
Digestion date: 10/3/22
Batch Analysis date: 10/4/22
Sampled date: 9/27/22 for samples 474856 – 474861

Matrix QC performed on sample 474860

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total Recoverable)	137	50-150		
LFB	Antimony (Total Recoverable)	104	85-115		
MS	Antimony (Total Recoverable)	103	70-130		
MSD	Antimony (Total Recoverable)			<1	<20
MRL	Arsenic (Total Recoverable)	107	50-150		
LFB	Arsenic (Total Recoverable)	103	85-115		
MS	Arsenic (Total Recoverable)	98	70-130		
MSD	Arsenic (Total Recoverable)			3	<20
MRL	Barium (Total Recoverable)	107	50-150		
LFB	Barium (Total Recoverable)	104	85-115		
MS	Barium (Total Recoverable)	104	70-130		
MSD	Barium (Total Recoverable)			<1	<20
MRL	Beryllium (Total Recoverable)	113	50-150		
LFB	Beryllium (Total Recoverable)	94	85-115		
MS	Beryllium (Total Recoverable)	***66**	70-130		
MSD	Beryllium (Total Recoverable)			4	<20
MRL	Cadmium (Total Recoverable)	99	50-150		
LFB	Cadmium (Total Recoverable)	101	85-115		
MS	Cadmium (Total Recoverable)	91	70-130		
MSD	Cadmium (Total Recoverable)			2	<20
MRL	Chromium (Total Recoverable)	97	50-150		
LFB	Chromium (Total Recoverable)	101	85-115		
MS	Chromium (Total Recoverable)	95	70-130		
MSD	Chromium (Total Recoverable)			1	<20
MRL	Lead (Total Recoverable)	100	50-150		
LFB	Lead (Total Recoverable)	100	85-115		
MS	Lead (Total Recoverable)	102	70-130		
MSD	Lead (Total Recoverable)			<1	<20
MRL	Molybdenum (Total Recoverable)	108	50-150		
LFB	Molybdenum (Total Recoverable)	101	85-115		
MS	Molybdenum (Total Recoverable)	103	70-130		
MSD	Molybdenum (Total Recoverable)			1	<20
MRL	Selenium (Total Recoverable)	107	50-150		
LFB	Selenium (Total Recoverable)	105	85-115		
MS	Selenium (Total Recoverable)	88	70-130		
MSD	Selenium (Total Recoverable)			2	<20
MRL	Thallium (Total Recoverable)	93	50-150		
LFB	Thallium (Total Recoverable)	99	85-115		
MS	Thallium (Total Recoverable)	102	70-130		
MSD	Thallium (Total Recoverable)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total Recoverable)	<0.18 ug/L	0.18 ug/L
LRB	Arsenic (Total Recoverable)	<0.36 ug/L	0.36 ug/L
LRB	Barium (Total Recoverable)	<0.10 ug/L	0.10 ug/L

LRB	Beryllium (Total Recoverable)	<0.12 ug/L	0.12 ug/L
LRB	Cadmium (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Chromium (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Lead (Total Recoverable)	<0.14 ug/L	0.14 ug/L
LRB	Molybdenum (Total Recoverable)	<0.27 ug/L	0.27 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L
LRB	Thallium (Total Recoverable)	<0.11 ug/L	0.11 ug/L

***See Narrative**

LD – Field Duplicate
LFB – Laboratory Fortified Blank
LRB – Laboratory Reagent Blank (Method Blank)
QCS – Quality Control Sample
MRL – Minimum Reporting Limit (Verification)
MS – Matrix Spike
MSD – Matrix Spike Duplicate
Underline – Data was outside the limit

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ANALYTICAL REPORT

Eurofins St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-47252-1
Client Project/Site: CCR Landfill

For:
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

Attn: Ms. Wendy Asay

Rhonda Ridenhower

Authorized for release by:
10/31/2022 10:22:30 AM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@et.eurofinsus.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Job ID: 160-47252-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-47252-1

Receipt
The samples were received on 9/29/2022 12:30 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved. The temperatures of the 2 coolers at receipt time were 12.1º C and 12.5º C.

RAD
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date

Radium 228 Batch 584854
The Ra-228 laboratory control sample (LCS) associated with the following samples recovered at 134%: 474856 CC_1 (160-47252-1), 474857 FC_1 (160-47252-2), 474858 FC_2 (160-47252-3), 474859 FC_3A (160-47252-4), 474860 FC_3B (160-47252-5), 474862 SC_10 (160-47252-6), 474863 SC_13 (160-47252-7), 474864 SC_14 (160-47252-8), 474865 SC_11 (160-47252-9), 474866 SC_12 (160-47252-10), 474867 SC_12 DUPLICATE (160-47252-11), (LCS 160-584854/2-A), (160-47249-B-1-B) and (160-47249-C-1-B DU). The limits in our LIMS system at 75-125% reflect the requirements of a regulatory agency that represents a large amount of our work. However, the samples associated with this LCS are not from this agency and are therefore held to our in-house statistical limits of 57-141% per method requirements. The LCS is within criteria and no further action is required.

The following samples did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interference. During preparation the analyst visually noted matrix effects. The data have been reported with this narrative. 474862 SC_10 (160-47252-6), 474863 SC_13 (160-47252-7), 474864 SC_14 (160-47252-8), 474865 SC_11 (160-47252-9), 474866 SC_12 (160-47252-10) and 474867 SC_12 DUPLICATE (160-47252-11)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045-1205
phone 314.298.8566 fax 314.298.8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☑ Other: Coal Combustion Rule

TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Wendy Asay	Site Contact:	Date:	COC No:
Colorado Springs Utilities	Tel/Fax: 719-668-4603	Lab Contact: Rhonda Ridenhower	Carrier:	_____ of _____ COCs
701 E. Las Vegas St.	Analysis Turnaround Time			Sampler:
Colorado Springs, CO 80903	☑ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
(719) 668-4603 Phone	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☑ 2 weeks			Lab Sampling:
Project Name: CCR Landfill	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Total Radium 226, EPA 903.0	Total Radium 228, EPA 904.0	Combined Ra 226 and Ra 228	Sample Specific Notes:
474856 CC_1	9/27/22	14:06	G	GW	2	N		X	X	X	
474857 FC_1	9/27/22	10:42	G	GW	2	N		X	X	X	
474858 FC_2	9/27/22	11:56	G	GW	2	N		X	X	X	
474859 FC_3A	9/27/22	15:25	G	GW	2	N		X	X	X	
474860 FC_3B	9/27/22	16:06	G	GW	2	N		X	X	X	
474862 SC_10	9/26/22	11:41	G	GW	2	N		X	X	X	
474863 SC_13	9/26/22	13:58	G	GW	2	N		X	X	X	
474864 SC_14	9/26/22	15:05	G	GW	2	N		X	X	X	
474865 SC_11	9/26/22	16:20	G	GW	2	N		X	X	X	
474866 SC_12	9/26/22	12:30	G	GW	2	N		X	X	X	
474867 SC_12 Duplicate	9/26/22	12:30	G	GW	2	N		X	X	X	

160-47252 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments: Please be sure to use the listed method numbers.

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C): Obs'd: _____ Corr'd: _____	Therm ID No.: _____

Relinquished by: Kelly Nelsen	Company: Colorado Springs Utilities	Date/Time: 9/28/22 10:20	Received by: Fedex	Company:	Date/Time:
Relinquished by: Fedex	Company:	Date/Time:	Received by:	Company:	Date/Time: 9/29/22 1230
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.18, dated 9/5/2018

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Cooler 1

10/31/2022

12 11 10 9 8 7 6 5 4 3 2 1

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-47252-1

Login Number: 47252
List Number: 1
Creator: Booker, Autumn R

List Source: Eurofins St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	EET SL
904.0	Radium-228 (GFPC)	EPA	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-47252-1	474856 CC_1	Water	09/27/22 14:06	09/29/22 12:30
160-47252-2	474857 FC_1	Water	09/27/22 10:42	09/29/22 12:30
160-47252-3	474858 FC_2	Water	09/27/22 11:56	09/29/22 12:30
160-47252-4	474859 FC_3A	Water	09/27/22 15:25	09/29/22 12:30
160-47252-5	474860 FC_3B	Water	09/27/22 16:06	09/29/22 12:30
160-47252-6	474862 SC_10	Water	09/26/22 11:41	09/29/22 12:30
160-47252-7	474863 SC_13	Water	09/26/22 13:58	09/29/22 12:30
160-47252-8	474864 SC_14	Water	09/26/22 15:05	09/29/22 12:30
160-47252-9	474865 SC_11	Water	09/26/22 16:20	09/29/22 12:30
160-47252-10	474866 SC_12	Water	09/26/22 12:30	09/29/22 12:30
160-47252-11	474867 SC_12 DUPLICATE	Water	09/26/22 12:30	09/29/22 12:30

Client Sample ID: 474856 CC_1

Date Collected: 09/27/22 14:06
Date Received: 09/29/22 12:30

Lab Sample ID: 160-47252-1

Matrix: Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.919		0.254	0.267	1.00	0.249	pCi/L	10/06/22 09:52	10/28/22 11:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	74.3		40 - 110	10/06/22 09:52	10/28/22 11:32	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	4.58		0.912	1.01	1.00	0.833	pCi/L	10/06/22 10:12	10/20/22 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	74.3		40 - 110	10/06/22 10:12	10/20/22 11:58	1
Y Carrier	81.9		40 - 110	10/06/22 10:12	10/20/22 11:58	1

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	5.50		0.947	1.04	5.00	0.833	pCi/L		10/31/22 10:01	1

Client Sample ID: 474857 FC_1

Date Collected: 09/27/22 10:42
Date Received: 09/29/22 12:30

Lab Sample ID: 160-47252-2

Matrix: Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.407		0.152	0.157	1.00	0.160	pCi/L	10/06/22 09:52	10/28/22 11:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	85.0		40 - 110	10/06/22 09:52	10/28/22 11:32	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.71		0.781	0.852	1.00	0.748	pCi/L	10/06/22 10:12	10/20/22 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	85.0		40 - 110	10/06/22 10:12	10/20/22 11:58	1
Y Carrier	83.7		40 - 110	10/06/22 10:12	10/20/22 11:58	1

Client Sample ID: 474857 FC_1
Lab Sample ID: 160-47252-2
Date Collected: 09/27/22 10:42
Matrix: Water
Date Received: 09/29/22 12:30

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	4.12		0.796	0.866	5.00	0.748	pCi/L		10/31/22 10:01	1

Client Sample ID: 474858 FC_2
Lab Sample ID: 160-47252-3
Date Collected: 09/27/22 11:56
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0485	U	0.104	0.104	1.00	0.187	pCi/L	10/06/22 09:52	10/28/22 11:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*58.1*		*40 - 110*	*10/06/22 09:52*	*10/28/22 11:32*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.13		0.693	0.721	1.00	0.823	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*58.1*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*81.1*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.18		0.701	0.728	5.00	0.823	pCi/L		10/31/22 10:01	1

Client Sample ID: 474859 FC_3A
Lab Sample ID: 160-47252-4
Date Collected: 09/27/22 15:25
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.191		0.111	0.112	1.00	0.133	pCi/L	10/06/22 09:52	10/28/22 13:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*73.8*		*40 - 110*	*10/06/22 09:52*	*10/28/22 13:46*	*1*

Client Sample ID: 474859 FC_3A

Date Collected: 09/27/22 15:25
Date Received: 09/29/22 12:30

Lab Sample ID: 160-47252-4

Matrix: Water

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.44		0.622	0.636	1.00	0.810	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*73.8*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*80.4*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.63		0.632	0.646	5.00	0.810	pCi/L		10/31/22 10:01	1

Client Sample ID: 474860 FC_3B

Date Collected: 09/27/22 16:06
Date Received: 09/29/22 12:30

Lab Sample ID: 160-47252-5

Matrix: Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.339		0.151	0.154	1.00	0.167	pCi/L	10/06/22 09:52	10/28/22 13:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*52.9*		*40 - 110*	*10/06/22 09:52*	*10/28/22 13:46*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.62		0.823	0.857	1.00	0.998	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*52.9*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*82.6*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.96		0.837	0.871	5.00	0.998	pCi/L		10/31/22 10:01	1

Client Sample ID: 474862 SC_10

Lab Sample ID: 160-47252-6

Date Collected: 09/26/22 11:41

Matrix: Water

Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.204	U	0.175	0.176	1.00	0.262	pCi/L	10/06/22 09:52	10/28/22 13:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*45.1*		*40 - 110*	*10/06/22 09:52*	*10/28/22 13:46*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**2.67**	**G**	1.08	1.10	1.00	1.41	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*45.1*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*85.6*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**2.87**		1.09	1.11	5.00	1.41	pCi/L		10/31/22 10:01	1

Client Sample ID: 474863 SC_13

Lab Sample ID: 160-47252-7

Date Collected: 09/26/22 13:58

Matrix: Water

Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0260	U	0.186	0.186	1.00	0.354	pCi/L	10/06/22 09:52	10/28/22 15:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*45.8*		*40 - 110*	*10/06/22 09:52*	*10/28/22 15:23*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.68**	**G**	1.07	1.08	1.00	1.60	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*45.8*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*80.7*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Client Sample ID: 474863 SC_13

Lab Sample ID: 160-47252-7
Date Collected: 09/26/22 13:58
Matrix: Water
Date Received: 09/29/22 12:30

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.71		1.09	1.10	5.00	1.60	pCi/L		10/31/22 10:01	1

Client Sample ID: 474864 SC_14

Lab Sample ID: 160-47252-8
Date Collected: 09/26/22 15:05
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.606		0.288	0.293	1.00	0.348	pCi/L	10/06/22 09:52	10/28/22 15:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*56.4*		*40 - 110*	*10/06/22 09:52*	*10/28/22 15:25*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	4.23	G	1.36	1.41	1.00	1.61	pCi/L	10/06/22 10:12	10/20/22 12:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*56.4*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*
Y Carrier	*84.1*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:03*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	4.84		1.39	1.44	5.00	1.61	pCi/L		10/31/22 10:01	1

Client Sample ID: 474865 SC_11

Lab Sample ID: 160-47252-9
Date Collected: 09/26/22 16:20
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.245	U	0.262	0.263	1.00	0.417	pCi/L	10/06/22 09:52	10/28/22 15:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*42.2*		*40 - 110*	*10/06/22 09:52*	*10/28/22 15:26*	*1*

Client Sample ID: 474865 SC_11
Lab Sample ID: 160-47252-9
Date Collected: 09/26/22 16:20
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.73	U G	1.43	1.44	1.00	2.24	pCi/L	10/06/22 10:12	10/20/22 12:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*42.2*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*
Y Carrier	*83.0*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.97	U	1.45	1.46	5.00	2.24	pCi/L		10/31/22 10:01	1

Client Sample ID: 474866 SC_12
Lab Sample ID: 160-47252-10
Date Collected: 09/26/22 12:30
Matrix: Water
Date Received: 09/29/22 12:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0873	U	0.179	0.180	1.00	0.321	pCi/L	10/06/22 09:52	10/28/22 15:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*42.4*		*40 - 110*	*10/06/22 09:52*	*10/28/22 15:26*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**3.29**	**G**	1.20	1.24	1.00	1.51	pCi/L	10/06/22 10:12	10/20/22 12:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*42.4*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*
Y Carrier	*86.4*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**3.38**		1.21	1.25	5.00	1.51	pCi/L		10/31/22 10:01	1

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Client Sample ID: 474867 SC_12 DUPLICATE

Date Collected: 09/26/22 12:30
Date Received: 09/29/22 12:30

Lab Sample ID: 160-47252-11

Matrix: Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.132	U	0.198	0.199	1.00	0.339	pCi/L	10/06/22 09:52	10/28/22 15:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*43.9*		*40 - 110*	*10/06/22 09:52*	*10/28/22 15:26*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**3.66**	**G**	1.17	1.22	1.00	1.35	pCi/L	10/06/22 10:12	10/20/22 12:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*43.9*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*
Y Carrier	*83.0*		*40 - 110*	*10/06/22 10:12*	*10/20/22 12:04*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**3.79**		1.19	1.24	5.00	1.35	pCi/L		10/31/22 10:01	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-584852/1-A
Matrix: Water
Analysis Batch: 587626

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 584852

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.05928	U	0.0627	0.0629	1.00	0.148	pCi/L	10/06/22 09:52	10/28/22 11:29	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.4*		*40 - 110*	*10/06/22 09:52*	*10/28/22 11:29*	*1*

Lab Sample ID: LCS 160-584852/2-A
Matrix: Water
Analysis Batch: 587628

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 584852

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.05		1.16	1.00	0.116	pCi/L	97	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*90.0*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-584854/1-A
Matrix: Water
Analysis Batch: 586614

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 584854

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.8138		0.365	0.373	1.00	0.481	pCi/L	10/06/22 10:12	10/20/22 11:57	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.4*		*40 - 110*	*10/06/22 10:12*	*10/20/22 11:57*	*1*
Y Carrier	*84.1*		*40 - 110*	*10/06/22 10:12*	*10/20/22 11:57*	*1*

Lab Sample ID: LCS 160-584854/2-A
Matrix: Water
Analysis Batch: 586614

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 584854

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.52	11.45		1.47	1.00	0.458	pCi/L	134	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*90.0*		*40 - 110*
Y Carrier	*83.0*		*40 - 110*

Rad

Prep Batch: 584852

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-47252-1	474856 CC_1	Total/NA	Water	PrecSep-21	
160-47252-2	474857 FC_1	Total/NA	Water	PrecSep-21	
160-47252-3	474858 FC_2	Total/NA	Water	PrecSep-21	
160-47252-4	474859 FC_3A	Total/NA	Water	PrecSep-21	
160-47252-5	474860 FC_3B	Total/NA	Water	PrecSep-21	
160-47252-6	474862 SC_10	Total/NA	Water	PrecSep-21	
160-47252-7	474863 SC_13	Total/NA	Water	PrecSep-21	
160-47252-8	474864 SC_14	Total/NA	Water	PrecSep-21	
160-47252-9	474865 SC_11	Total/NA	Water	PrecSep-21	
160-47252-10	474866 SC_12	Total/NA	Water	PrecSep-21	
160-47252-11	474867 SC_12 DUPLICATE	Total/NA	Water	PrecSep-21	
MB 160-584852/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-584852/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 584854

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-47252-1	474856 CC_1	Total/NA	Water	PrecSep_0	
160-47252-2	474857 FC_1	Total/NA	Water	PrecSep_0	
160-47252-3	474858 FC_2	Total/NA	Water	PrecSep_0	
160-47252-4	474859 FC_3A	Total/NA	Water	PrecSep_0	
160-47252-5	474860 FC_3B	Total/NA	Water	PrecSep_0	
160-47252-6	474862 SC_10	Total/NA	Water	PrecSep_0	
160-47252-7	474863 SC_13	Total/NA	Water	PrecSep_0	
160-47252-8	474864 SC_14	Total/NA	Water	PrecSep_0	
160-47252-9	474865 SC_11	Total/NA	Water	PrecSep_0	
160-47252-10	474866 SC_12	Total/NA	Water	PrecSep_0	
160-47252-11	474867 SC_12 DUPLICATE	Total/NA	Water	PrecSep_0	
MB 160-584854/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-584854/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-47252-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
160-47252-1	474856 CC_1	74.3
160-47252-2	474857 FC_1	85.0
160-47252-3	474858 FC_2	58.1
160-47252-4	474859 FC_3A	73.8
160-47252-5	474860 FC_3B	52.9
160-47252-6	474862 SC_10	45.1
160-47252-7	474863 SC_13	45.8
160-47252-8	474864 SC_14	56.4
160-47252-9	474865 SC_11	42.2
160-47252-10	474866 SC_12	42.4
160-47252-11	474867 SC_12 DUPLICATE	43.9
LCS 160-584852/2-A	Lab Control Sample	90.0
MB 160-584852/1-A	Method Blank	90.4

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
160-47252-1	474856 CC_1	74.3	81.9
160-47252-2	474857 FC_1	85.0	83.7
160-47252-3	474858 FC_2	58.1	81.1
160-47252-4	474859 FC_3A	73.8	80.4
160-47252-5	474860 FC_3B	52.9	82.6
160-47252-6	474862 SC_10	45.1	85.6
160-47252-7	474863 SC_13	45.8	80.7
160-47252-8	474864 SC_14	56.4	84.1
160-47252-9	474865 SC_11	42.2	83.0
160-47252-10	474866 SC_12	42.4	86.4
160-47252-11	474867 SC_12 DUPLICATE	43.9	83.0
LCS 160-584854/2-A	Lab Control Sample	90.0	83.0
MB 160-584854/1-A	Method Blank	90.4	84.1

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

APPENDIX D

Statistical Analysis Report

Statistical Analysis Report for CSU Clear Spring Ranch

2022 CCR Program, Annual Update, Ash Landfill Network

Kirk Cameron, Ph.D., MacStat Consulting, Ltd.

2023-01-23

Contents

1 Introduction

This report summarizes the statistical analysis performed on groundwater quality constituents monitored during 2022 of the Coal Combustion Residuals (CCR) Rule's groundwater monitoring program at the Colorado Springs Utilities (CSU) Clear Spring Ranch Ash Landfill (CSR).

The Clear Spring Ranch Ash Landfill CCR unit is currently in Assessment Monitoring, necessitating monitoring of both the Appendix III and IV constituents listed in **Table 2**. As part of this year's efforts (i.e., 2022), the baseline data sets collected since the first year of the CCR-Rule Program were evaluated in order to establish updated groundwater protection standards (GWPS) on upgradient background data representing Appendix IV constituents, and then to compare 2022 compliance measurements against these statistical limits to assess any statistically significant increases (SSI) above the GWPS. The analysis also established updated prediction limits on upgradient background data for Appendix III constituents, and compared 2022 compliance measurements against these statistical limits to assess any SSIs above background. Summaries of all the statistical test results are provided in subsequent sections of this report.

At the Clear Spring Ranch Ash Landfill network, the sampling results used to compute the background statistics and to identify potential SSIs were obtained from a set of designated background wells (CC-1, FC-1, FC-2, FC-3A, FC-3B) using data collected from June 2016 until September 2022.

Groundwater samples were analyzed for 21 distinct constituents as required under Appendix III and Appendix IV of the CCR Rule (listed in **Table 2**). Only non-filtered sample results were utilized for the statistical analysis.

As required by the USEPA's Coal Combustion Residuals (CCR) Rule section describing the Assessment Monitoring Program (§257.95), test results for the 2022 Appendix IV Assessment Monitoring events were compared to the GWPS for determination of any exceedances. Also, test results for the Appendix III parameters were compared against the updated background prediction limits.

Included in this report are 'Traffic Light' matrices to facilitate an at-a-glance identification of any statistically significant exceedances and to promote intra-company follow-up assessments of the possible causes and to plan for mitigation actions, whenever warranted. Sample analytical results of CCR-Rule Appendix III and Appendix IV constituents obtained from each of the monitoring wells and events were used to perform the statistical analysis and generate the graphs shown in this report. The current CCR Rule groundwater monitoring network, as Certified by a Professional Engineer, is presented in **Table 1**.

The 'R' Statistical Analysis package (www.r-project.org) in conjunction with R-Studio (www.rstudio.com), both popular public domain software products, were used in the production of the statistical values and graphs. Data dumps from CSU's Database were used to populate the R-based statistical analyses.

Table 1: CCR Rule Monitoring Network

Background	Downgradient
CC-1	SC-10
FC-1	SC-11
FC-2	SC-12
FC-3A	SC-13
FC-3B	SC-14

For this year's efforts, the baseline datasets of the CCR-Rule groundwater monitoring program were augmented with routine monitoring samples in order to update the background data set. The background data were then utilized to develop both updated prediction limits and statistically-derived GWPS in those cases where site-specific background levels naturally exceed published regulatory limits. Finally, data from the compliance wells were statistically compared either to prediction limits for Appendix III parameters or to the GWPS for Appendix IV parameters to determine whether any statistical limits or standards were exceeded.

At the Clear Spring Ranch Ash Landfill CCR network, the sampling results used to compute the background statistics were obtained only from designated background wells using historical data that were first screened for possible trends or shifts in concentration levels over time. Any early data exhibiting a substantially different pattern or average concentration level than more recent data were excluded from the calculations. The cutoff date used for selecting background data was determined on a constituent by constituent basis, but was designed to include as much data as possible reflecting current groundwater conditions (see **Table 2**)

Groundwater samples were analyzed for a total of 21 distinct constituents, as required for the CCR monitoring program. Fluoride is monitored under both Appendices. Descriptive graphical summaries of all the data are presented in **Appendix A**. Time series plots of each well-constituent pair display the individual measurement results, while side-by-side boxplots, colored by gradient, allow visual comparisons between upgradient or background wells versus downgradient locations, relative to an overlaid regulatory limit (REGLIM) – either the CCR Rule Standard or the MCL – when applicable.

USEPA's Unified Guidance document on the statistical analysis of groundwater monitoring data (USEPA 2009) discusses recommended strategies for statistical evaluations during Detection and Assessment Monitoring. Of note, it is a 'best-practice' when using prediction limits to always implement some form of retesting, in order to avoid potential false positive results and to confirm real changes in groundwater quality. Under this framework, a statistically significant increase (SSI) is identified only when both the routine observation and any resamples exceed the prediction limit.

In Assessment Monitoring, confidence-interval (CI) bands are a recommended technique for performing statistical comparisons to GWPS. In particular, trends at downgradient wells in analytical concentrations of required parameters can be plotted and used to estimate CI bands, which in turn can be compared against their respective GWPS. A statistically significant increase (SSI) is found if and only if the lower limit of the CI band exceeds the GWPS for the most recent Assessment Monitoring sampling event.

2 Statistical Analysis Approach: Appendix III Parameters

CSU has established a statistical testing approach within its CCR detection monitoring program using the following decision logic:

1. For each Appendix III parameter and compliance well location, a comparison is made between each routinely collected sample and a site-specific upper prediction limit (UPL) computed from upgradient background data (or for pH, against a site-specific prediction interval).

2. If the routine observation exceeds the upper prediction limit (or for pH, is lower than the lower prediction limit), a potential SSI is identified. If the routine observation is within the bounds of the UPL or prediction interval, the test passes.

Table 2: CCR Rule Monitored Constituents

Constituent	Begin Date	End Date	Appendix
Boron	2016-06-22	2022-09-27	III
Calcium	2016-06-22	2022-09-27	III
Chloride	2016-06-22	2022-09-27	III
Fluoride	2016-06-22	2022-09-27	III, IV
Sulfate	2016-06-22	2022-09-27	III
pH	2016-06-22	2022-09-27	III
TDS	2016-06-22	2022-09-27	III
Antimony	2016-06-22	2022-09-27	IV
Arsenic	2016-06-22	2022-09-27	IV
Barium	2016-06-22	2022-09-27	IV
Beryllium	2018-03-01	2022-09-27	IV
Cadmium	2018-01-01	2022-09-27	IV
Chromium	2018-01-01	2022-09-27	IV
Cobalt	2019-01-01	2022-09-27	IV
Lead	2019-01-01	2022-09-27	IV
Lithium	2016-06-22	2022-09-27	IV
Mercury	2016-06-22	2022-09-27	IV
Molybdenum	2018-01-01	2022-09-27	IV
Rad226+228	2016-06-22	2022-09-27	IV
Selenium	2016-06-22	2022-09-27	IV
Thallium	2018-01-01	2022-09-27	IV

3. In the event of a potential SSI, one resample is compared against the UPL or prediction interval. If the resample falls within the bounds of prediction limit/interval, the test passes. If instead the resample exceeds the bounds of the limit/interval, an SSI is confirmed for that well and constituent.

2.1 Background Statistical Models and Prediction Limits

Beginning with last year's annual report, certain technical improvements were implemented when computing each prediction limit (UPL) or prediction interval, leading to the following steps:

1. All baseline data from designated upgradient or background wells collected through September 2022 were grouped and initially screened for possible outliers. This outlier screening was performed visually on time series plots of the data, as well as systematically via a modified version of Tukey's boxplot rule.

Unlike earlier analyses, however, apparent outliers were not formally tested or removed from the data analysis. Instead, as described in Step 2 below, any possible outliers were *down-weighted* in the statistical calculations, in order to minimize the impact of such values on the UPL estimates.

In case of a nonparametric model, any potential outliers that were flagged were visually compared against observations at other well locations. If similar patterns or measurement ranges were seen, the suspect values were kept in the data. If not, the suspected outliers were excluded from the prediction limit computations. At the Clear Spring Ranch Ash Landfill CCR network, 8 possible nonparametric outliers were flagged in the grouped background data.

Any confirmed nonparametric background outliers are listed in **Table 3** below. These values were excluded from the UPL calculations, but *are* shown on the time series plots for the sake of completeness and transparency.

Table 3: Confirmed and Excluded NonParametric Background Outliers

COC	Well	Date	Result	NonDetect Flag	Outlier
Mercury	FC-3B	2018-09-25	0.024	0	TRUE
Calcium	CC-1	2022-03-14	84100	0	TRUE
Calcium	FC-1	2022-03-14	66100	0	TRUE
Calcium	FC-3B	2020-04-06	398000	0	TRUE
Calcium	CC-1	2020-04-06	797000	0	TRUE
Calcium	FC-1	2020-04-06	651000	0	TRUE
Calcium	FC-2	2020-04-06	678000	0	TRUE
Calcium	FC-3A	2020-04-06	711000	0	TRUE

This strategy for handling outliers entails certain benefits, especially since the process of flagging outliers always involves a mixture of art (i.e., professional judgment) and statistical science. In some cases, disputes can arise among stakeholders as to whether specific values ought to be treated as outliers and/or eliminated from statistical analysis. This can especially be true when there is no known physical cause of the apparent outliers (e.g., laboratory or sampling error). Down-weighting done in an objective manner does not exclude any data, yet minimizes the impact of true outliers.

At the Clear Spring Ranch Ash Landfill CCR network, 3 potential parametric outliers were flagged in the grouped background data.

Any potential parametric background outliers are listed in **Table 4** below. If too extreme, these values were down-weighted using the values shown in the Weight column. Note that non-outliers or less extreme outliers generally have weights equal or close to 1.

Table 4: Down-Weighted Parametric Background Outliers

COC	Well	Date	Result	ND.Flag	Weight	Outlier
Antimony	CC-1	2018-02-14	8	1	1	TRUE
Antimony	FC-1	2018-02-14	8	1	1	TRUE
Barium	FC-3B	2016-11-15	65.2	0	1	TRUE

2. The grouped baseline data were analyzed to determine whether they could be fit to a known statistical model. If so, a quasi-parametric t-bootstrap prediction limit/interval was computed; if not, a nonparametric prediction limit/interval was constructed. Datasets which could not be sufficiently normalized were therefore analyzed by nonparametric means. In the nonparametric case, any apparent outliers were carefully reviewed to determine if they should be removed from the analysis. Unfortunately, formal outlier testing is not possible when the underlying data model is unknown. Outlier removal in this setting comes down to professional judgment and statistical experience.

To account for possible outliers in those datasets that were fit to a known statistical model (i.e., parametric cases), a probability plot of the background dataset was constructed matching the observed data values against quantiles from a standard normal distribution (i.e., z-scores). Then a

robust regression line was fit to the probability plot, to capture the dominant pattern in the bulk of the data while minimizing the impact (or influence) on the estimated line of any extreme or outlying values. Using this robust regression line, the distance between each observed value and the regression line fit was calculated and used to generate a statistical weighting of each data point. Values farther off the line were assigned smaller weights via a standard weighting function, while those closest to the line received the highest weights. These weights (w_i) were subsequently used in computing each prediction limit/interval.

To account for non-normal data, a range of possible mathematical transformations was applied to each background dataset, in order to identify the statistical model that maximized the robust correlation between pairs on the probability plot. The statistical weights described above were ultimately computed using the best-fitting statistical model.

3. The best-fitting statistical model for each COC was used to compute a prediction limit or interval.

When a parametric model is appropriate, on the normalized scale, a prediction interval is computed using the standard normal theory equation:

$$PL = \bar{x} \pm \kappa s$$

where $\bar{x}$ and s represent the mean and standard deviation of the (transformed) observations, and κ is a prediction limit multiplier. If the data have been transformed, the final prediction limit/interval is derived by back-transforming the scaled limit/interval. The prediction limit multiplier is computed as function of several inputs, including the background sample size, the targeted site-wide false positive risk (SWFPR), the configuration of the monitoring network (i.e., number of wells and number of COIs per well), and the retesting strategy implemented at the site (e.g., 1-of-2, etc.).

To account for possible outliers and the statistical weighting described above, a slightly different strategy was implemented to compute an estimate of the prediction limit multiplier, $\hat{\kappa}$. Specifically, a large number of weighted *bootstrap* samples were drawn from the observed data (each bootstrap sample representing a random resampling of the original data, with each sample element being selected *with replacement*). For each bootstrap sample, the weighted mean and weighted standard deviation of the resample were computed to form the following ratio:

$$\left(\frac{x_i - \bar{x}_w}{s_w} \right)$$

where x_i is a random value drawn from the background data with probability equal to its statistical weight w_i. Ultimately, an upper percentile of these ratios gave an estimate of the appropriate prediction limit multiplier, $\hat{\kappa}$, and the bootstrap-t prediction interval was computed as:

$$PL = \bar{x}_w \pm \hat{\kappa} s_w$$

The PLs computed under this methodology utilize all the data, including any possible extreme values, are reasonably robust (i.e., minimally impacted) in the presence of actual outliers, but are *quasi-parametric* — instead of nonparametric — despite the use of the bootstrap technique. This last characteristic implies that the t-bootstrap will result in an accurate PL only when the bulk of the background data can be closely fit to a known statistical model. In cases where an adequate statistical model cannot be identified, a nonparametric PL must be computed instead.

The probability plot correlations mentioned earlier were utilized in testing this method on a large series of datasets to derive an empirical cutoff value of 0.95 for deciding when the t-bootstrap could be applied. Further, the t-bootstrap does not work very well when the dataset is *multi-modal* (i.e., it has multiple peaks or 'humps'), for instance when multiple background wells are grouped together but have much different average concentration levels (perhaps due to a heterogenous aquifer). If a test for unimodality (i.e., single peak like the normal distribution) passed, then correlations of 0.95 and above led to use of the t-bootstrap, while multi-modality or correlations below this cutoff led to calculation of a nonparametric prediction limit/interval. Note that for nonparametric models, the prediction limit is selected as one of the largest of the sample values, often the maximum.

For the Clear Spring Ranch Ash Landfill CCR network, **Table 5** lists the calculated UPLs (and LPL for pH) established for this particular Unit.

Table 5: Clear Spring Ranch Ash Landfill Interwell Prediction Limits

COI	N	ND.Pct	Model	1-of-m	FPR	Units	LPL	UPL
Boron	95	0	TBOOT-Log	2	0.0050	ug/L	NA	1716
Calcium	83	0	TBOOT-Seventh Power	2	0.0050	ug/L	NA	458500
Chloride	90	0	NP	2	0.0024	mg/L	NA	1680
Fluoride	95	0	NP	2	0.0021	mg/L	NA	0.76
pH	95	0	NP	2	0.0043	SU	6.7	7.9
Sulfate	85	0	NP	2	0.0027	mg/L	NA	20700
TDS	90	0	NP	2	0.0024	mg/L	NA	35100

2.2 Comparing Compliance Data Against Prediction Limits

To assess whether any SSIs occurred during 2022 Detection Monitoring at the Clear Spring Ranch Ash Landfill CCR site, the first routine sampling event from each parameter-well pair was compared against its respective prediction limit. Under a 1-of-2 retesting strategy, the next consecutive sampling round was reserved as a possible resample. This enabled sufficient lag time between any of the routine and resample measurements to assume approximate statistical independence.

If the routine observation exceeded the upper prediction limit (UPL), or for pH, was outside the bounds of the prediction interval on either side, a potential SSI was flagged. Then the reserved resample associated with the routine event was compared against the same limit or interval (when available). Only if the routine observation and its associated resample both were outside the bounds of the prediction limit/interval was a confirmed SSI identified.

Table 6 is a summary of 2022 statistical tests at the Clear Spring Ranch Ash Landfill CCR unit where a confirmed or potential SSI occurred. Plots of the 2022 sampling data overlaid with the constituent-specific prediction limits are shown in **Appendix B**. In these figures, any confirmed SSIs are shown by coloring the routine measurement exceedance in orange and the resample confirmatory exceedance in purple. Potential SSIs are shown by coloring the routine measurement in yellow.

Table 6: 2022 Confirmed or Potential Prediction Limit SSIs at Clear Spring Ranch Ash Landfill CCR Site

COC	Well	Date	Result	Units	Stage	LPL	UPL	SSI
Boron	SC-11	2022-03-15	2380	ug/L	Sample	NA	1716	YES
Boron	SC-11	2022-09-26	2510	ug/L	Resample	NA	1716	YES

Table 6: 2022 Confirmed or Potential Prediction Limit SSIs at Clear Spring Ranch Ash Landfill CCR Site *(continued)*

COC	Well	Date	Result	Units	Stage	LPL	UPL	SSI
Boron	SC-12	2022-03-15	4020	ug/L	Sample	NA	1716	YES
Boron	SC-12	2022-09-26	4420	ug/L	Resample	NA	1716	YES
Fluoride	SC-12	2022-03-15	1.43	mg/L	Sample	NA	0.76	YES
Fluoride	SC-12	2022-09-26	0.93	mg/L	Resample	NA	0.76	YES
Fluoride	SC-13	2022-03-15	1.14	mg/L	Sample	NA	0.76	YES
Fluoride	SC-13	2022-09-26	0.78	mg/L	Resample	NA	0.76	YES

2.3 Summary of Appendix III Statistical Analysis

To facilitate an 'at-a-glance' summary of the prediction limit statistical comparison results, **Table 7** is a 'traffic light' matrix, showing a compact representation of each well location matched against each constituent in Appendix III. This summary is useful in planning for mitigation actions. Green cells indicate that no SSI was observed in 2022. Red cells indicate the opposite: an SSI was flagged during 2022.

At the Clear Spring Ranch Ash Landfill CCR network in 2022, a total of 4 Appendix III SSIs were identified at Program network wells.

Table 7: Traffic Light Matrix for Clear Spring Ranch Ash Landfill CCR Site

	Well Locations				
COC	**SC-10**	**SC-11**	**SC-12**	**SC-13**	**SC-14**
Boron	GRN	RED	RED	GRN	GRN
Calcium	GRN	GRN	GRN	GRN	GRN
Chloride	GRN	GRN	GRN	GRN	GRN
Fluoride	GRN	GRN	RED	RED	GRN
pH	GRN	GRN	GRN	GRN	GRN
Sulfate	GRN	GRN	GRN	GRN	GRN
TDS	GRN	GRN	GRN	GRN	GRN

Color-Coding Key:
RED = Results outside prediction limit bounds;
GRN = Results within prediction limit bounds;
YLW = Initial results outside bounds (potential SSI)

3 Statistical Analysis Approach: Appendix IV Parameters

The basic steps in the Assessment Monitoring analysis included the following:

1. Developing groundwater protection standards (GWPS) for each Appendix IV constituent, using published MCLs and/or water quality limits, along with baseline data from upgradient and background well locations at each CCR site;
2. Computing trends and associated confidence interval (CI) bands for each well location and Appendix IV constituent (i.e., for each well-constituent pair); and
3. Comparing each CI band against its respective GWPS to assess whether or not a statistically significant exceedance (SSI) occurred.

To accomplish these steps, the data were first summarized and modeled. To handle any non-detects in these calculations, non-detect values were treated as statistically 'left-censored,' with the censoring limit equal to the reporting limit (RL). Then the Kaplan-Meier adjustment method (USEPA 2009) was employed to derive estimated summary statistics that account for the presence of non-detects.

3.1 Developing and Computing Groundwater Protection Standards (GWPS)

USEPA has published maximum contaminant limits (MCL) or alternate regulatory limits for each of the Appendix IV constituents. Consequently, in most cases the Groundwater Protection Standard (GWPS) is equal to the MCL. However, there may be cases where background levels of a constituent exceed the MCL. In these instances, an alternate GWPS must be derived from on-site background levels.

CSU has established GWPS across its CCR program using the following decision logic:

- For each Appendix IV parameter where a GWPS must be established, a comparison is made between the promulgated regulatory limit and a site-specific limit computed from background data.
- If the background-based limit is larger than the promulgated limit, the GWPS is set to the background limit. If the promulgated limit is larger, the GWPS is set to the published value.

In cases where a background limit must be computed, USEPA's Unified Guidance recommends different strategies for computing a background-based GWPS ((USEPA 2009), Section 7.5). One of these strategies — a 95% confidence, 95% coverage upper tolerance limit (UTL) on background — was selected and used to compute the UTL on site-specific background data for each Appendix IV parameter. Then these UTLs were compared against the promulgated regulatory limits to determine the site-specific GWPS.

Each tolerance limit (UTL) was computed in the following manner, using the same technical improvements applied to computation of prediction limits for Appendix III parameters:

1. All baseline data from designated upgradient or background wells collected through September 2022 were grouped and initially screened for possible outliers. This outlier screening was performed visually on time series plots of the data, as well as systematically via a modified version of Tukey's boxplot rule, as described in **Section 2.1**. Apparent outliers were not formally tested or removed from the data analysis, but instead were *down-weighted* in the statistical calculations, in order to minimize the impact of such values on the UTL estimates.

In case of a nonparametric model, any outliers that were flagged were visually compared against observations at other well locations. If similar patterns or measurement ranges were seen, the suspect values were kept in the data. If not, the suspected outliers were excluded from the tolerance limit computations.

2. The grouped baseline data were analyzed to determine whether they could be fit to a known statistical model. If so, a quasi-parametric t-bootstrap UTL was computed; if not, a nonparametric UTL was constructed. Datasets which could not be sufficiently normalized were therefore analyzed by nonparametric means.

To account for possible outliers in each dataset, a probability plot of the background dataset was constructed matching the observed data values against quantiles from a standard normal distribution (i.e., z-scores). Then a *robust* regression line was fit to the probability plot, to capture the dominant pattern in the bulk of the data while minimizing the impact (or influence) on the estimated line of any extreme or outlying values. Using this robust regression line, the distance between each observed value and the regression line fit was calculated and used to generate a statistical weighting of each data point. Values further off the line were assigned smaller weights via a standard weighting function, while those closest to the line received the highest weights. These weights (w_i) were subsequently used in computing each UTL.

To account for non-normal data, a range of possible mathematical transformations was applied to each background dataset, in order to identify the statistical model that maximized the robust correlation between pairs on the probability plot. The statistical weights described above were ultimately computed using the best-fitting statistical model.

3. The best-fitting statistical model for each COI was used to compute an upper tolerance limit (UTL) with 95% coverage and 95% confidence.

When a parametric model is appropriate, on the normalized scale, a UTL is computed using the standard normal theory equation:

$$UTL = \bar{x} + \kappa s$$

where $\bar{x}$ and s represent the mean and standard deviation of the (transformed) observations, and κ is a tolerance limit multiplier. If the data have been transformed, the final UTL is derived by back-transforming the scaled UTL. The tolerance limit multiplier (or *tolerance factor*) is drawn from a standard table of such values.

To account for possible outliers and the statistical weighting described above, a different strategy was implemented to compute an estimate of the tolerance factor, $\hat{\kappa}$. Specifically, a large number of weighted *bootstrap* samples were drawn from the observed data (each bootstrap sample representing a random resampling of the original data, with each sample element being selected at random *with replacement*). For each bootstrap sample, a weighted mean and weighted standard deviation were computed to form the following ratio:

$$\left(\frac{x_i - \bar{x}_w}{s_w} \right)$$

where x_i is a random value drawn from the background data with probability of selection equal to its statistical weight w_i. Ultimately, an upper percentile of these ratios gave an estimate of the appropriate tolerance factor, $\hat{\kappa}$, and the bootstrap-t upper tolerance limit was computed as:

$$UTL = \bar{x}_w + \hat{\kappa} s_w$$

The UTLs computed under this methodology utilize all the data, including any possible extreme values, are reasonably robust (i.e., minimally impacted) in the presence of actual outliers, but are *quasi-parametric* — instead of nonparametric — despite the use of the bootstrap technique. This last characteristic implies that the t-bootstrap will result in an accurate UTL only when the bulk of the background data can be closely fit to a known statistical model. In cases where an adequate statistical model cannot be identified, a nonparametric UTL must be computed instead.

The probability plot correlations mentioned earlier were utilized in testing this method on a large series of datasets to derive an empirical cutoff value of 0.94 for deciding when the t-bootstrap could be applied. Correlations of 0.94 and above led to use of the t-bootstrap, while correlations below this cutoff led to calculation of a nonparametric UTL. Note that for nonparametric models, the UTL is selected as one of the largest of the sample values, often the maximum.

For the Clear Spring Ranch Ash Landfill CCR unit, **Table 8** lists the calculated GWPS limits established for this monitoring network.

3.2 Computing Trend Lines and Confidence Interval Bands

USEPA's *Unified Guidance* recommends comparing some type of confidence interval (CI) against a groundwater protection standard (GWPS) in order to assess whether or not the limit has been exceeded with statistical significance. If the entire interval exceeds the GWPS, a statistically significant increase (SSI) is identified. If none of the interval, or only part, exceeds the GWPS, no SSI is recorded.

Since groundwater data are collected over time, and not all at once, some or most of the variation in the measurements may be due to a trend. To better account for this possibility, USEPA also

Table 8: 2022 Clear Spring Ranch Ash Landfill CCR Unit GWPS Limits

COI	Model	N	Coverage	Confidence	UTL	RegLimit	GWPS
Antimony	TBOOT-Eighth Root	95	0.95	0.95	1.36	6	6
Arsenic	TBOOT-Fourth Root	95	0.95	0.95	12	10	12
Barium	TBOOT-Log	95	0.95	0.95	36.8	2000	2000
Beryllium	NP	45	0.95	0.901	0.2	4	4
Cadmium	TBOOT-Normal	50	0.95	0.95	0.921	5	5
Chromium	TBOOT-Normal	50	0.95	0.95	6.35	100	100
Cobalt	TBOOT-Normal	40	0.95	0.95	6.05	6	6.05
Fluoride	NP	95	0.95	0.954	0.75	4	4
Lead	TBOOT-Normal	40	0.95	0.95	2.01	15	15
Lithium	NP	95	0.95	0.954	1160	40	1160
Mercury	NP	94	0.95	0.952	0.009	2	2
Molybdenum	TBOOT-Log	50	0.95	0.95	10.6	100	100
Rad226+228	TBOOT-Fifth Root	95	0.95	0.95	4.75	5	5
Selenium	NP	95	0.95	0.954	216	50	216
Thallium	TBOOT-Square Root	50	0.95	0.95	1.79	2	2

recommends a variation on the confidence interval method known as a confidence interval band around a trend line. In this case, a (linear) trend line is first fit to the data, then a confidence band is constructed around the trend line. The confidence interval band can be compared against a GWPS in much the same fashion as a confidence interval, only now a comparison can be made at different points in time by comparing the 'cross-section' of the band for a given sampling date. If the interval represented by the confidence band cross-section fully exceeds the GWPS, an SSI is identified for that sampling event.

At the CSU CCR site, CI bands were constructed for each well-constituent pair using all available non-outlier sample data. Cross-sections of each band were then compared to the GWPS for the most recent Assessment Monitoring event for the purpose of identifying any SSIs.

3.2.1 Trend Lines Using Linear Regression

Unless there are extreme outliers and/or curvature in the data, linear regression provides a standard and well-tested method for estimating the linear portion of a trend. The slope of the regression line points to the magnitude and direction of the trend. There is also a standard method for computing a confidence band around a linear regression trend line. For instance, equations [21.24] and [21.25] of Section 21.3 in the *Unified Guidance* can be compactly written as

$$CB_{1-\alpha} = \hat{x}_0 \pm \sqrt{2 s_e^2 F_{1-\alpha,n-2} \left[\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1)s_t^2} \right]}$$

where CB = confidence band, $\hat{x}_0$ is the regression line estimate at time t_0, s_e^2 is the mean squared error of the regression line, F is a quantile from the F-distribution with 2 and $n-2$ degrees of freedom, and $\bar{t}$ and s_t^2 represent the mean and standard deviation of the sampling dates.

For well-constituent pairs with no non-detects, linear regression and the formula above were used to construct each confidence band with 98% overall confidence, corresponding to a lower confidence limit with 99% confidence.

3.3 Comparing Confidence Interval Bands Against GWPS

To assess whether any SSIs have occurred during the 2022 Assessment Monitoring at the CSU CCR site, the confidence interval (CI) bands described in **Section 2.2** were compared against the constituent-specific groundwater protection standards (GWPS) described in **Section 2.1**. Of note, an SSI was identified if and only if the CI band fully exceeded the GWPS at the most recent sampling event.

Plots of the CI band comparisons for each well-constituent pair are presented in **Appendix B**.

3.4 Summary of Appendix IV Statistical Analysis

To facilitate an 'at-a-glance' summary of the statistical comparison results, **Table 9** is a 'traffic light' matrix, showing a compact representation of each well location matched against each constituent in Appendix IV. This summary is useful in planning for mitigation actions. Green cells indicate that no SSI was observed. Red cells indicate the opposite: an SSI was flagged at the most recent sampling event. Yellow cells are warnings which indicate that a well-constituent pair should be closely watched. These cases have increasing trends and a CI band whose lower limit is at least 65% of the GWPS. Often, in yellow cells, the CI band cross-section straddles the GWPS.

At the Clear Spring Ranch Ash Landfill CCR unit, a total of 0 SSI(s) were identified during the 2022 annual Assessment Monitoring analysis.

Table 9: Traffic Light Matrix for Clear Spring Ranch Ash Landfill CCR Unit

	Well Locations				
COC	**SC-10**	**SC-11**	**SC-12**	**SC-13**	**SC-14**
Antimony	GRN	GRN	GRN	GRN	GRN
Arsenic	GRN	GRN	GRN	GRN	GRN
Barium	GRN	GRN	GRN	GRN	GRN
Beryllium	GRN	GRN	GRN	GRN	GRN
Cadmium	GRN	GRN	GRN	GRN	GRN
Chromium	GRN	GRN	GRN	GRN	GRN
Cobalt	GRN	GRN	GRN	GRN	GRN
Fluoride	GRN	GRN	GRN	GRN	GRN
Lead	GRN	GRN	GRN	GRN	GRN
Lithium	GRN	GRN	GRN	GRN	GRN
Mercury	GRN	GRN	GRN	GRN	GRN
Molybdenum	GRN	GRN	GRN	GRN	GRN
Rad226+228	GRN	GRN	GRN	GRN	GRN
Selenium	YLW	YLW	GRN	GRN	GRN
Thallium	GRN	GRN	GRN	GRN	GRN

Color-Coding Key:
RED = CI Band above GWPS;
GRN = CI Band below GWPS;
YLW = Non-Decr Trend, CI Lower Bound at least 65% of GWPS

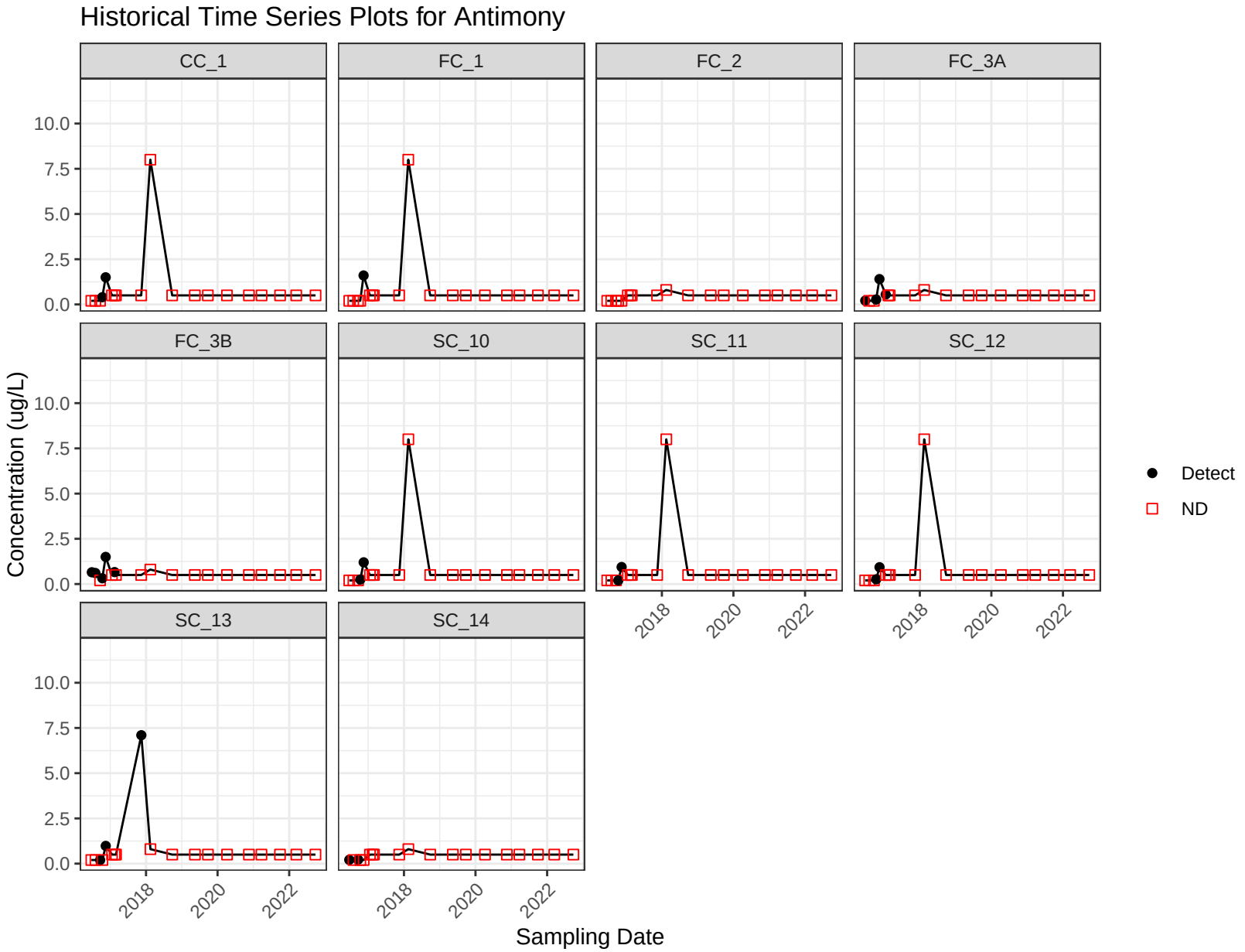
4 References

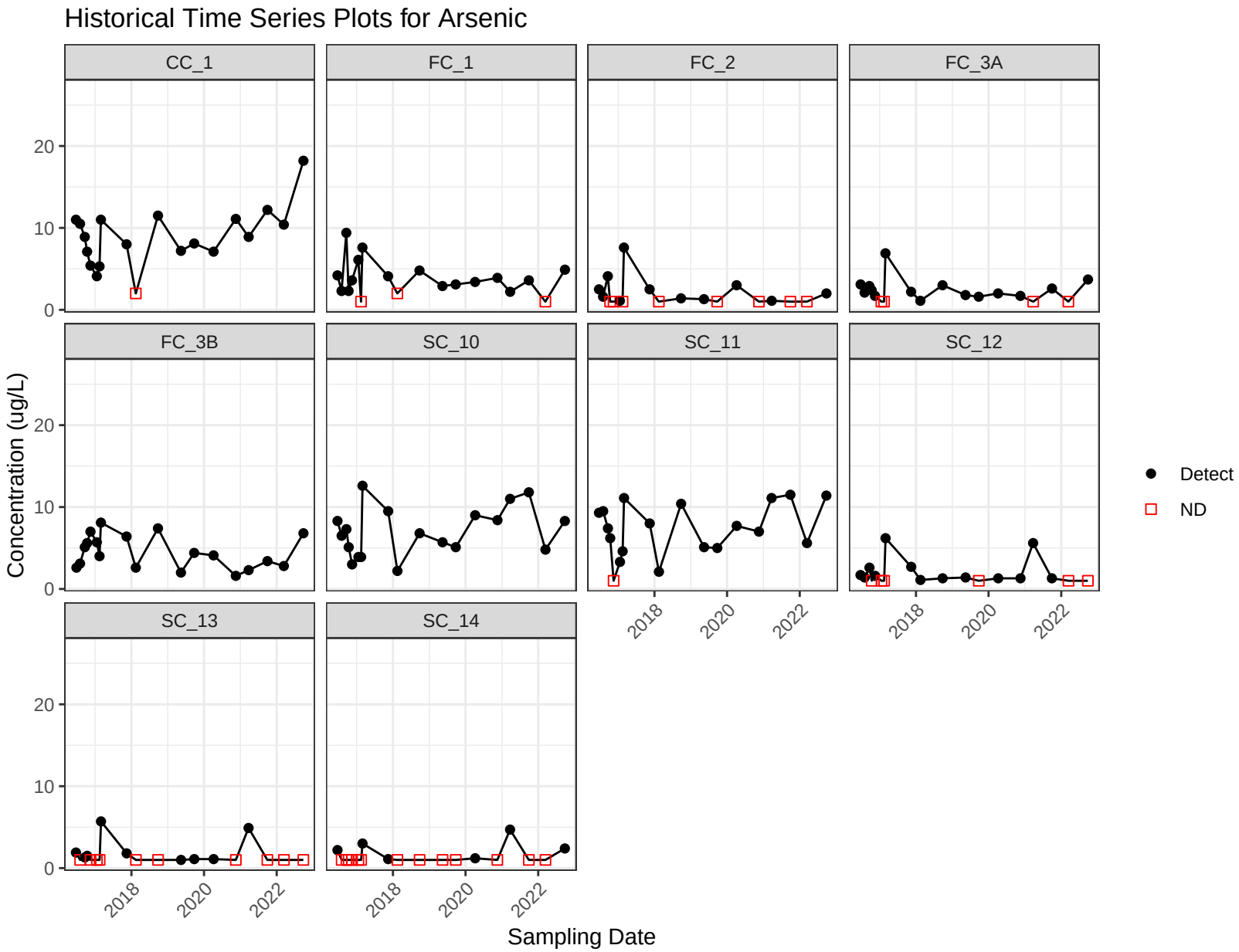
USEPA. 2009. "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance." USEPA: Office of Resource Conservation & Recovery, EPA 530-R-09-007.

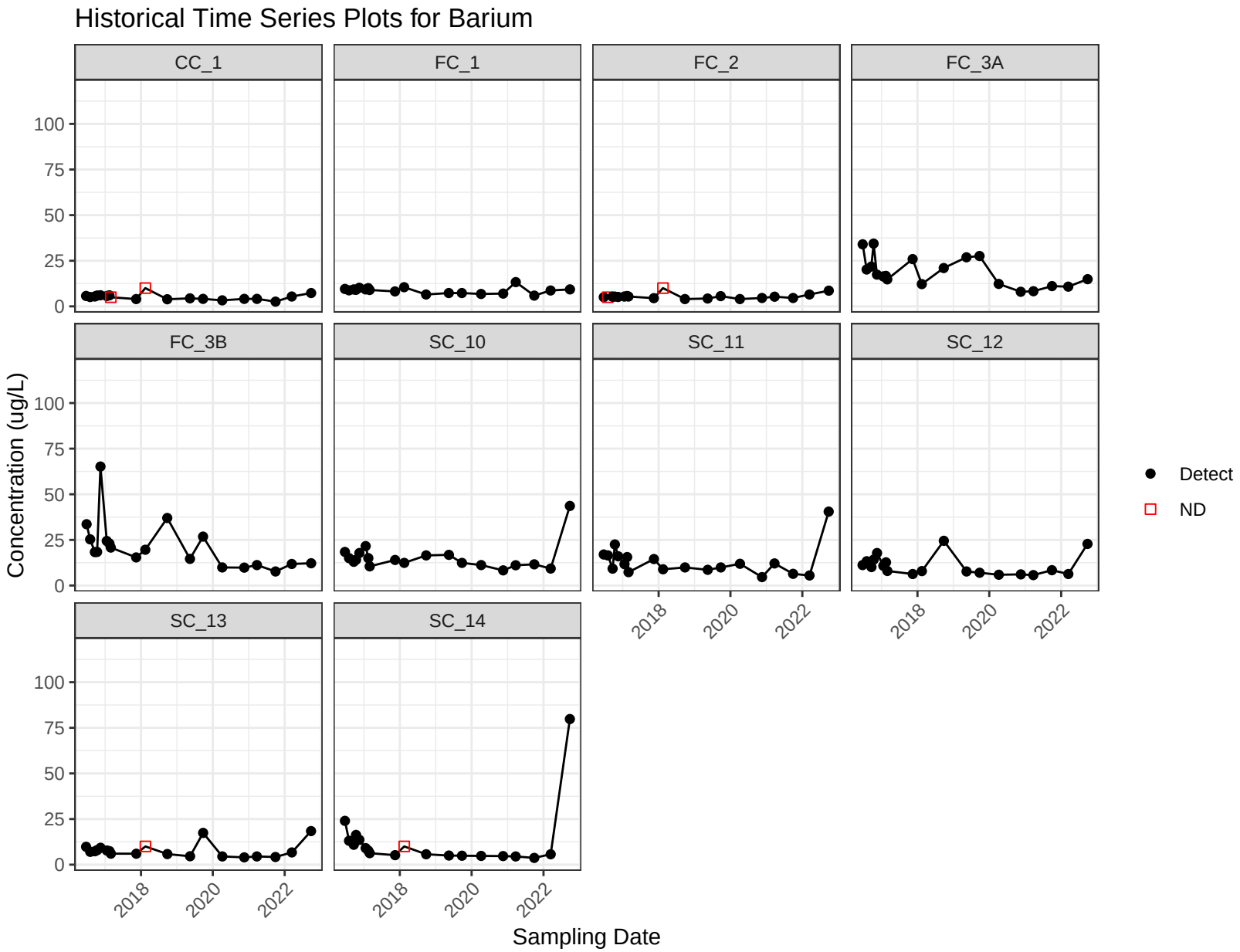
Appendix A: Exploratory Plots

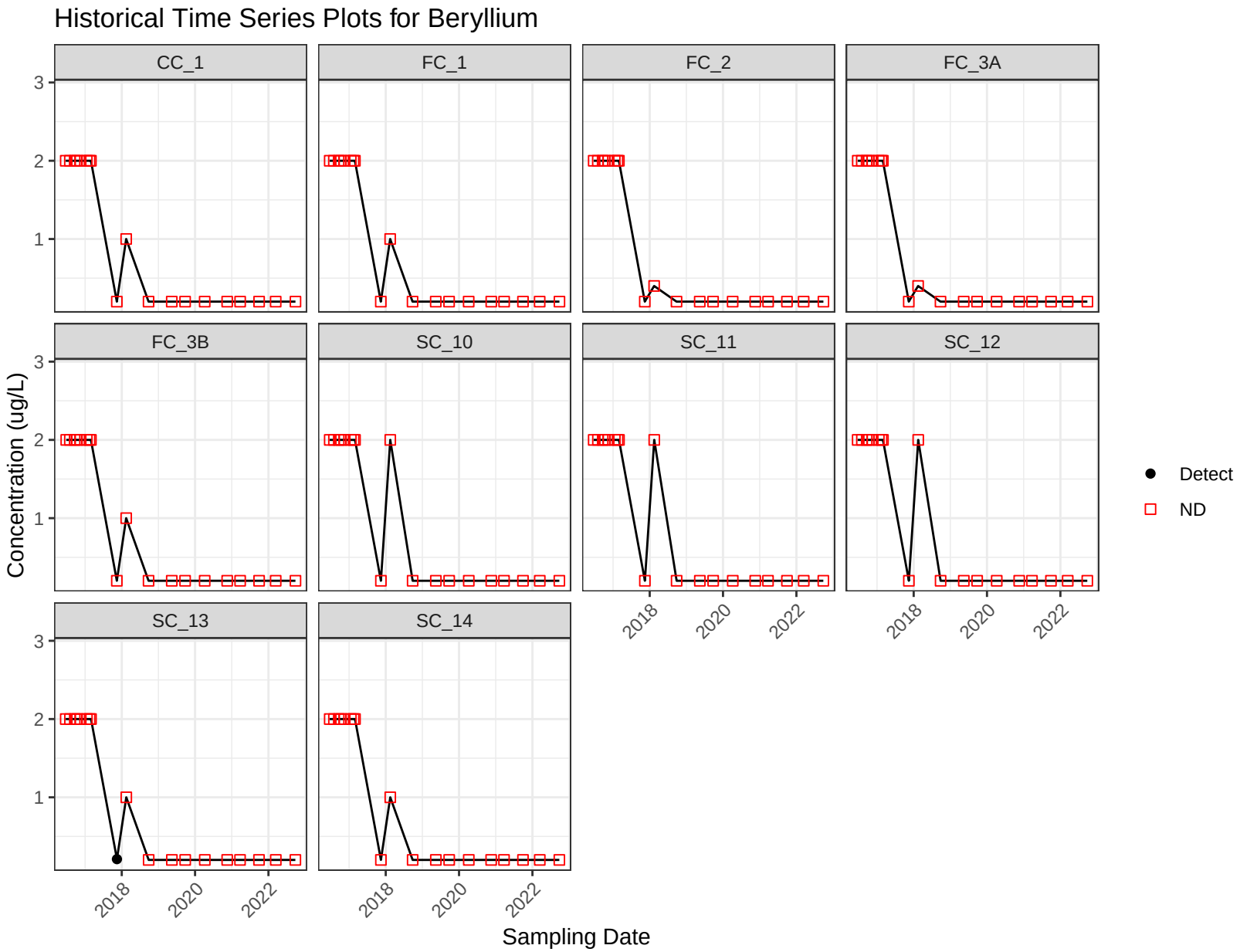
1. Time Series Plots of Each Parameter
2. Box Plots of Each Parameter

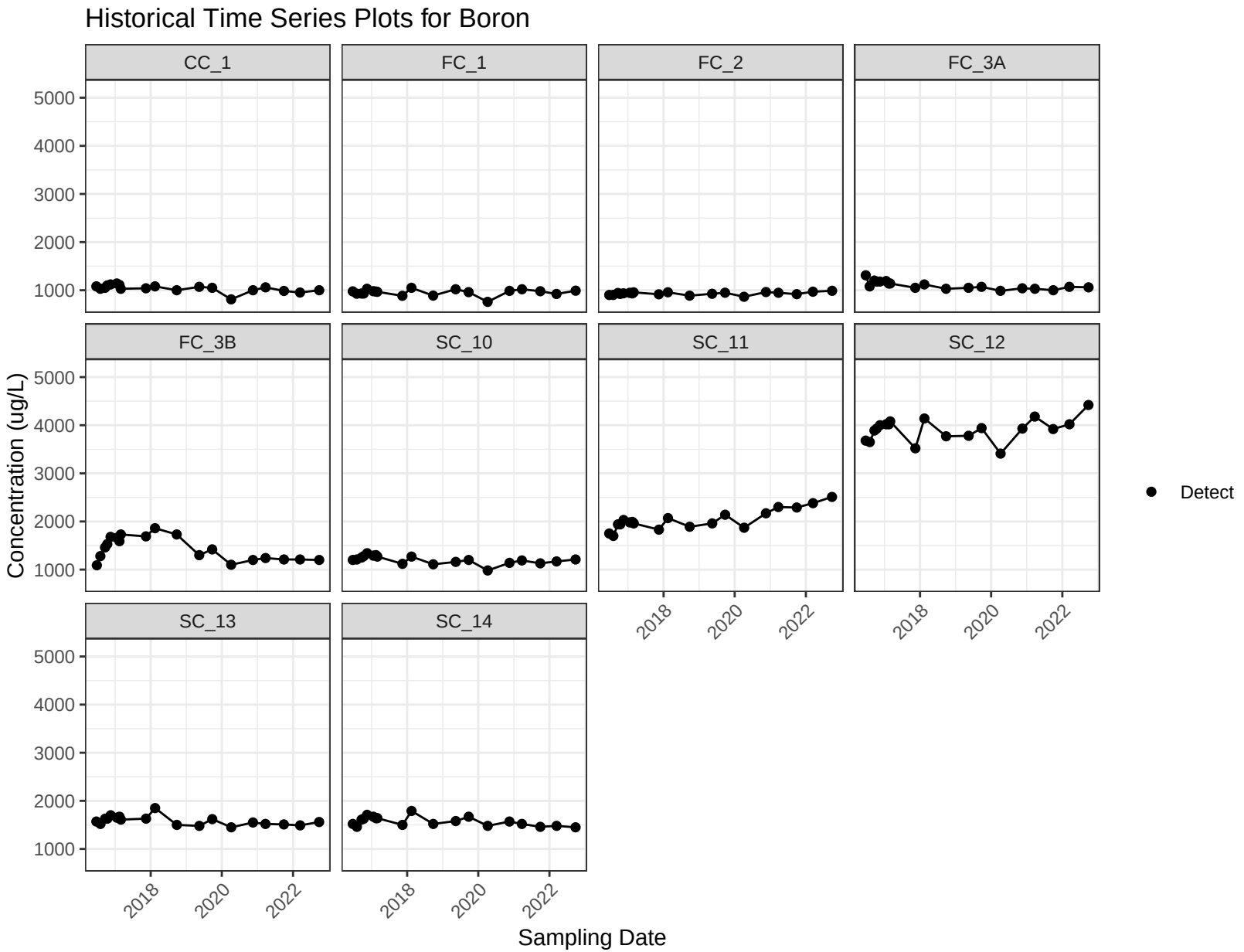
Time Series Plots

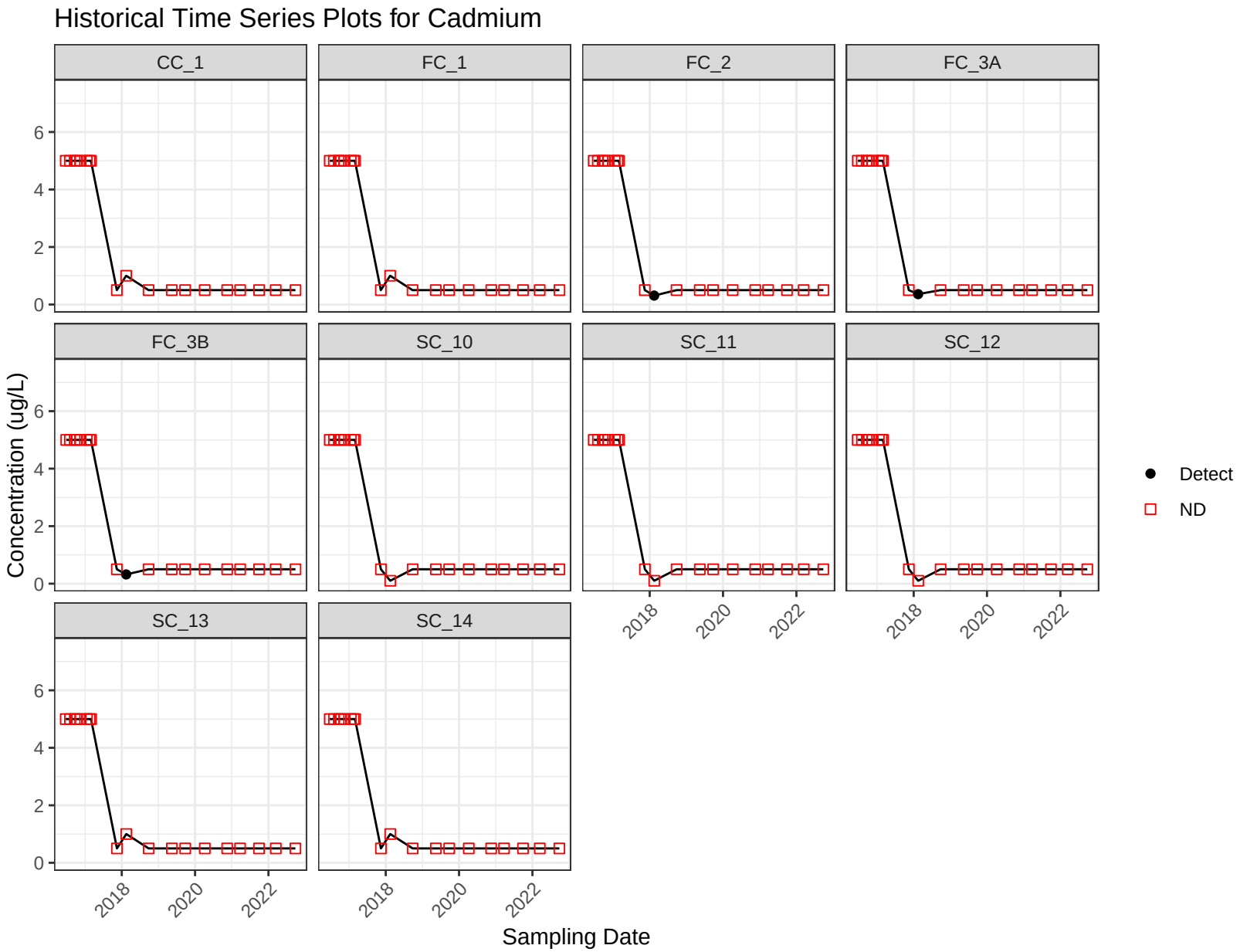


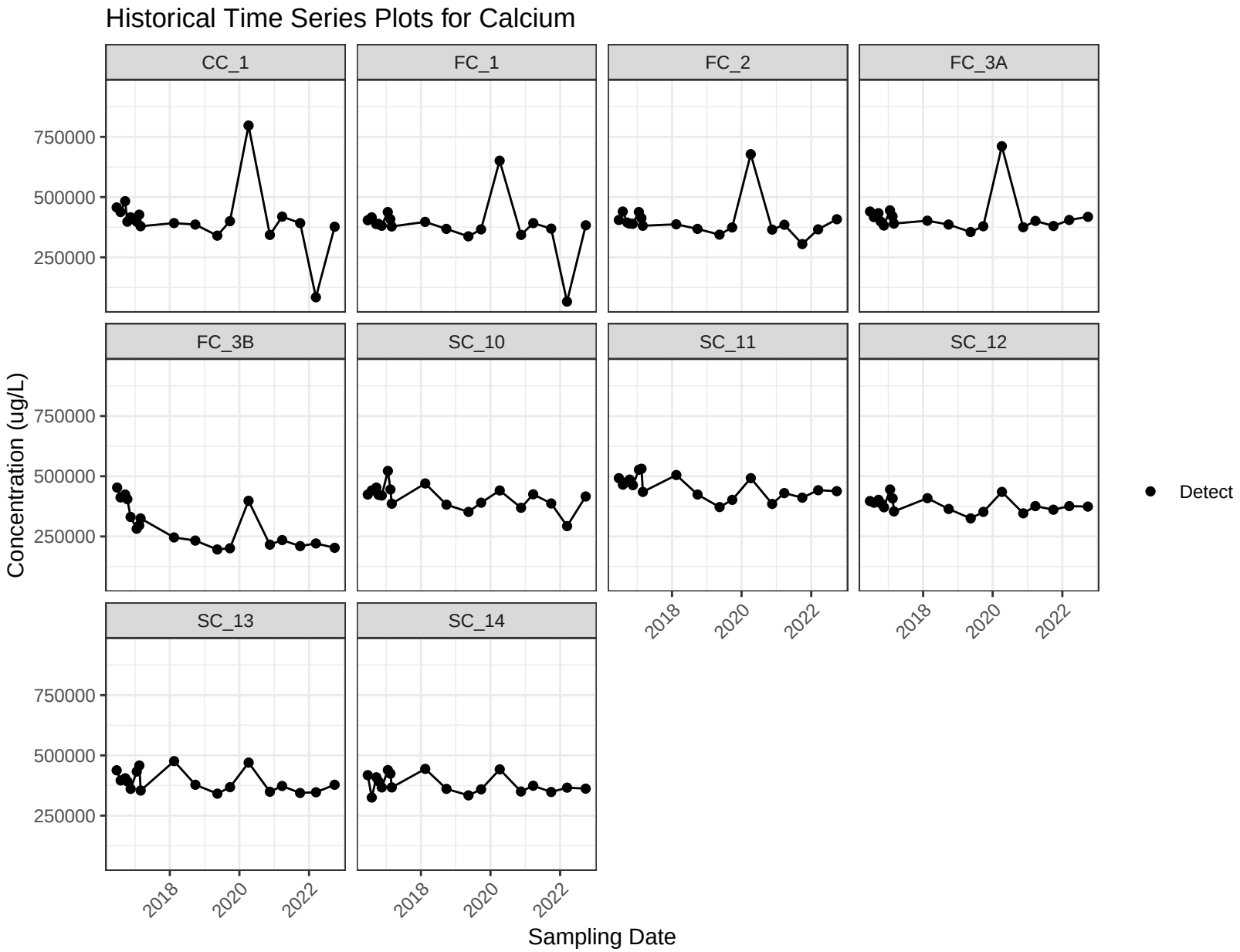

Historical Time Series Plots for Arsenic
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
10
20
2018
2020
2022
Sampling Date
Detect
ND

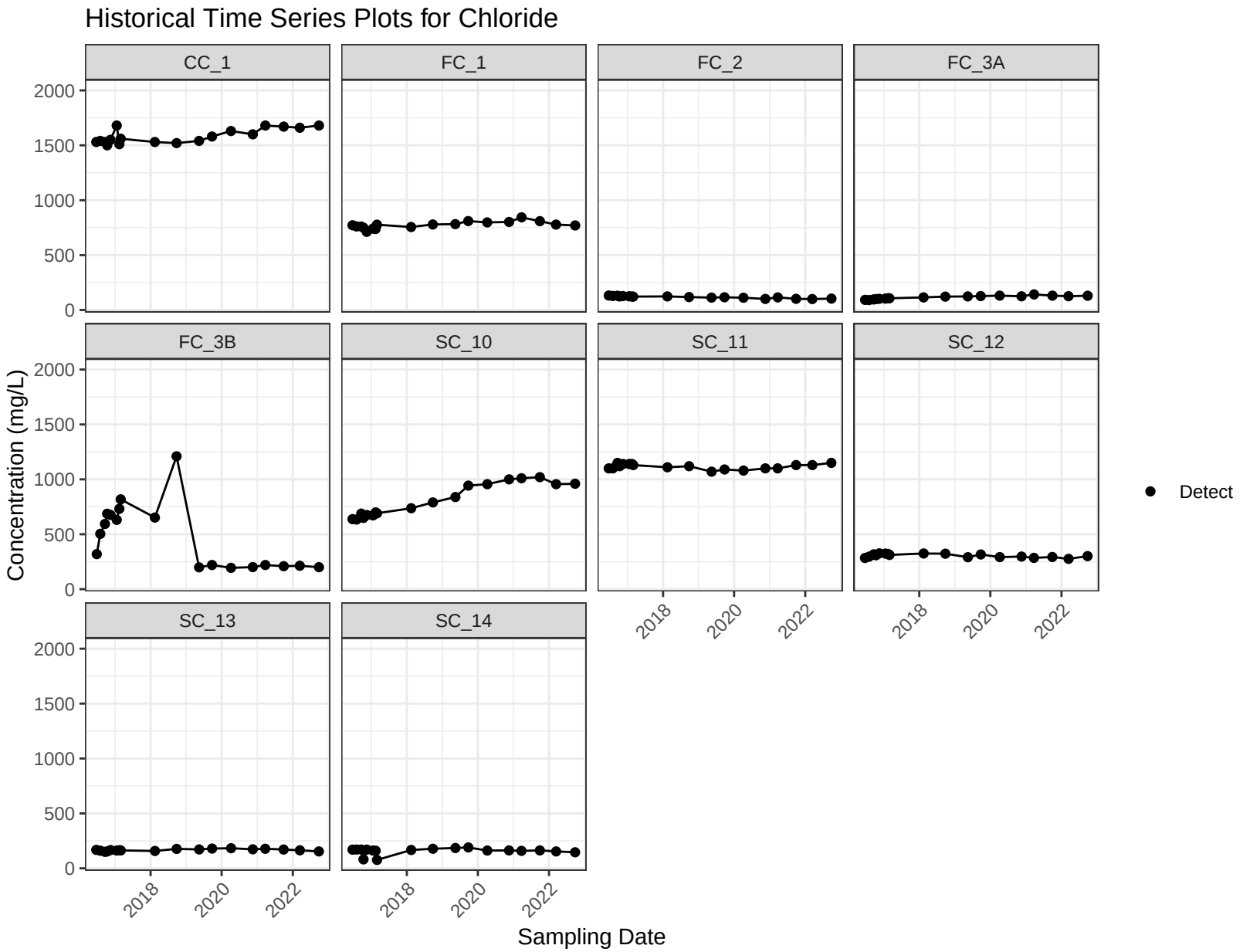

Historical Time Series Plots for Barium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
25
50
75
100
2018
2020
2022
Sampling Date
Detect
ND

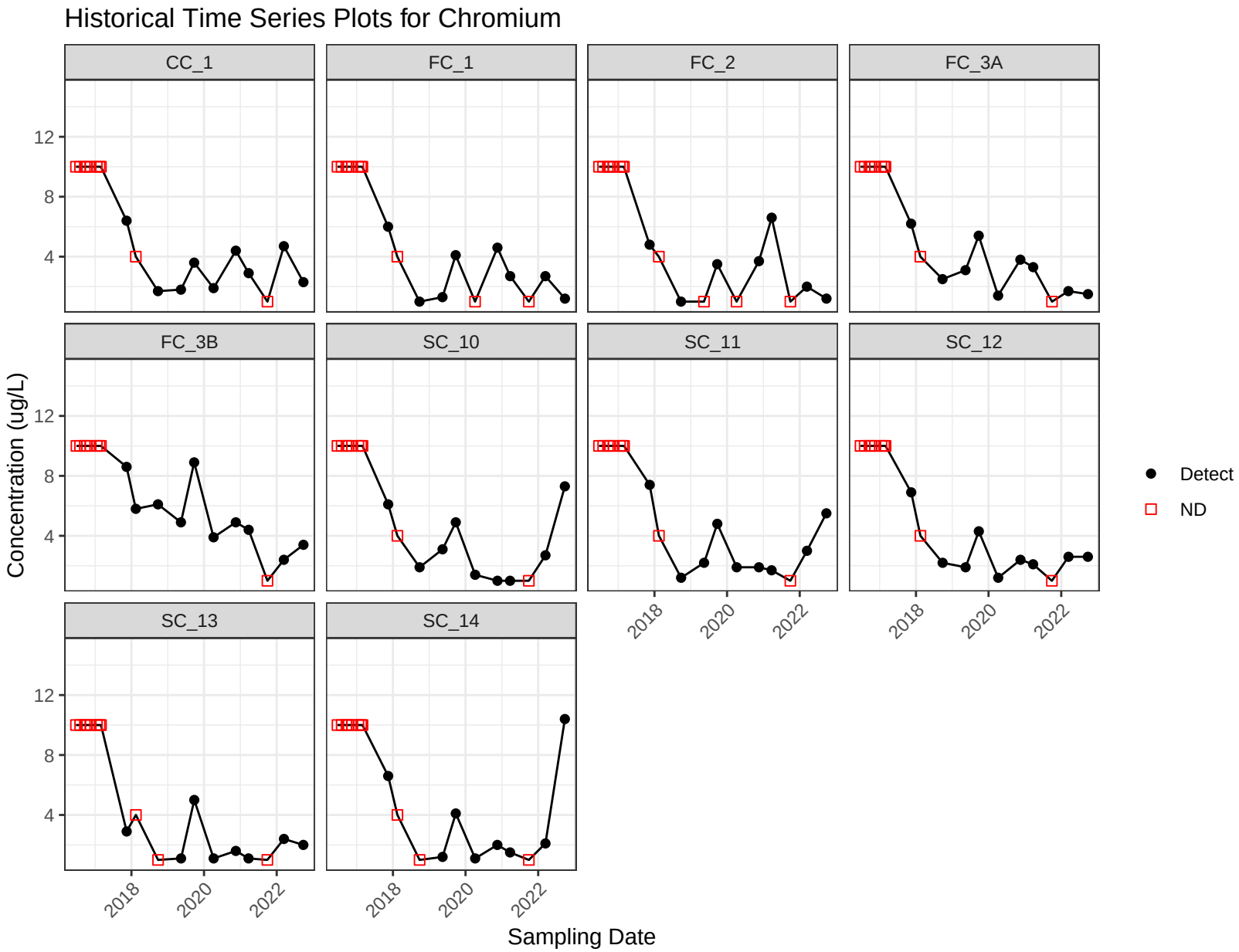

Historical Time Series Plots for Beryllium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
3
2
1
2018
2020
2022
Sampling Date
Detect
ND

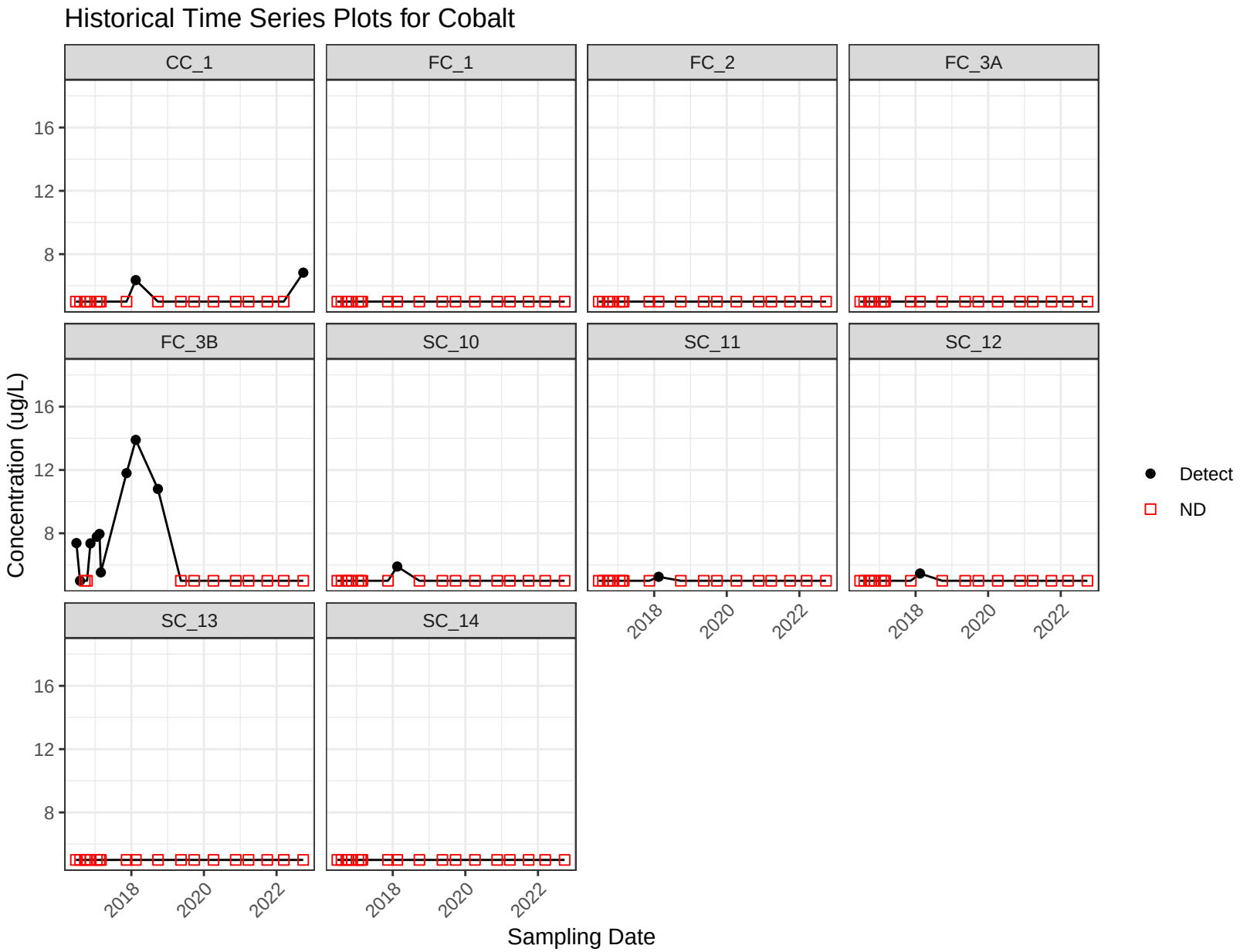

Historical Time Series Plots for Boron
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
5000
4000
3000
2000
1000
2018
2020
2022
Sampling Date
Detect

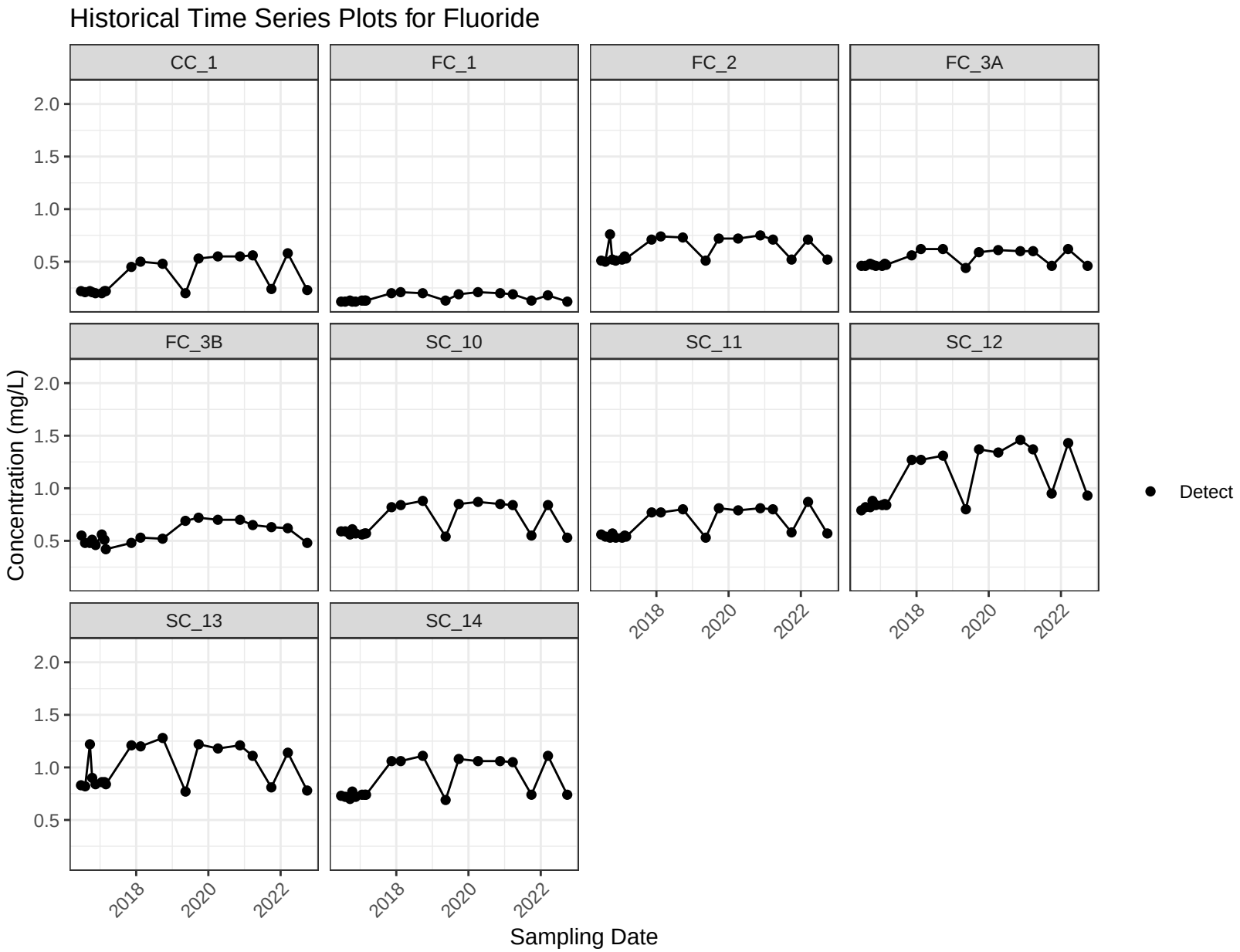

Historical Time Series Plots for Cadmium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
2
4
6
2018
2020
2022
Sampling Date
Detect
ND

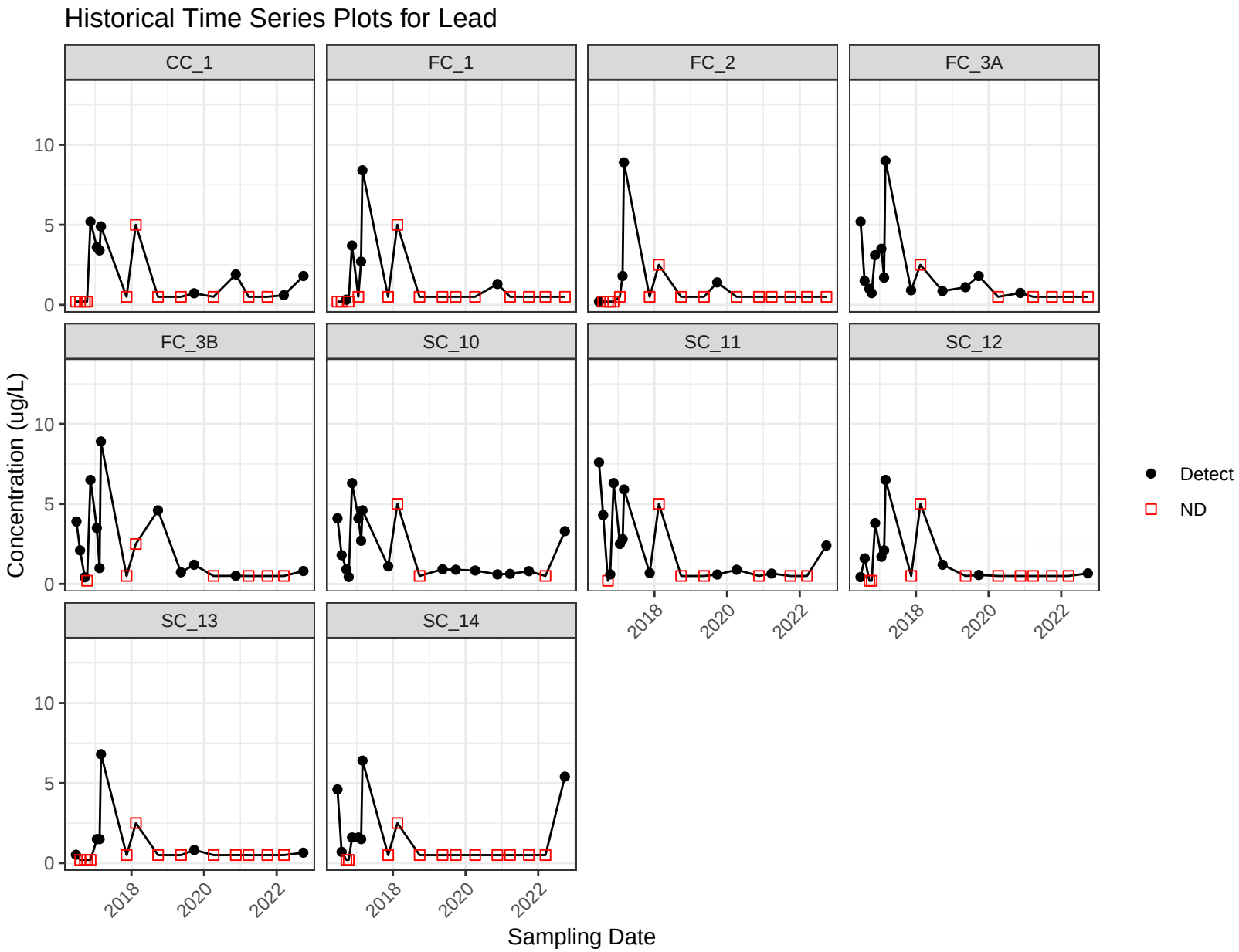

Historical Time Series Plots for Calcium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
750000
500000
250000
2018
2020
2022
Concentration (ug/L)
Sampling Date
Detect

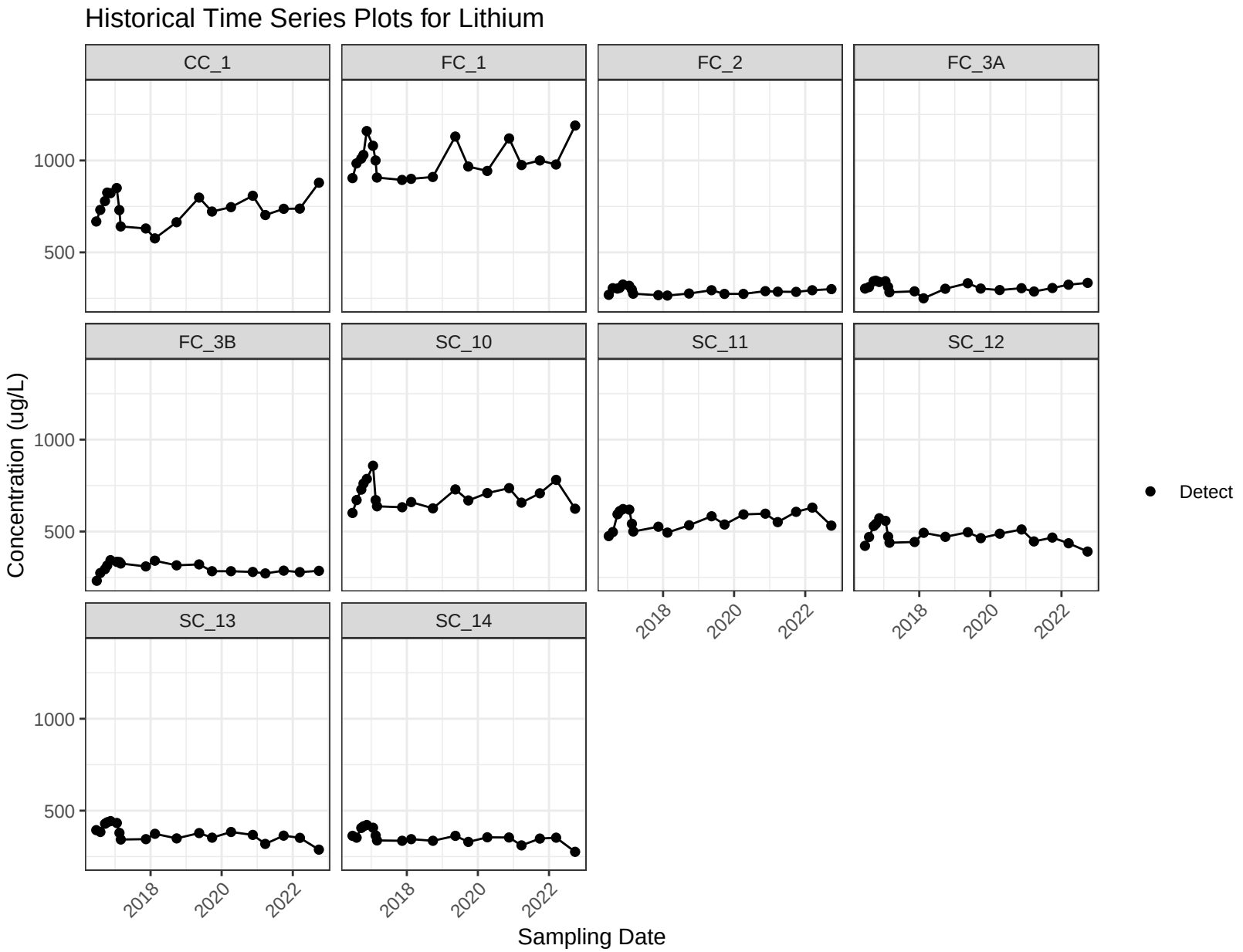

Historical Time Series Plots for Chloride
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (mg/L)
0
500
1000
1500
2000
2018
2020
2022
Sampling Date
Detect

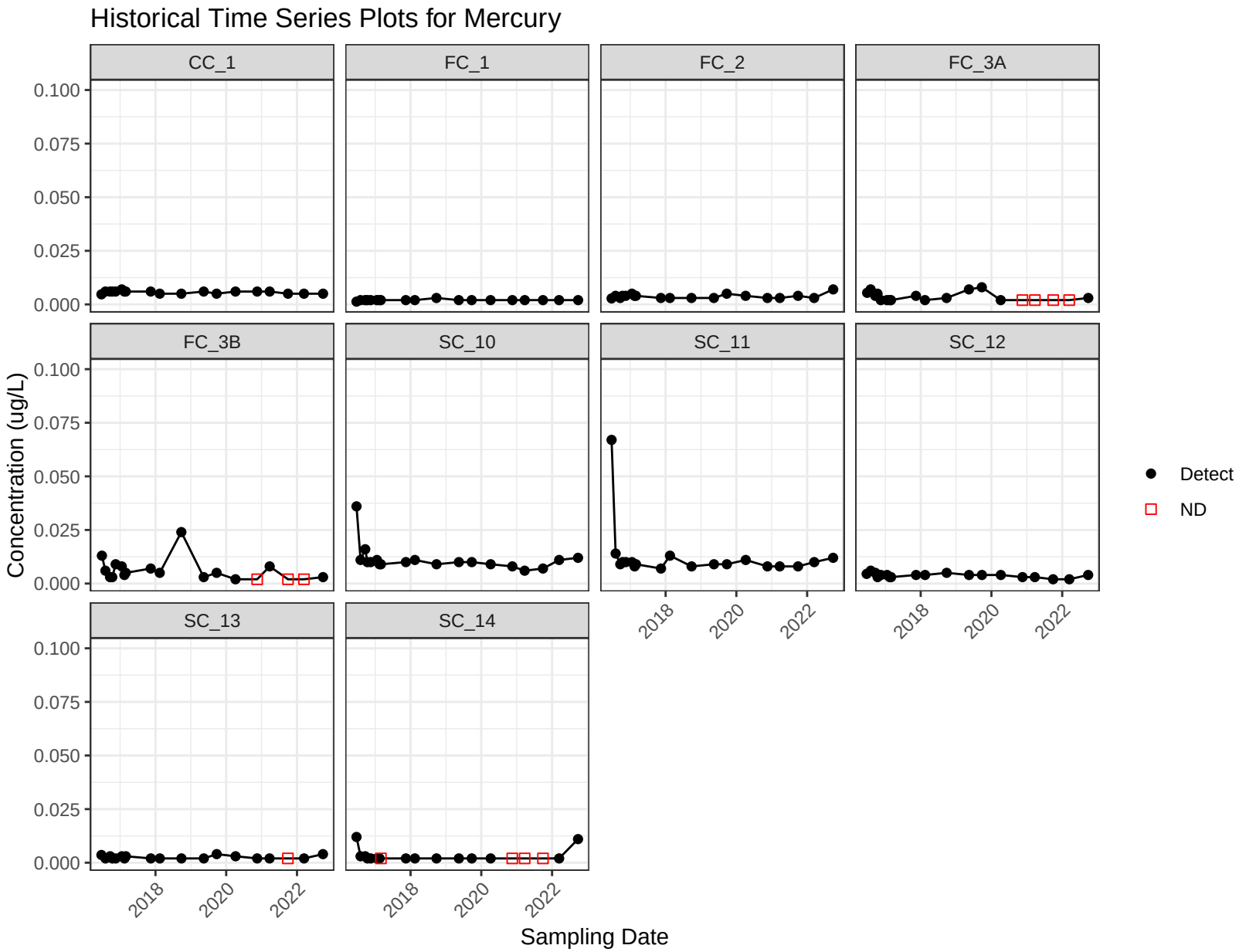

Historical Time Series Plots for Chromium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
12
8
4
2018
2020
2022
Sampling Date
Detect
ND


Historical Time Series Plots for Cobalt
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
16
12
8
2018
2020
2022
Sampling Date
Detect
ND


Historical Time Series Plots for Fluoride
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (mg/L)
2.0
1.5
1.0
0.5
2018
2020
2022
Sampling Date
Detect


Historical Time Series Plots for Lead
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
5
10
2018
2020
2022
Sampling Date
Detect
ND


Historical Time Series Plots for Lithium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
1000
500
2018
2020
2022
Concentration (ug/L)
Sampling Date
Detect


Historical Time Series Plots for Mercury
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FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
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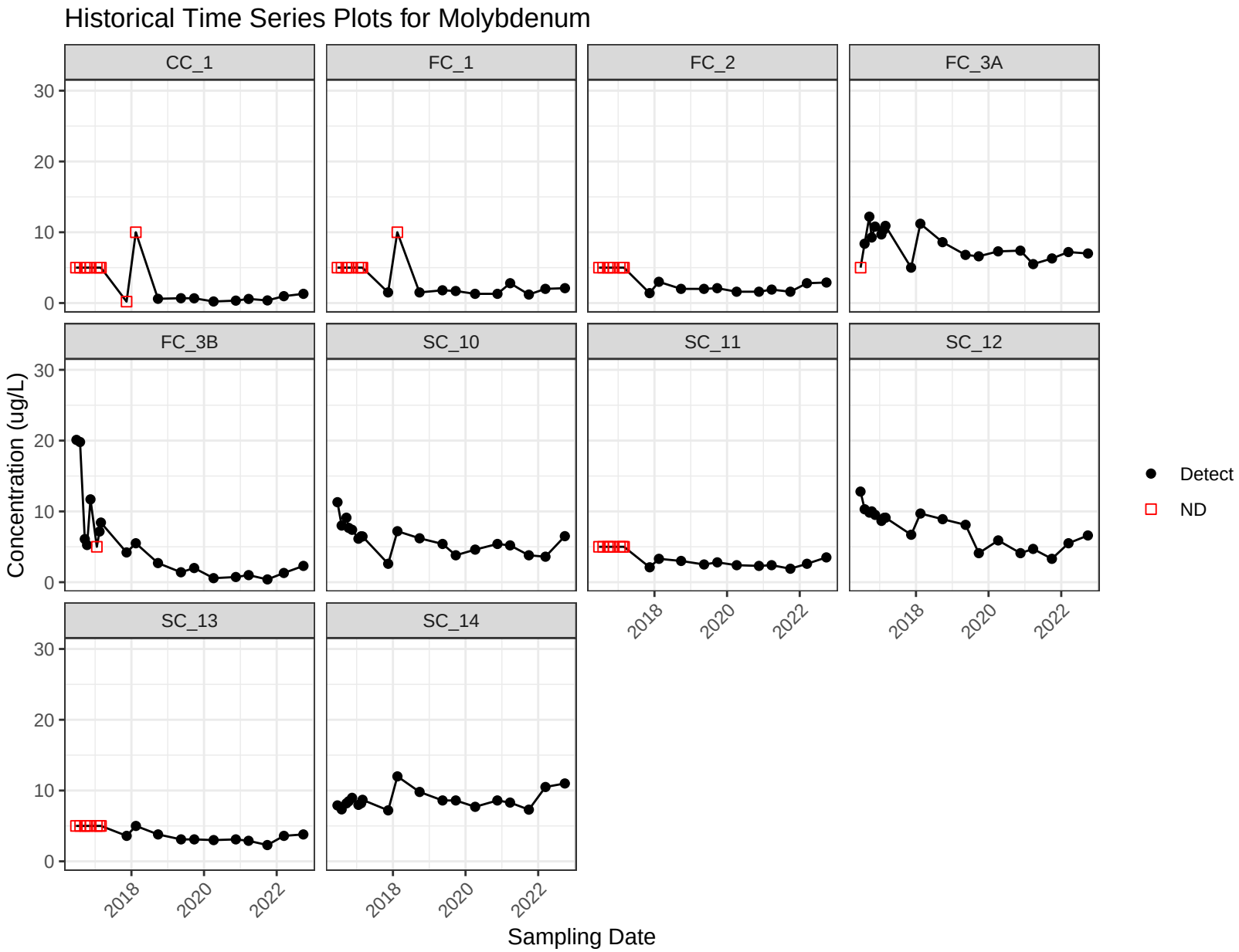
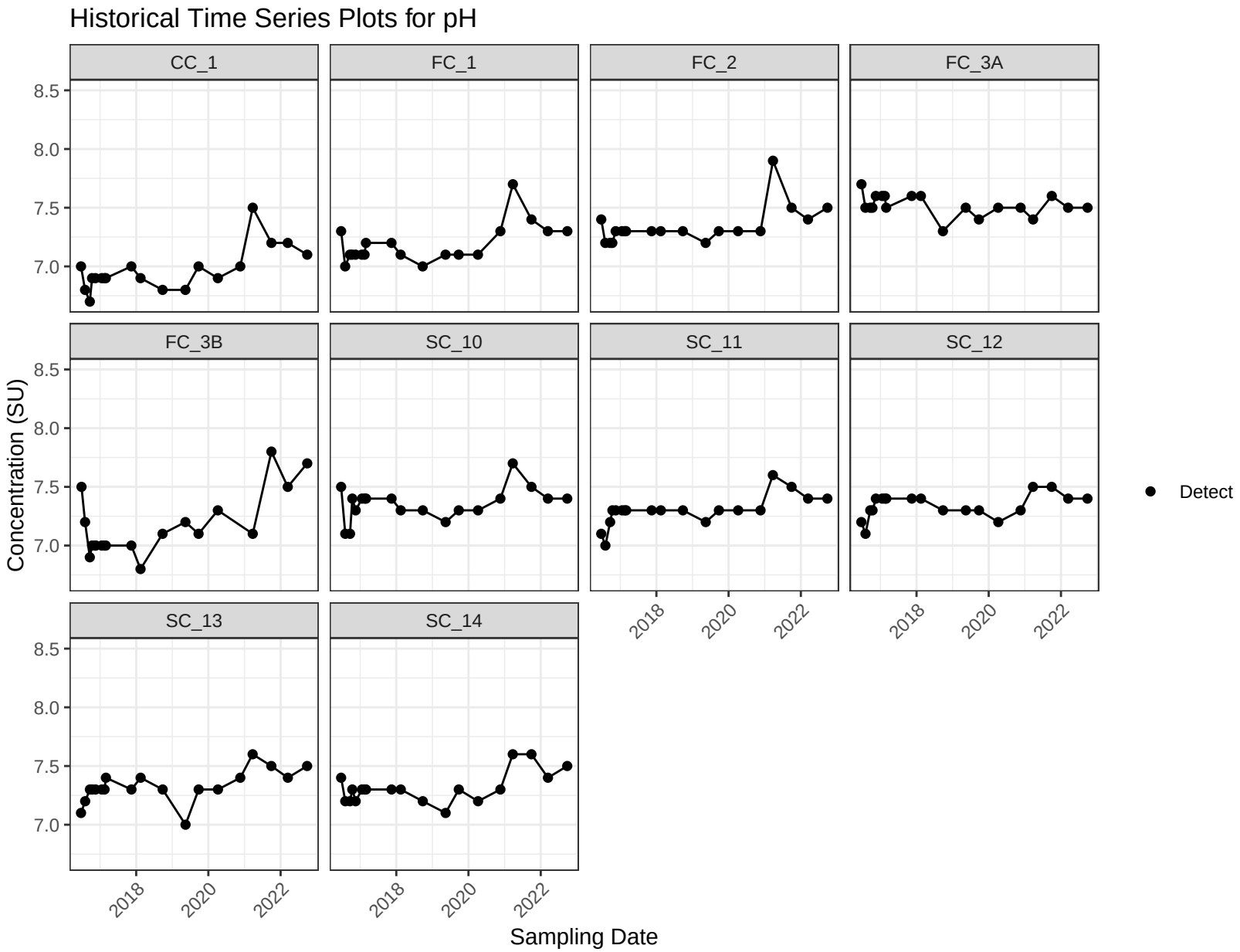
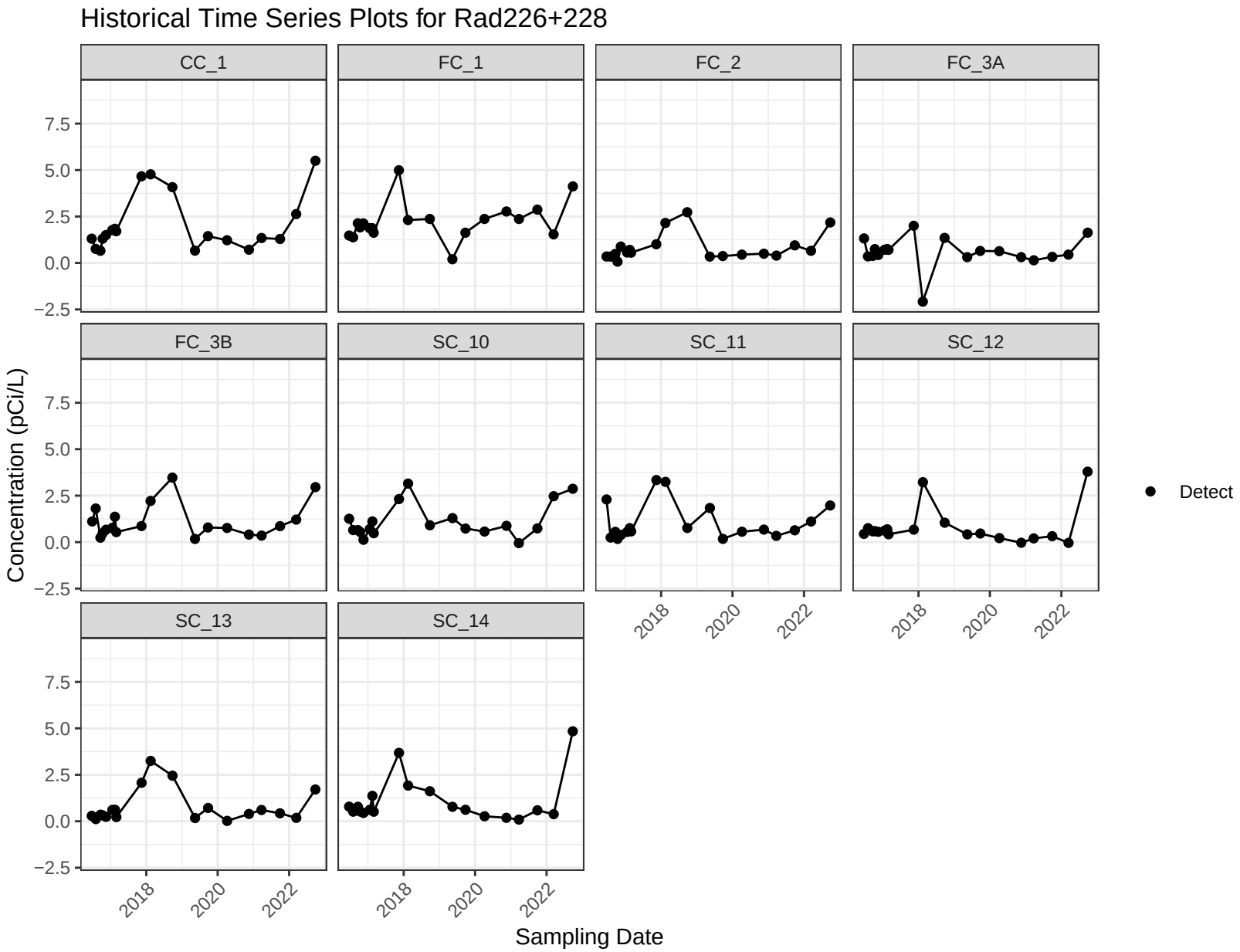
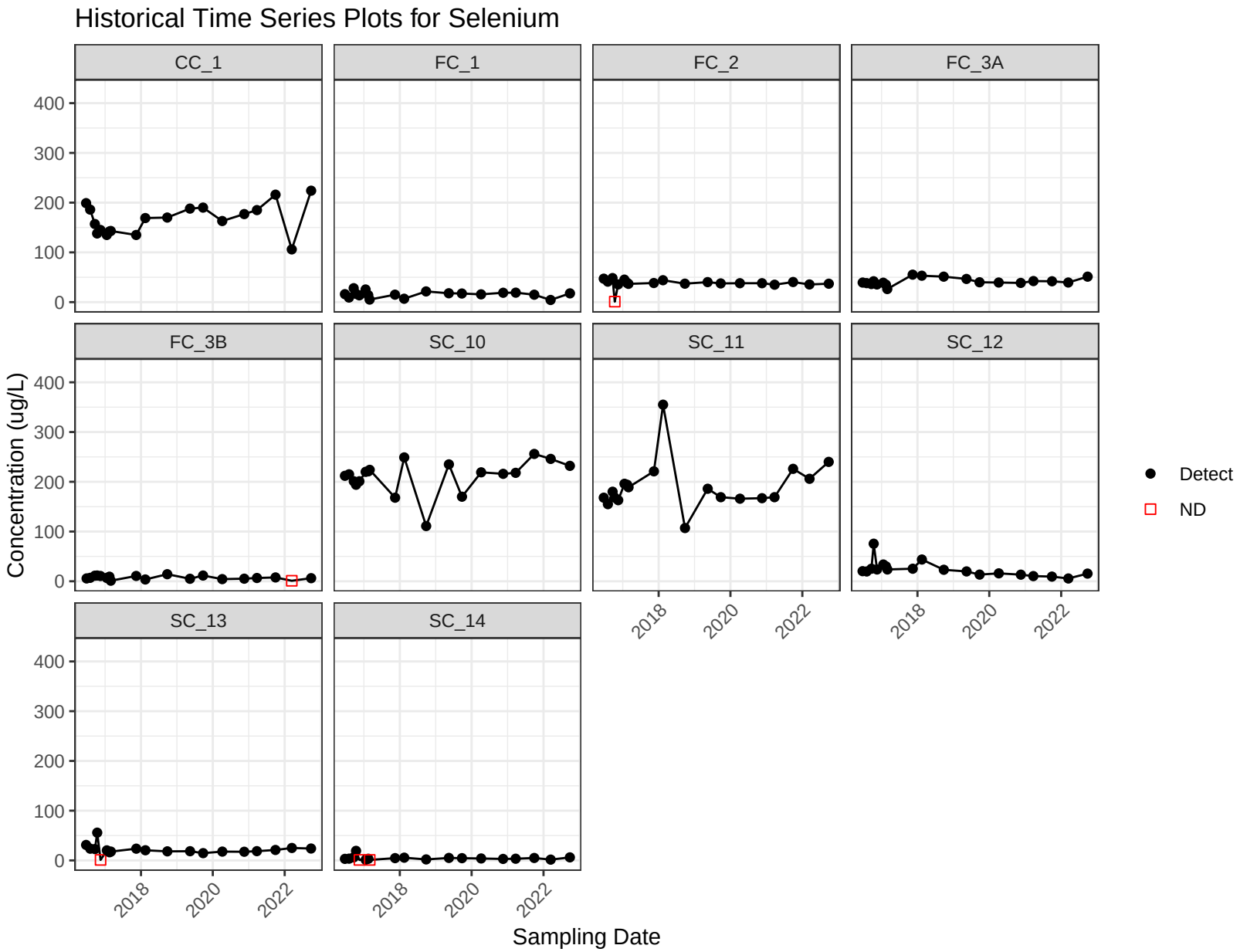
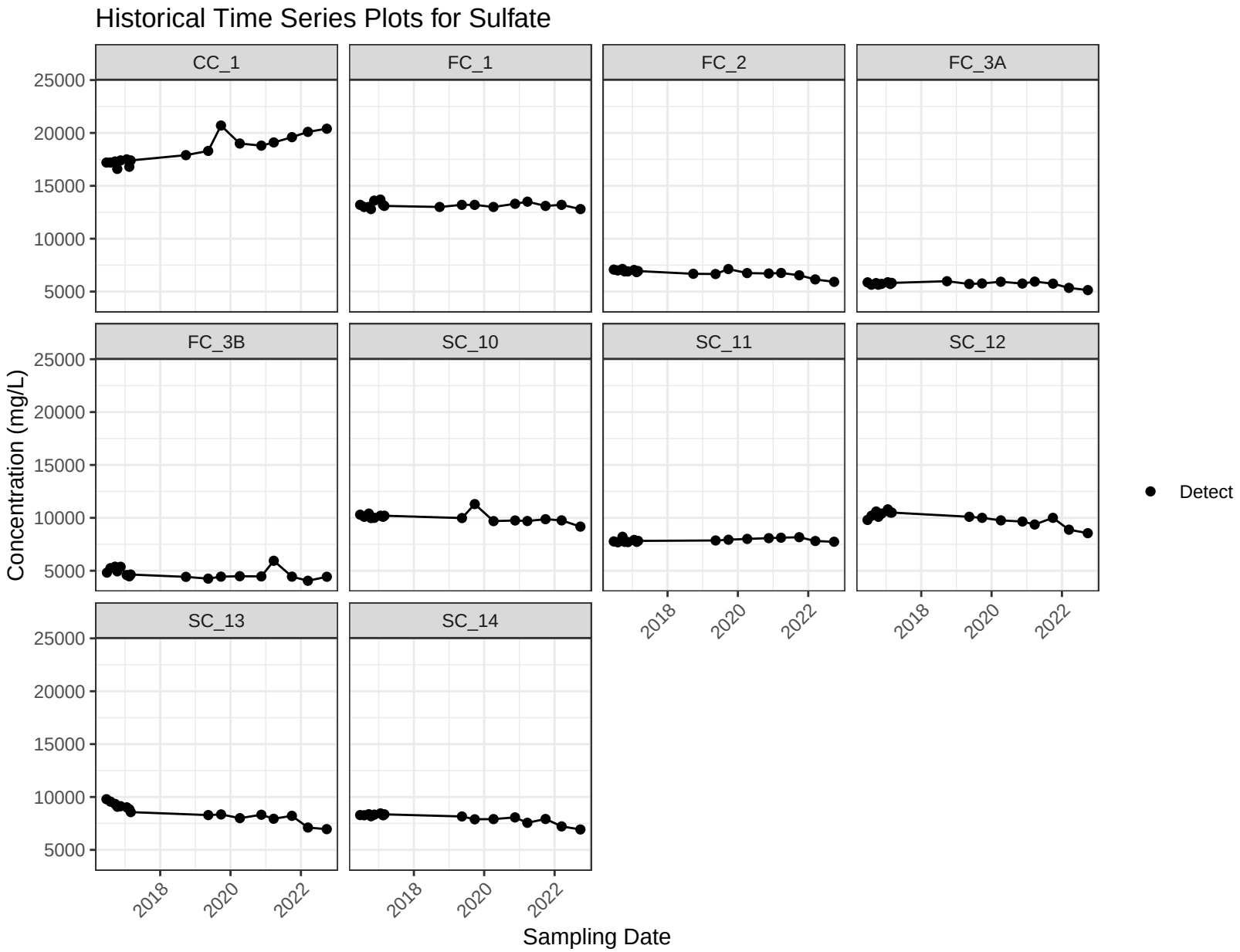
0.075
0.050
0.025
0.000
Concentration (ug/L)
2018
2020
2022
Sampling Date
Detect
ND

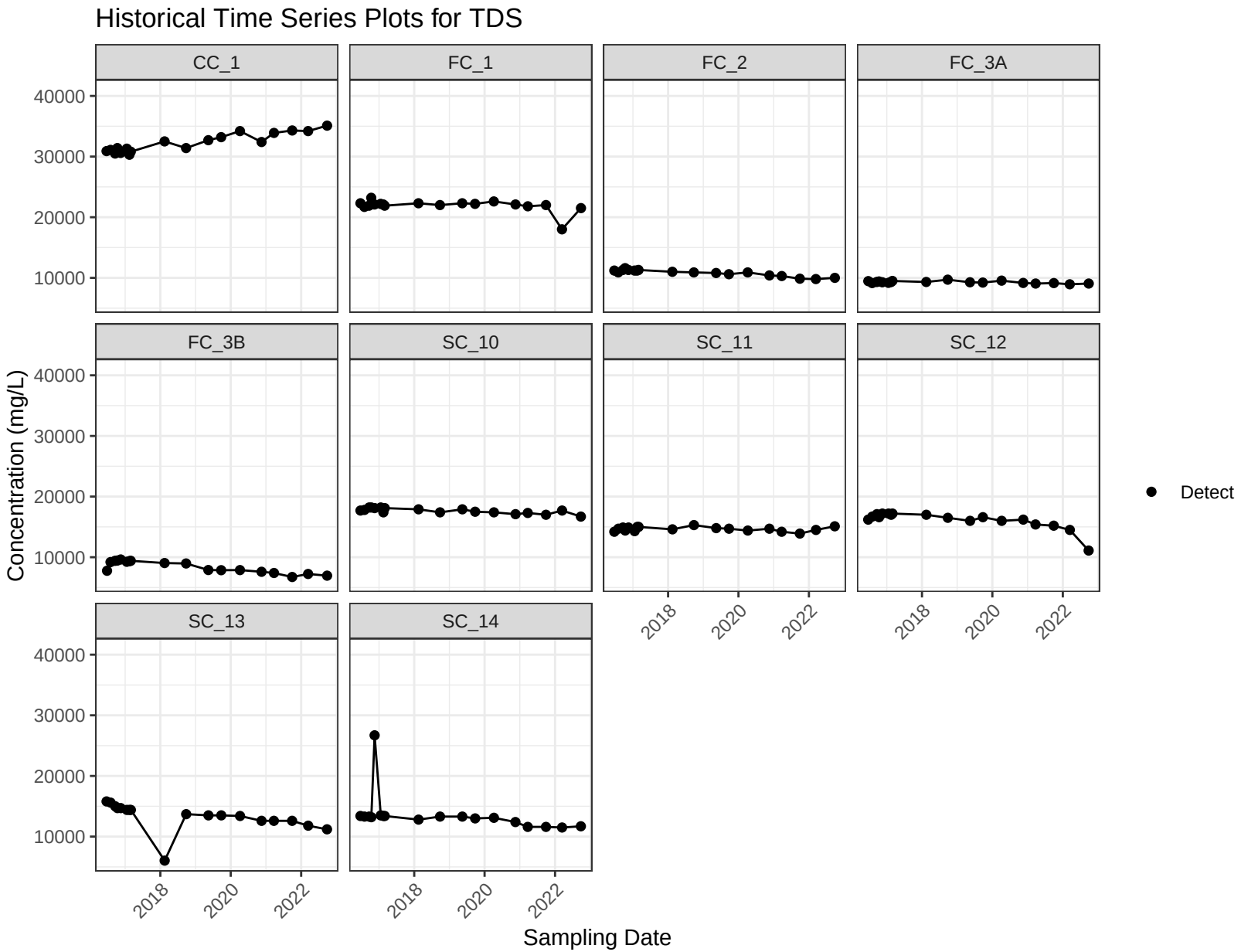

Historical Time Series Plots for Molybdenum
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
10
20
30
2018
2020
2022
Sampling Date
Detect
ND

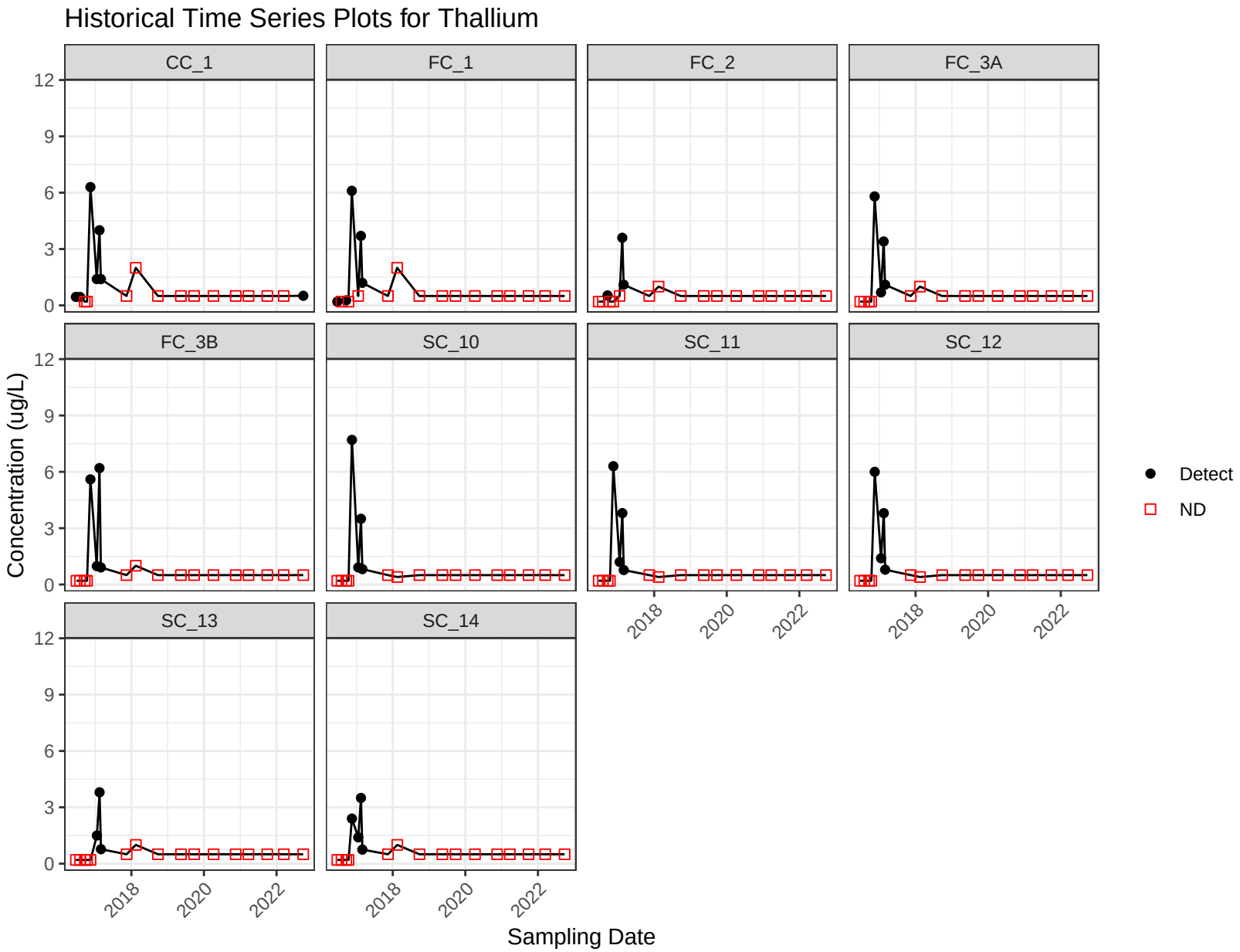

Historical Time Series Plots for pH
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
8.5
8.0
7.5
7.0
2018
2020
2022
Concentration (SU)
Sampling Date
Detect


Historical Time Series Plots for Rad226+228
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
7.5
5.0
2.5
0.0
−2.5
2018
2020
2022
Concentration (pCi/L)
Sampling Date
Detect

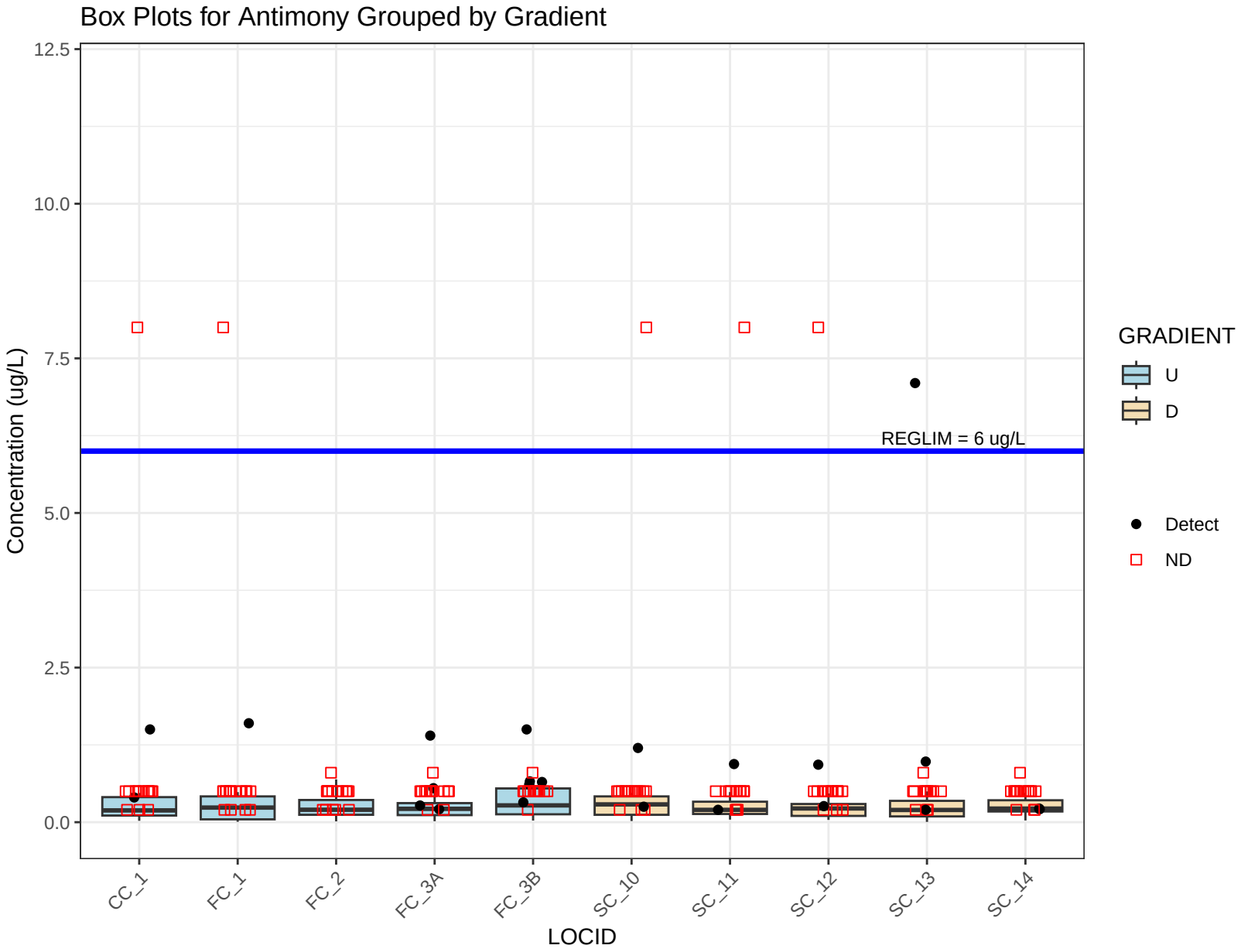

Historical Time Series Plots for Selenium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
100
200
300
400
2018
2020
2022
Sampling Date
Detect
ND

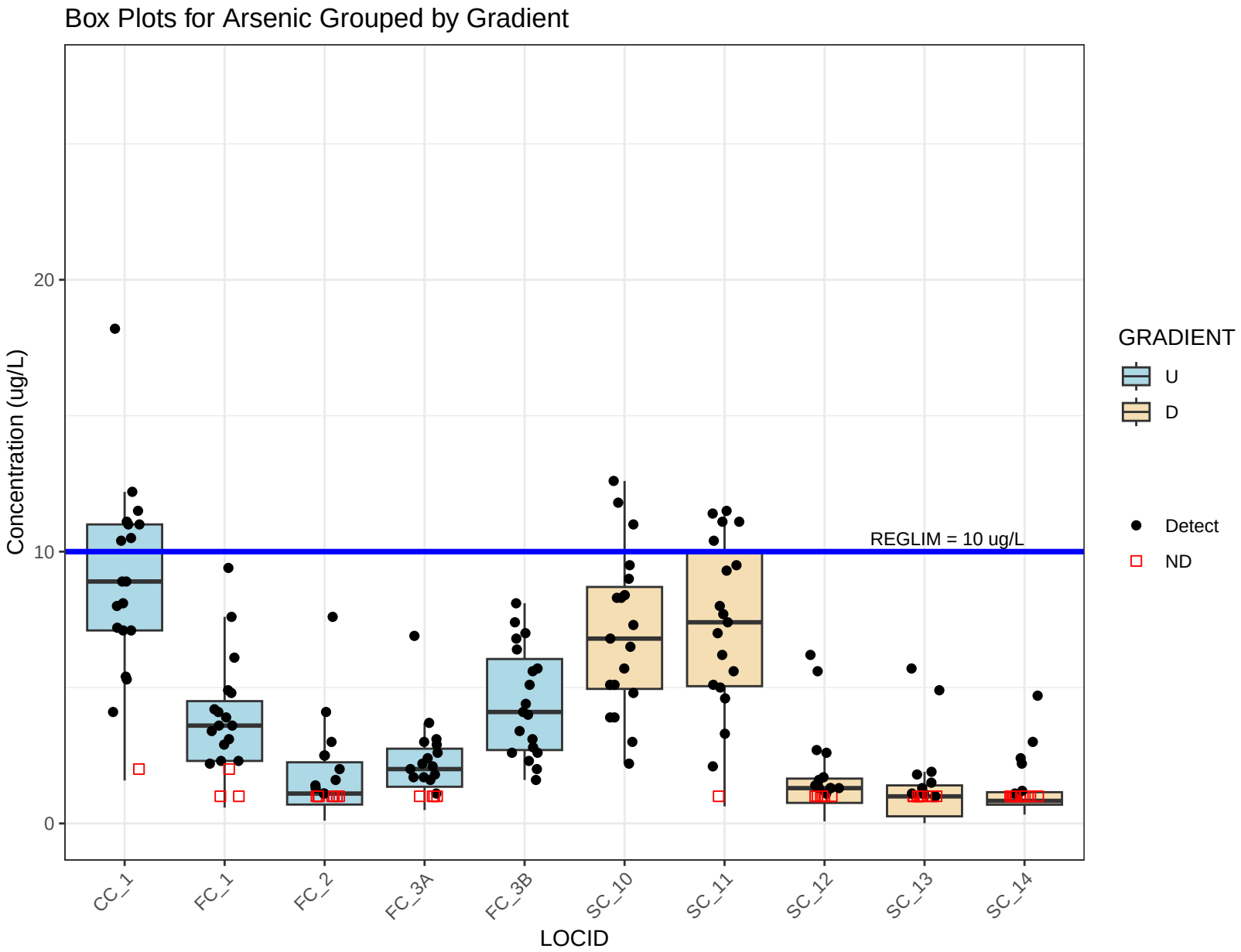

Historical Time Series Plots for Sulfate
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
25000
20000
15000
10000
5000
2018
2020
2022
Concentration (mg/L)
Sampling Date
Detect

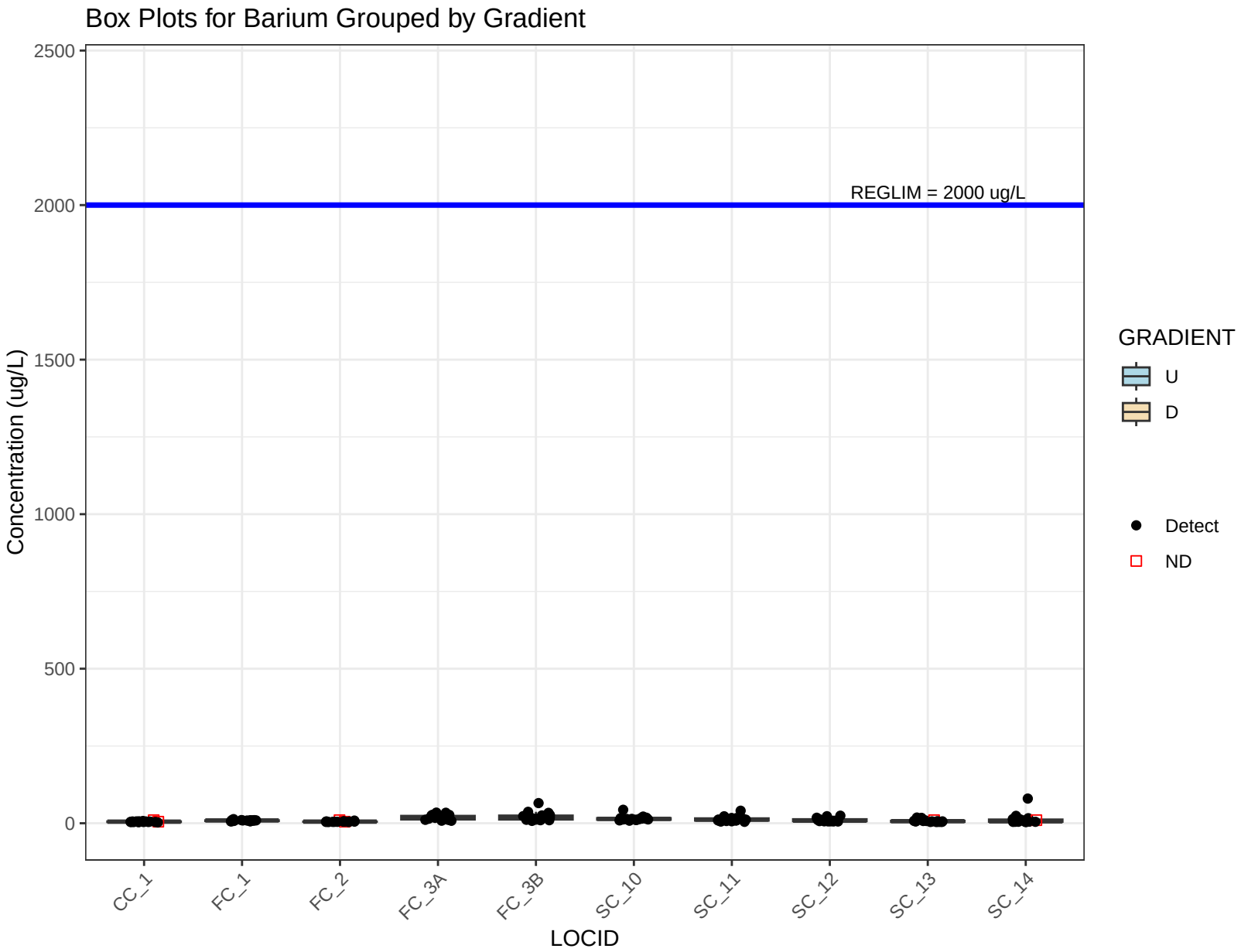

Historical Time Series Plots for TDS
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
40000
30000
20000
10000
2018
2020
2022
Concentration (mg/L)
Sampling Date
Detect

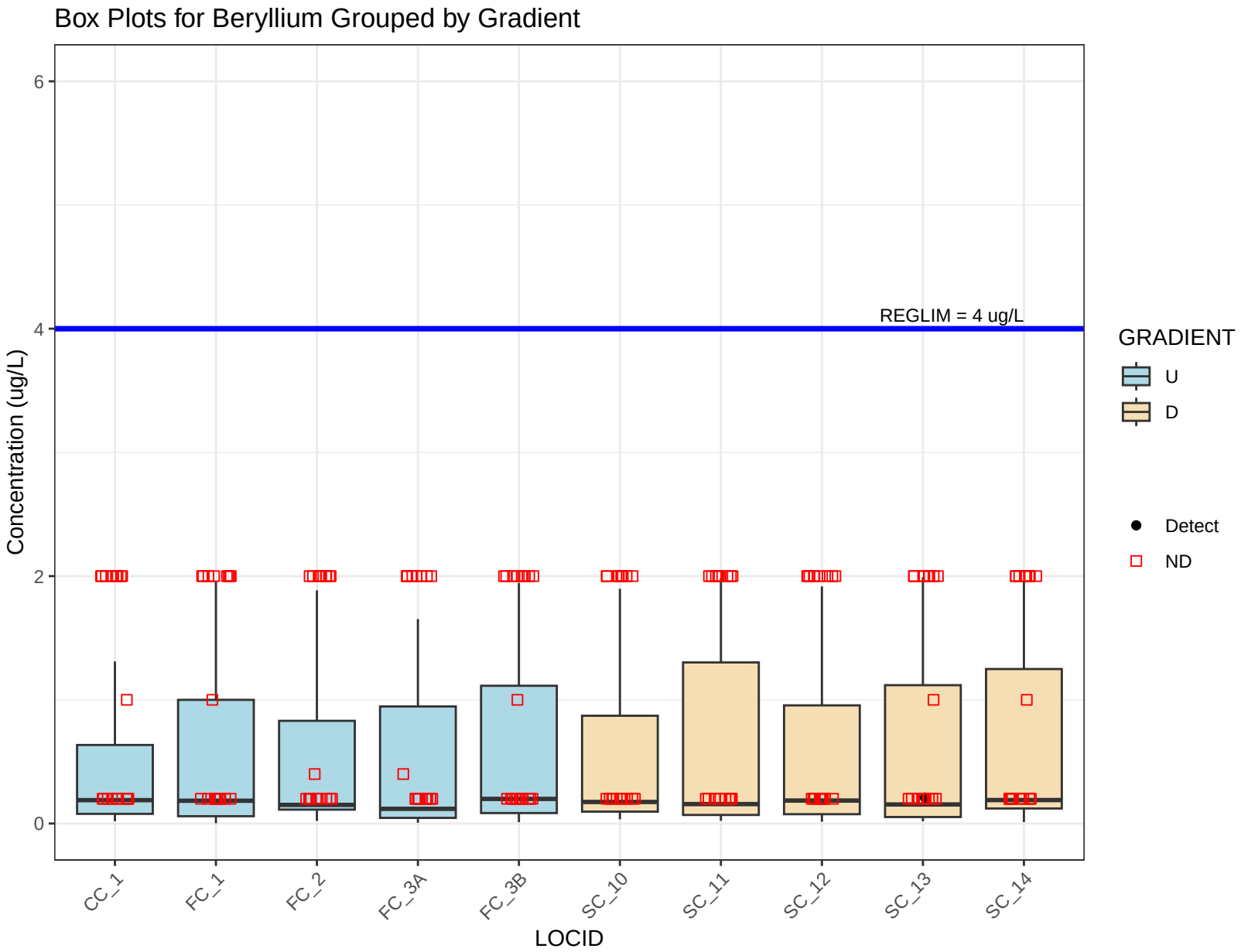

Historical Time Series Plots for Thallium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Concentration (ug/L)
0
3
6
9
12
2018
2020
2022
Sampling Date
Detect
ND

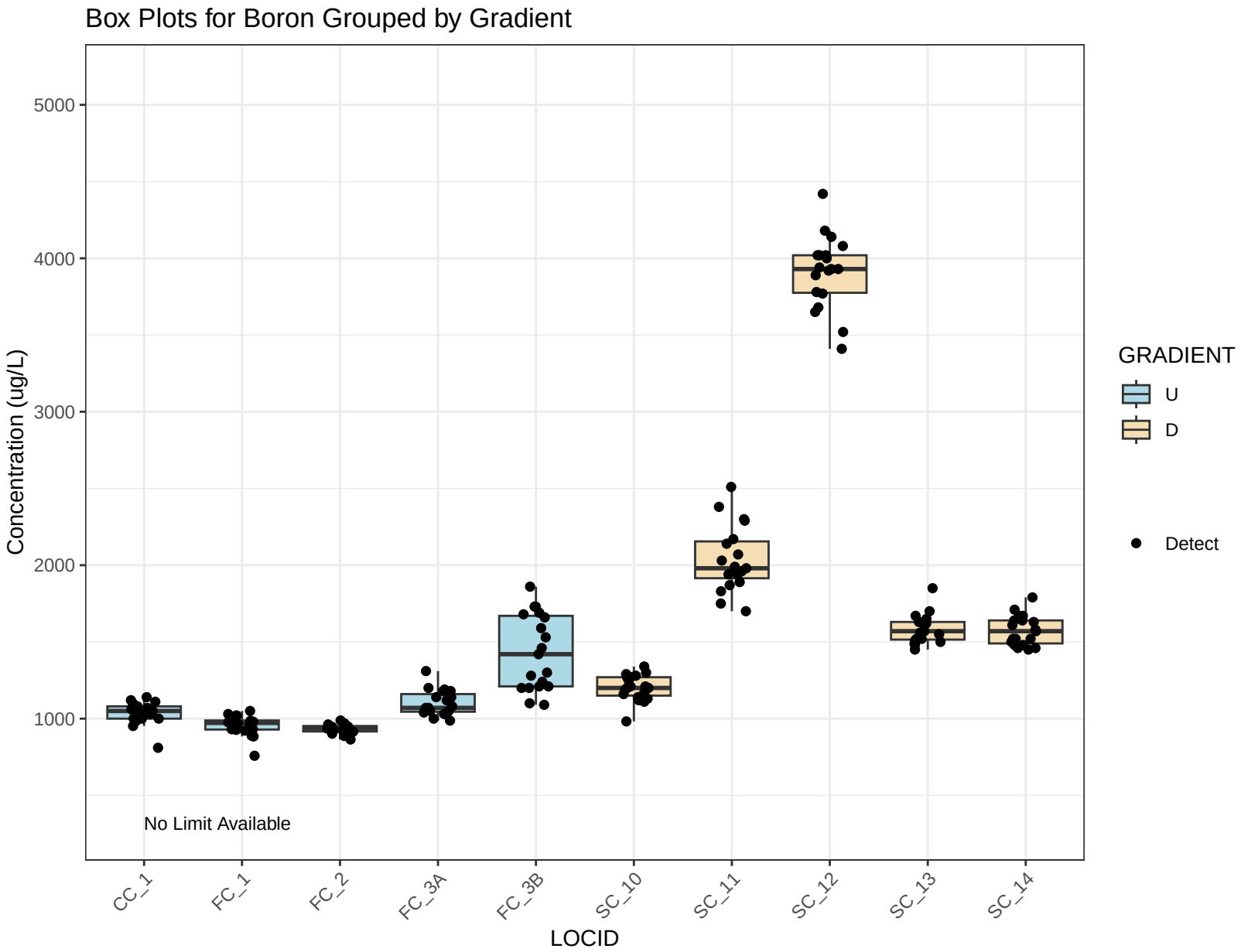
Box Plots

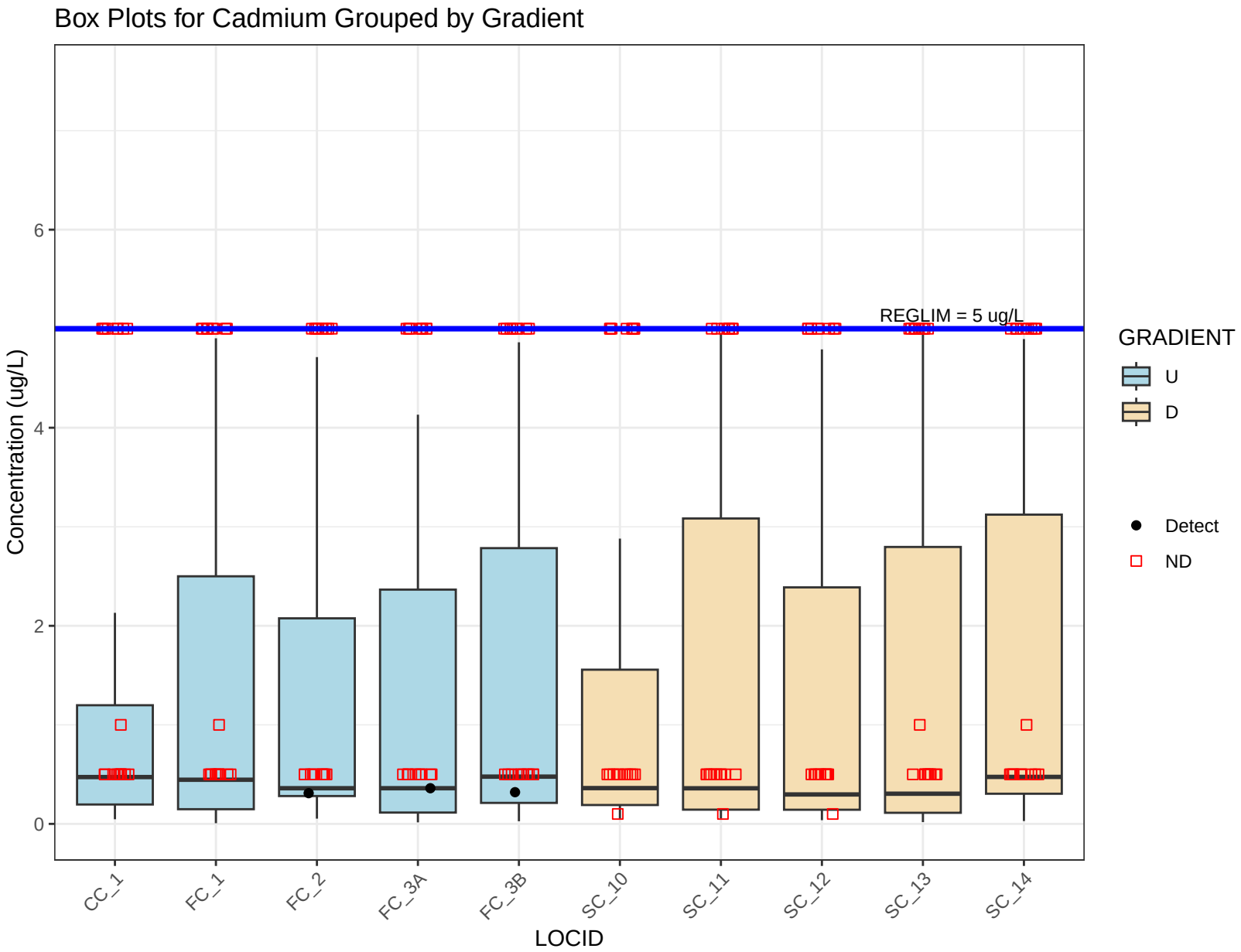

Box Plots for Antimony Grouped by Gradient
Concentration (ug/L)
12.5
10.0
7.5
5.0
2.5
0.0
REGLIM = 6 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

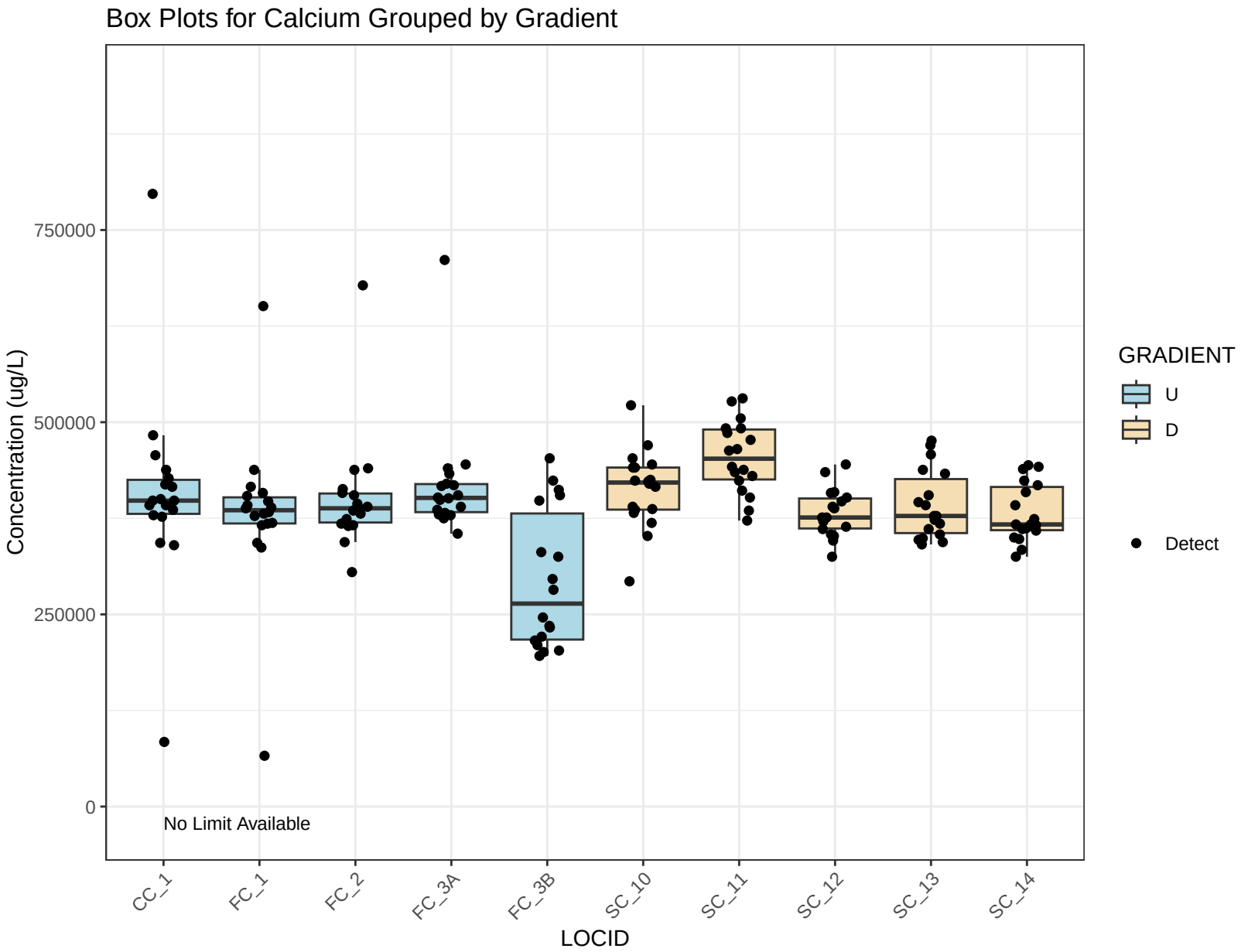

Box Plots for Arsenic Grouped by Gradient
Concentration (ug/L)
20
10
0
REGLIM = 10 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

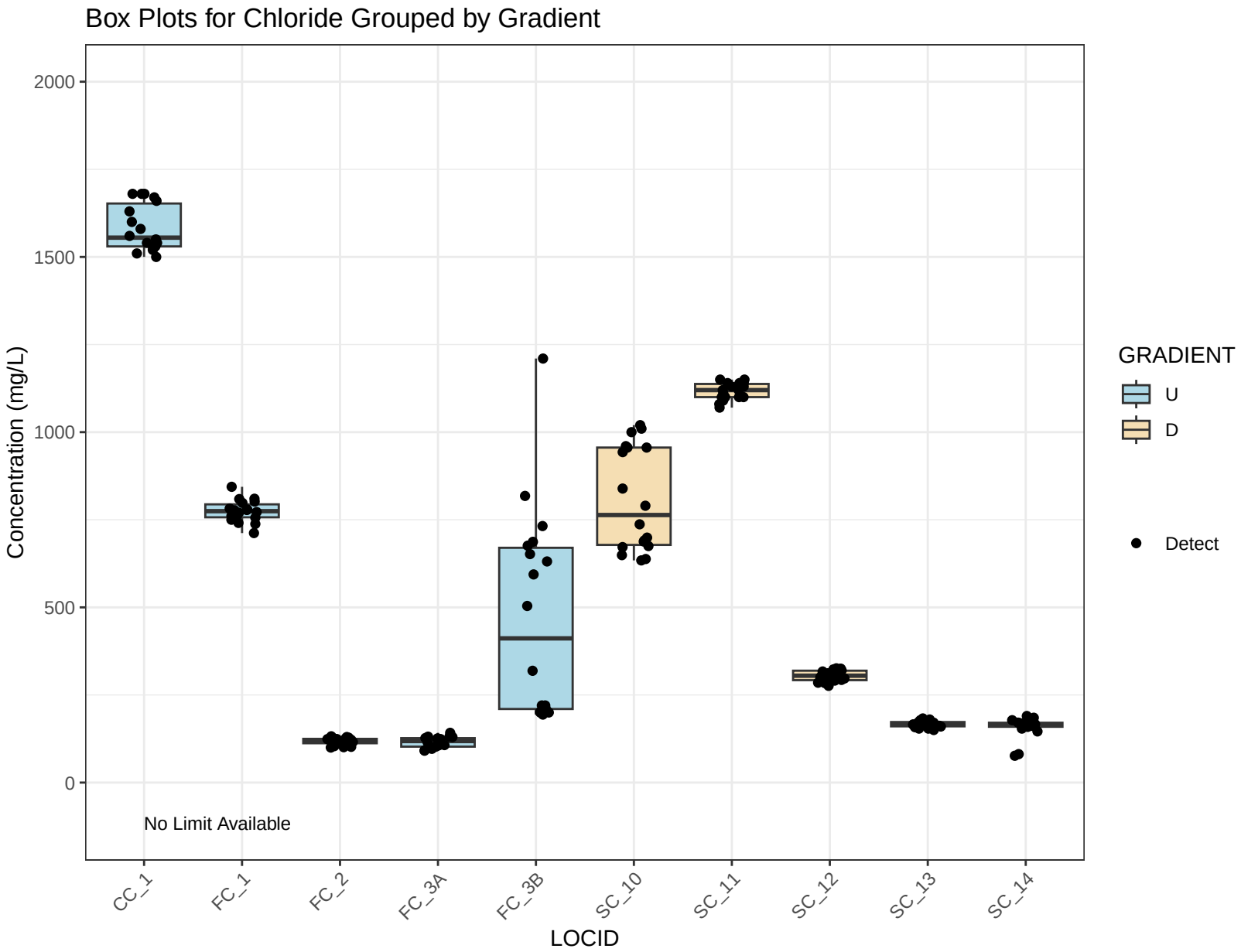

Box Plots for Barium Grouped by Gradient
Concentration (ug/L)
2500
2000
1500
1000
500
0
REGLIM = 2000 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

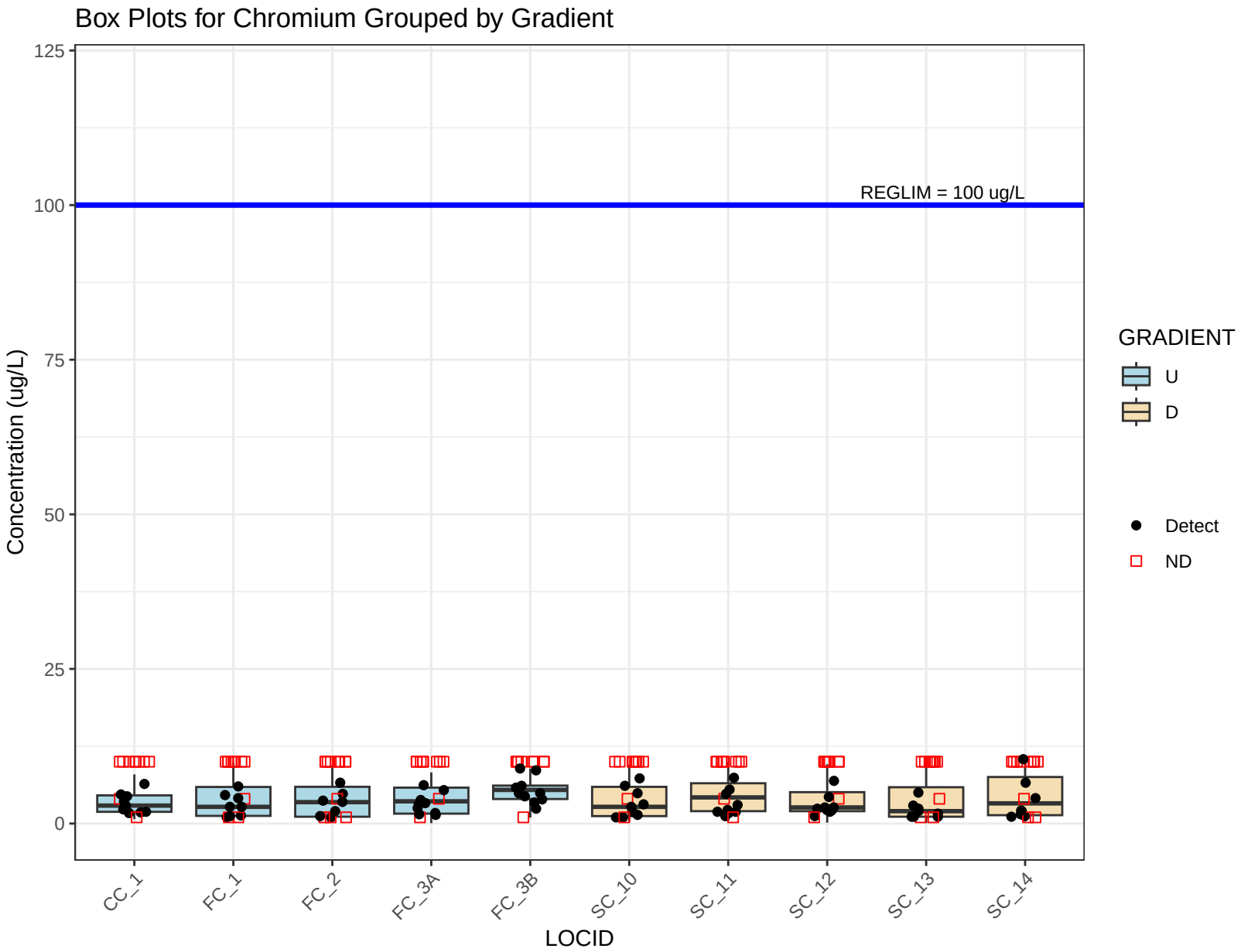

Box Plots for Beryllium Grouped by Gradient
Concentration (ug/L)
6
4
2
0
REGLIM = 4 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

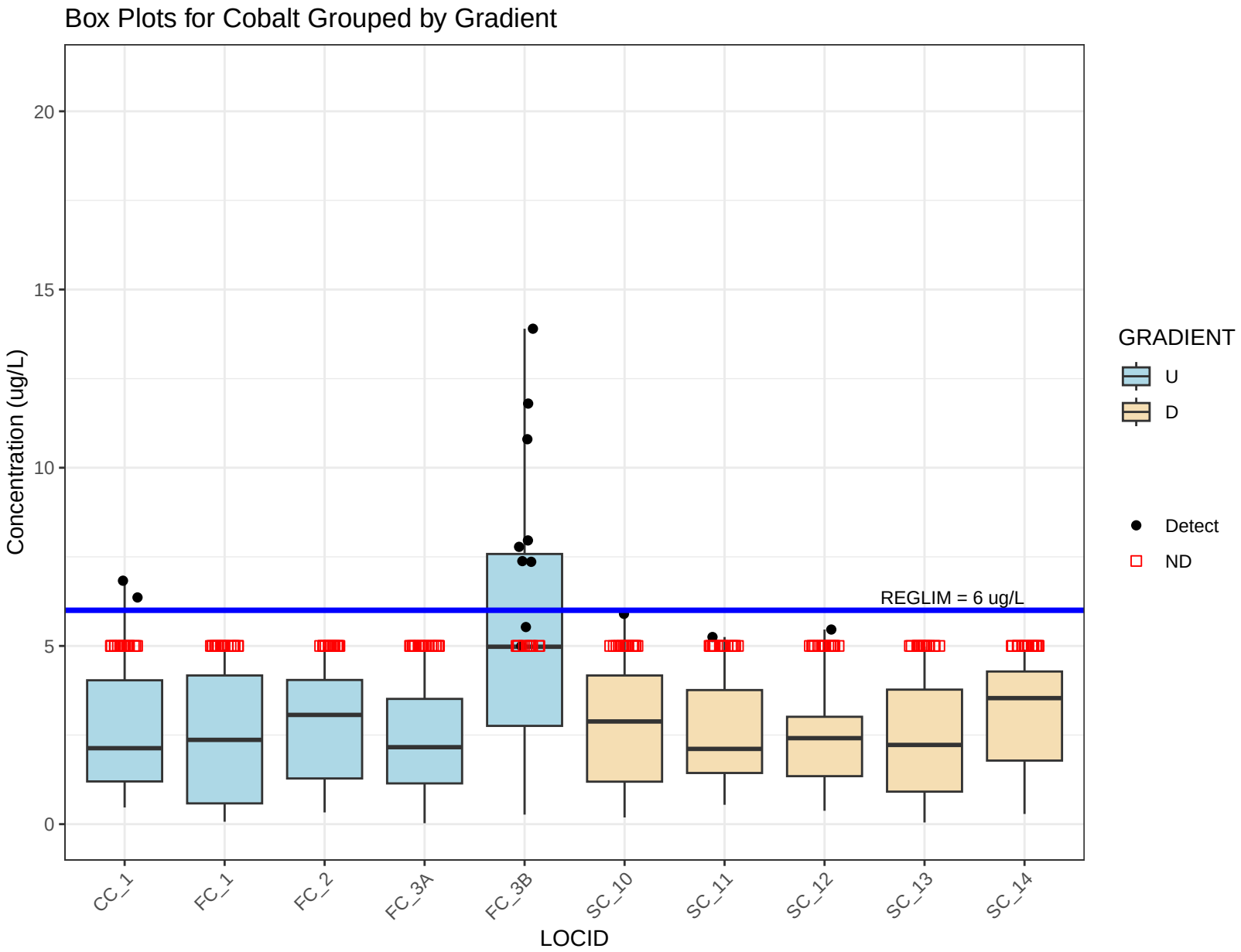

Box Plots for Boron Grouped by Gradient
Concentration (ug/L)
5000
4000
3000
2000
1000
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

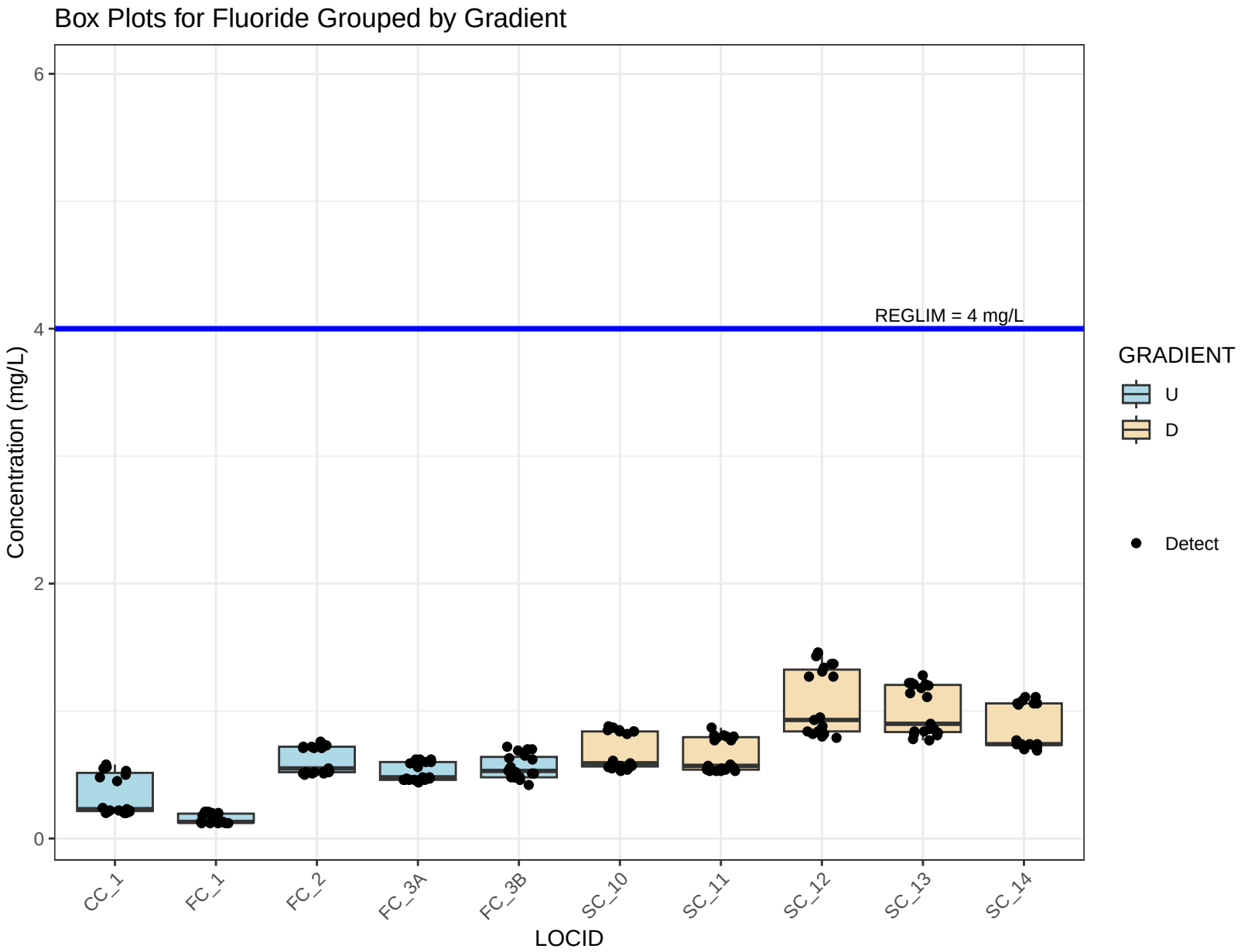

Box Plots for Cadmium Grouped by Gradient
Concentration (ug/L)
0
2
4
6
REGLIM = 5 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

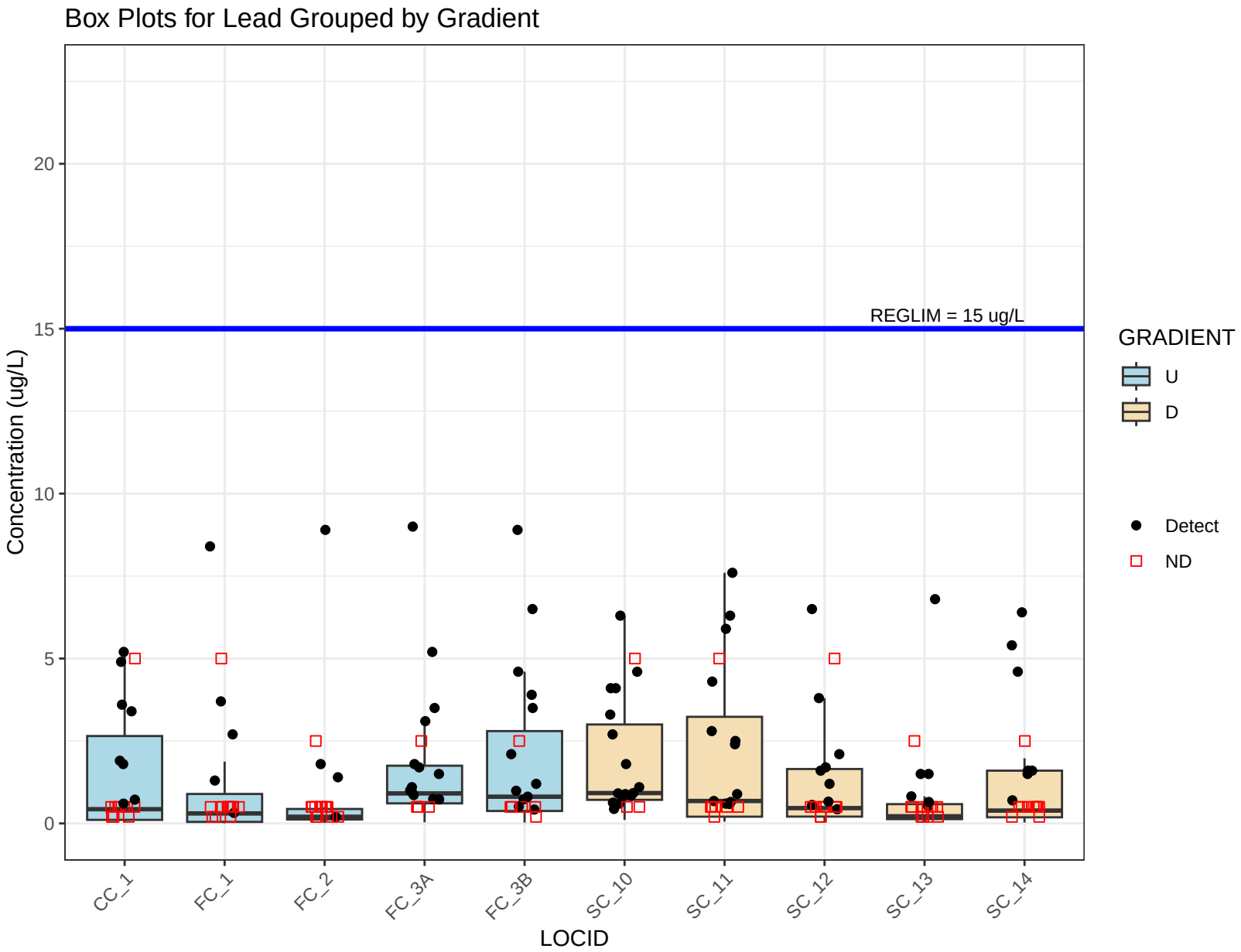

Box Plots for Calcium Grouped by Gradient
Concentration (ug/L)
750000
500000
250000
0
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

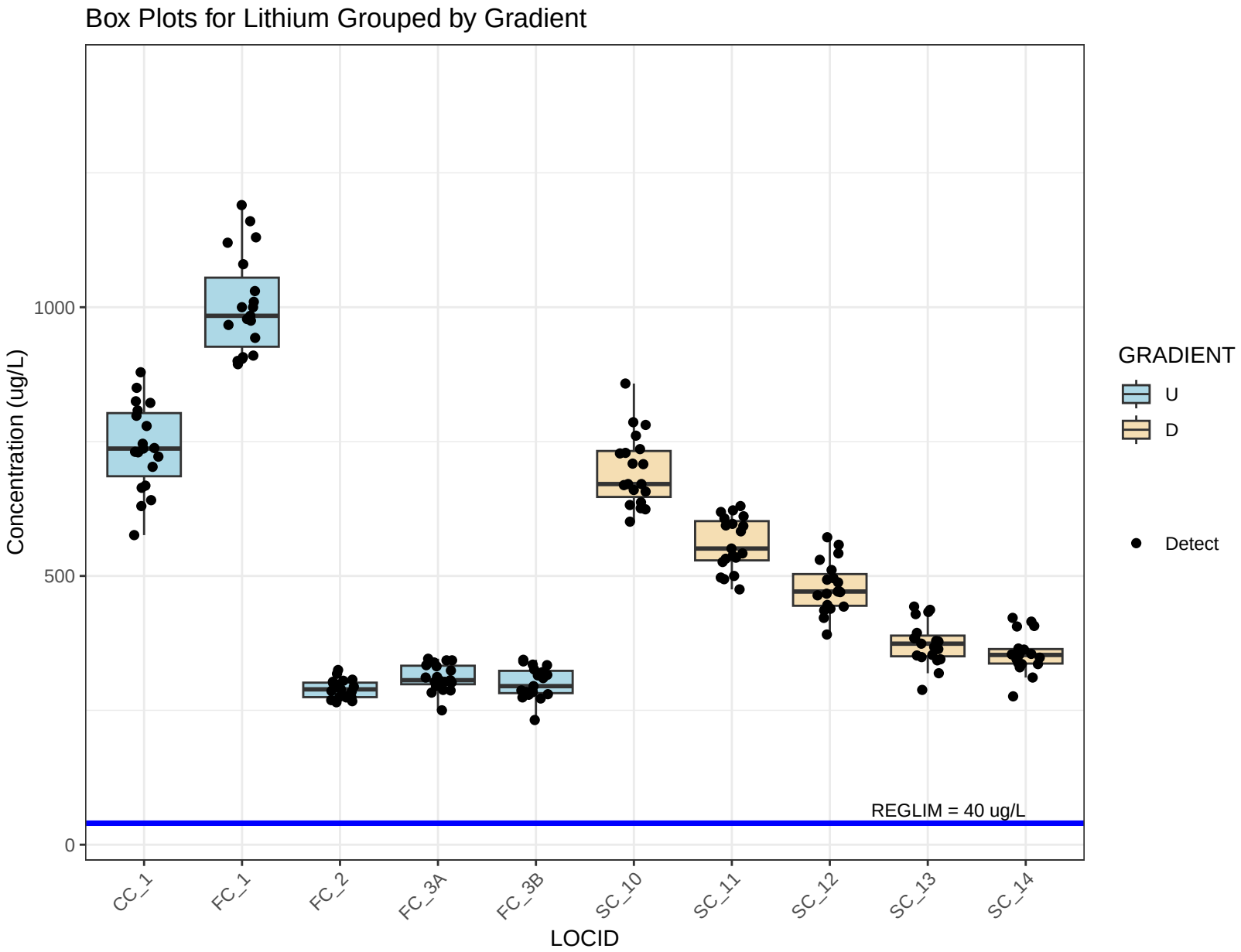

Box Plots for Chloride Grouped by Gradient
Concentration (mg/L)
2000
1500
1000
500
0
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

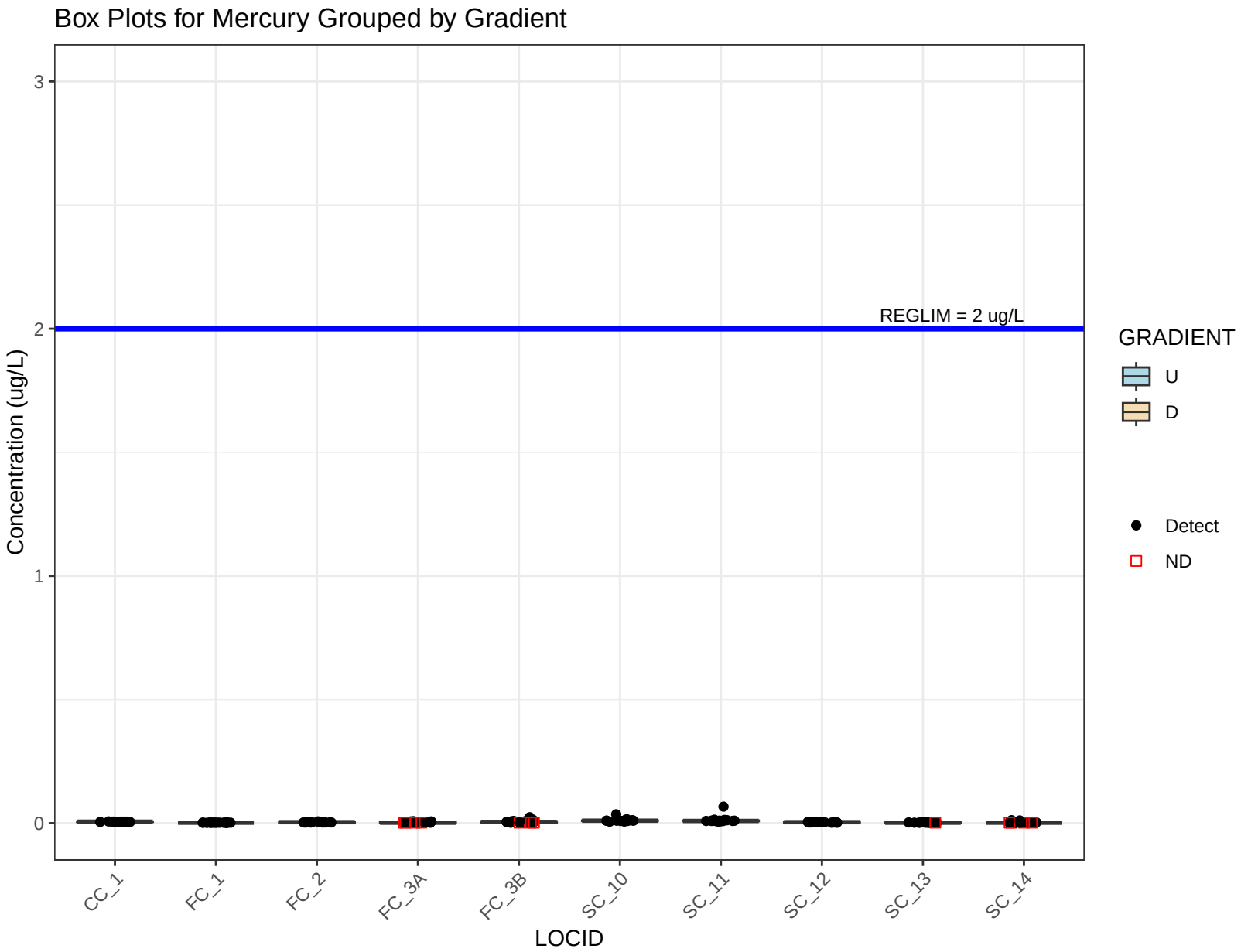

Box Plots for Chromium Grouped by Gradient
125
100
75
50
25
0
Concentration (ug/L)
REGLIM = 100 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

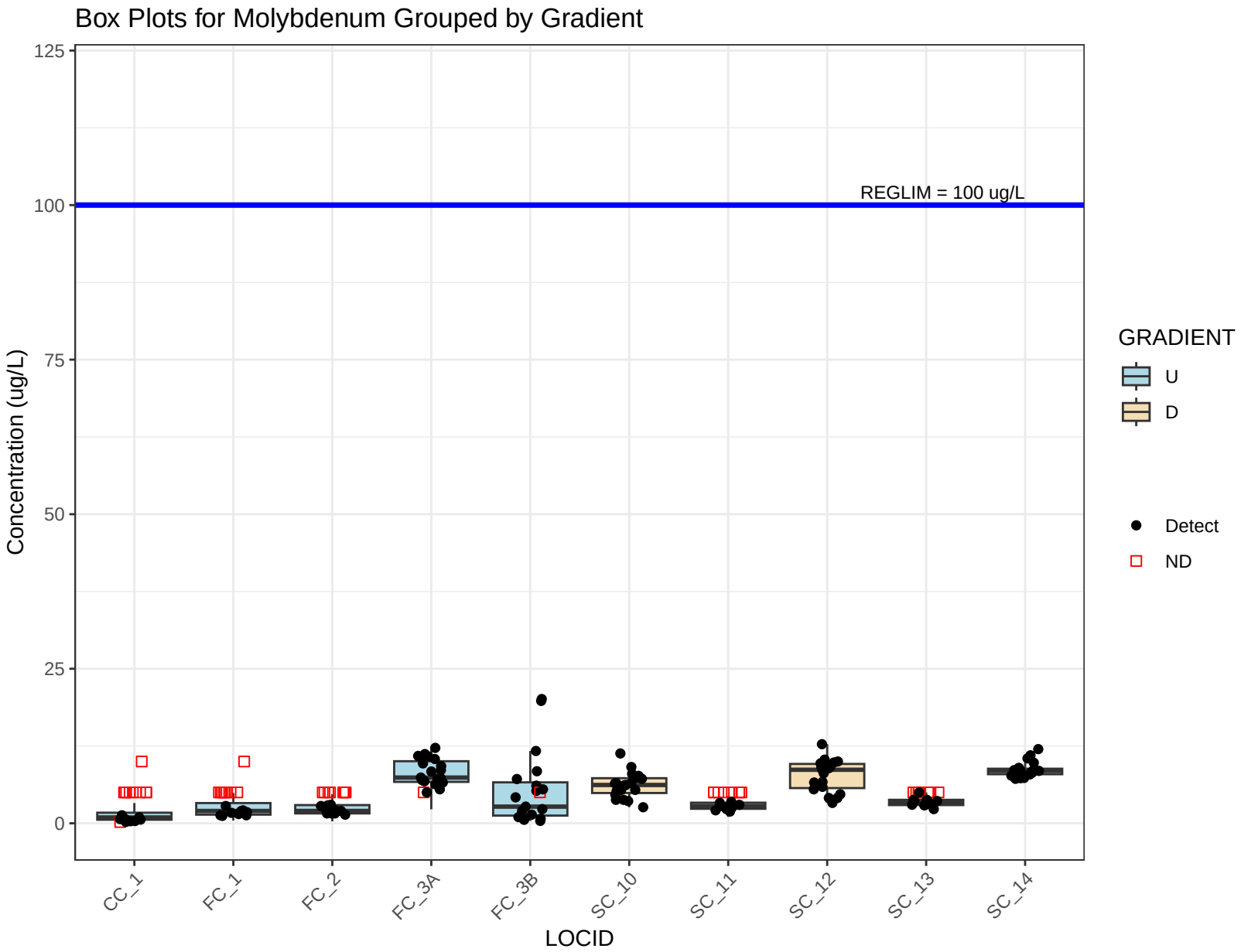

Box Plots for Cobalt Grouped by Gradient
Concentration (ug/L)
20
15
10
5
0
REGLIM = 6 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

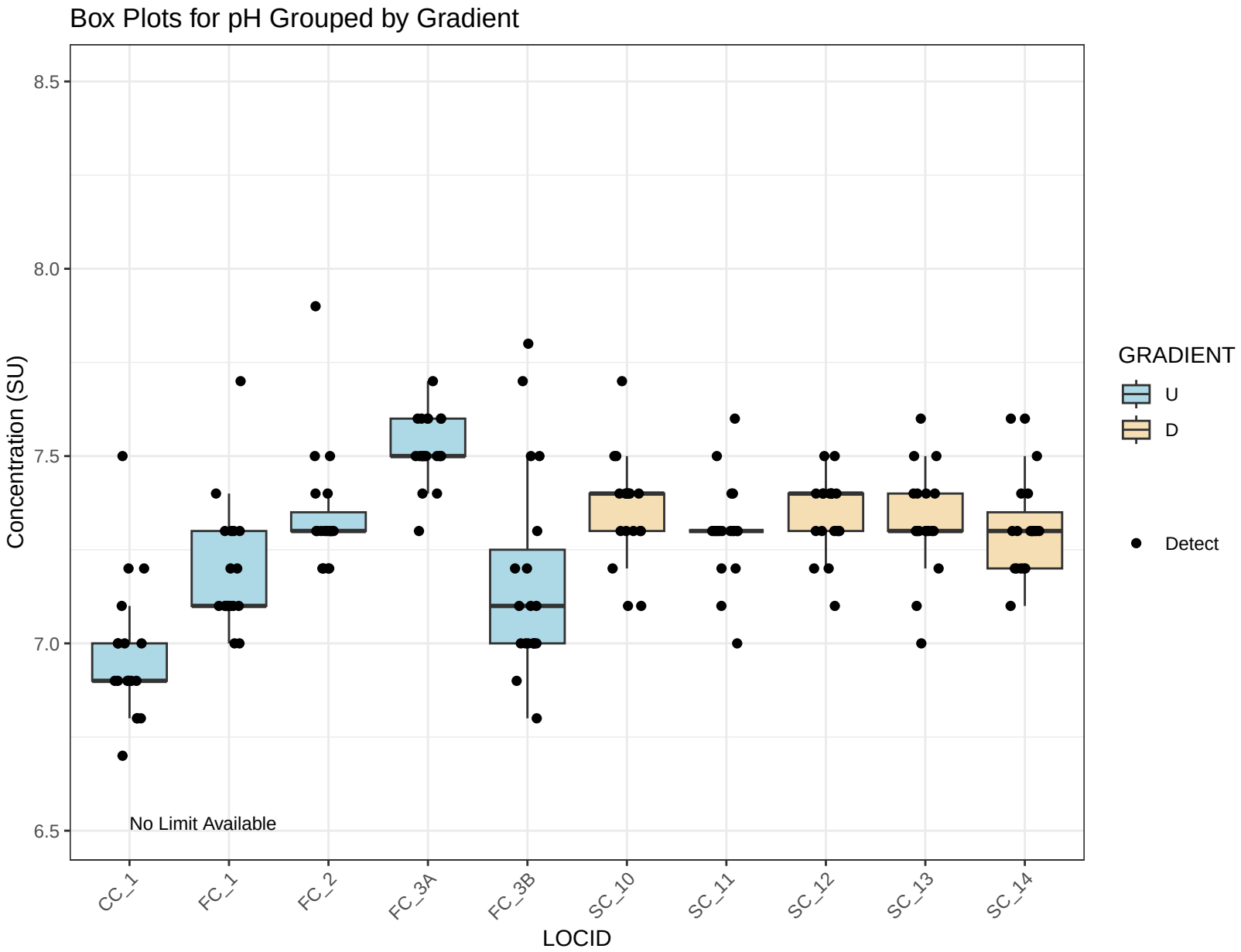

Box Plots for Fluoride Grouped by Gradient
Concentration (mg/L)
6
4
2
0
REGLIM = 4 mg/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

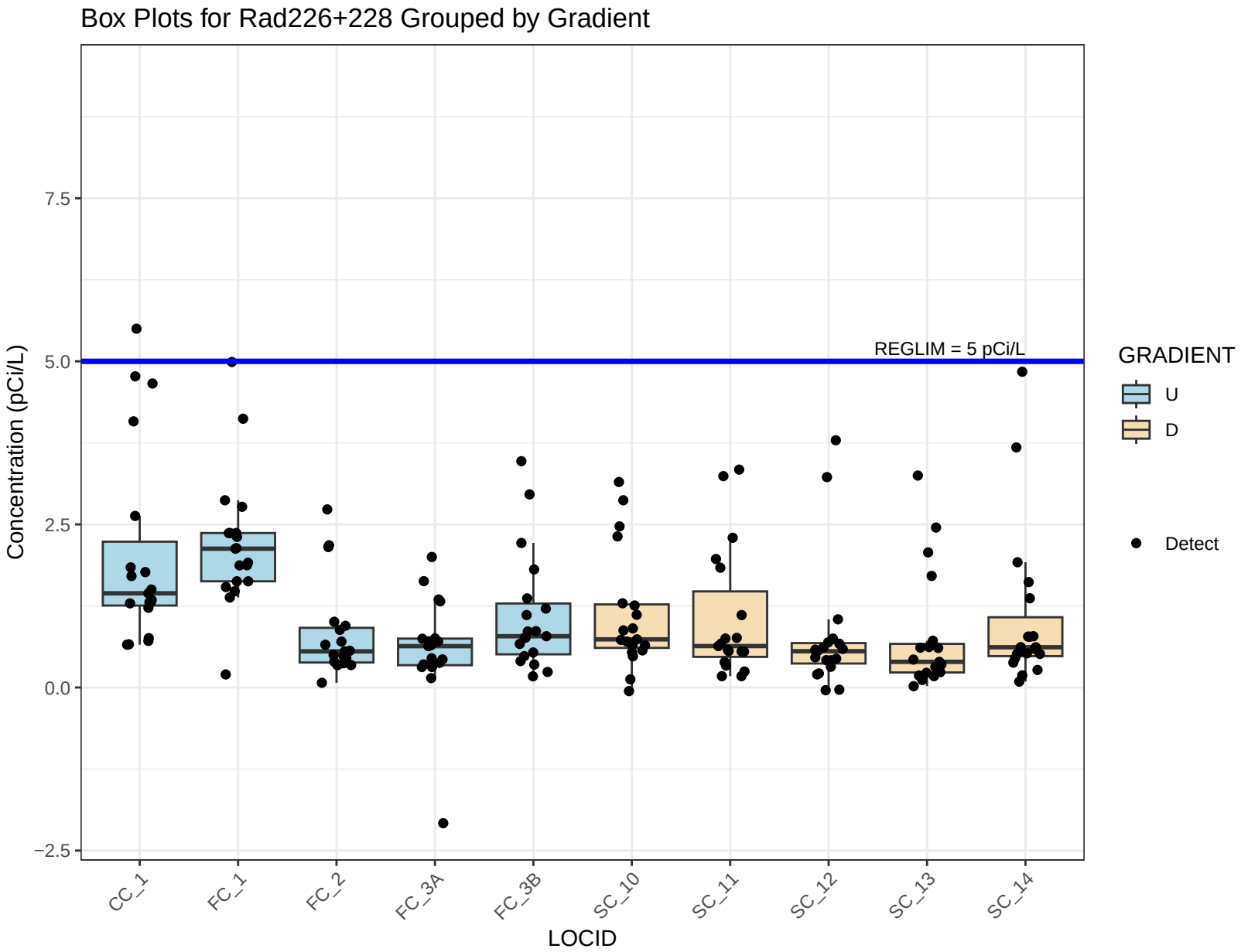

Box Plots for Lead Grouped by Gradient
Concentration (ug/L)
20
15
10
5
0
REGLIM = 15 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

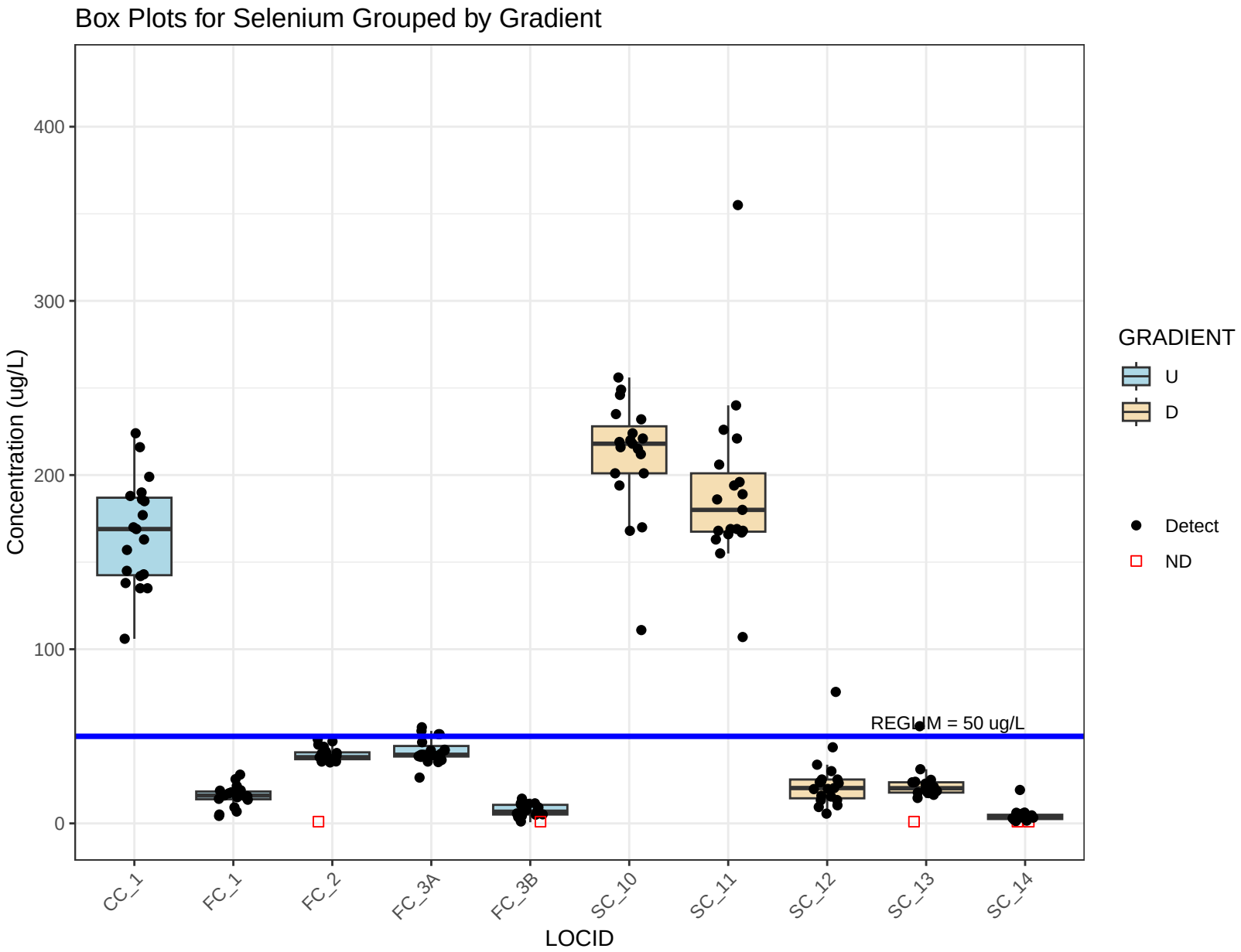

Box Plots for Lithium Grouped by Gradient
Concentration (ug/L)
1000
500
0
REGLIM = 40 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

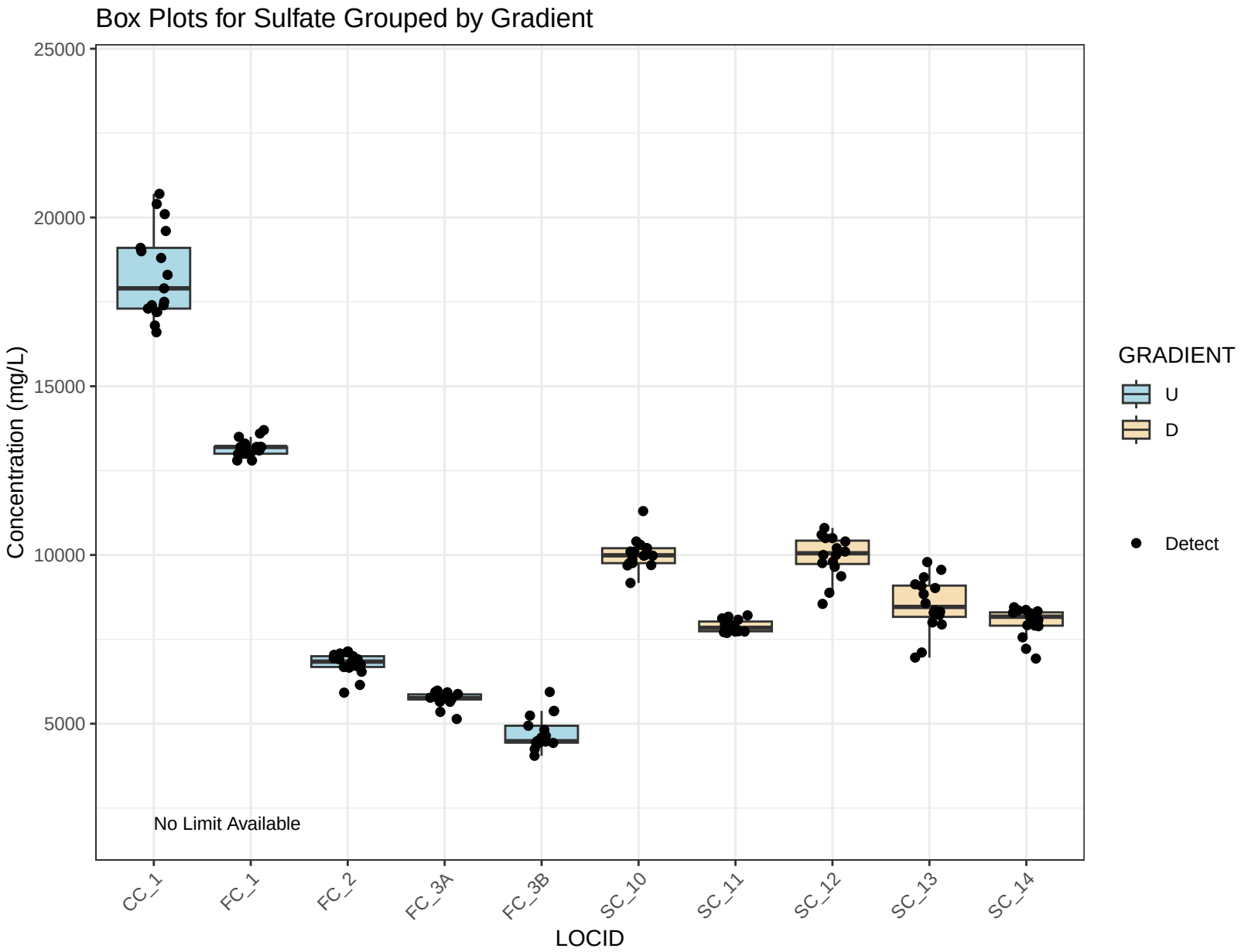

Box Plots for Mercury Grouped by Gradient
Concentration (ug/L)
3
2
1
0
REGLIM = 2 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

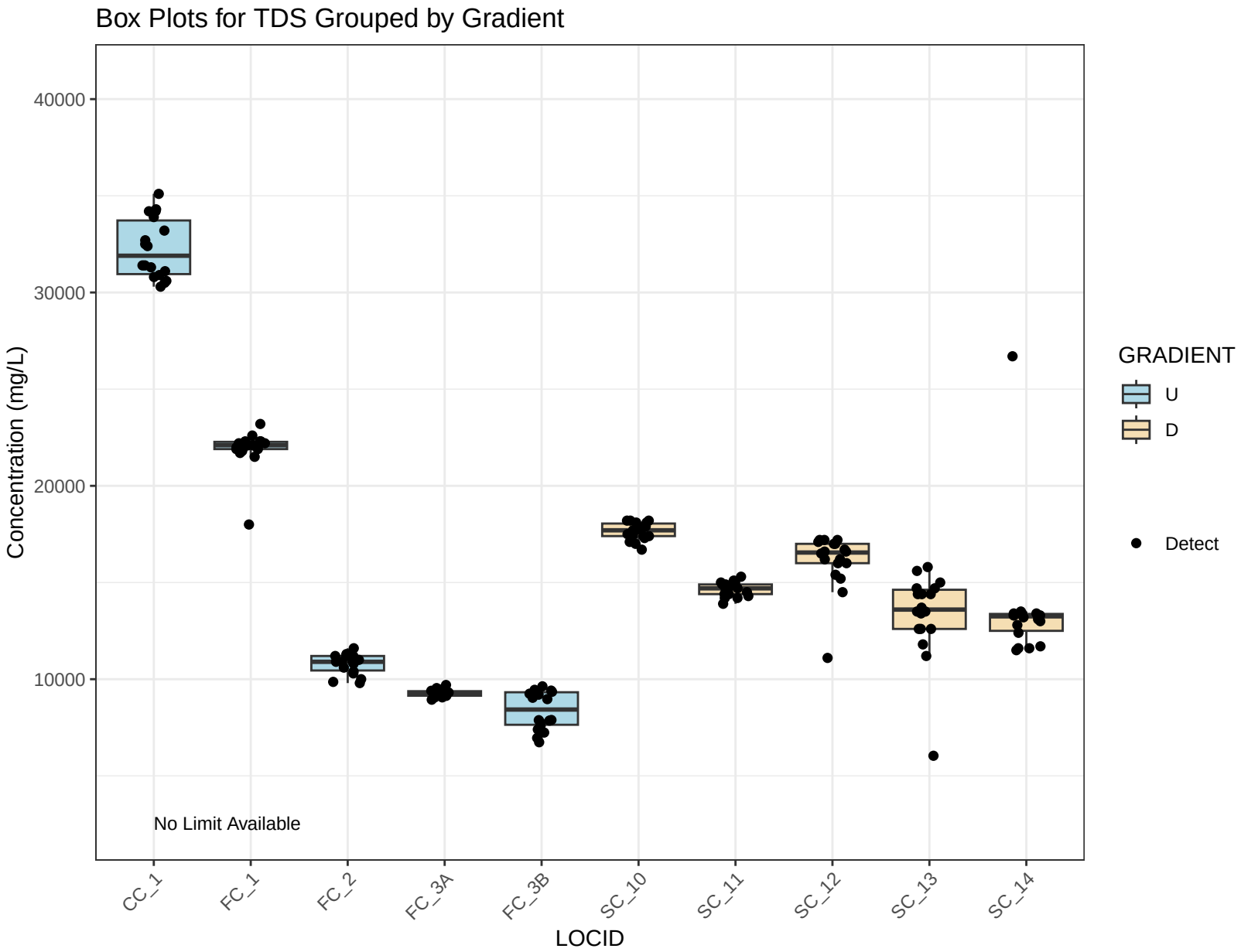

Box Plots for Molybdenum Grouped by Gradient
125
100
75
50
25
0
Concentration (ug/L)
REGLIM = 100 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

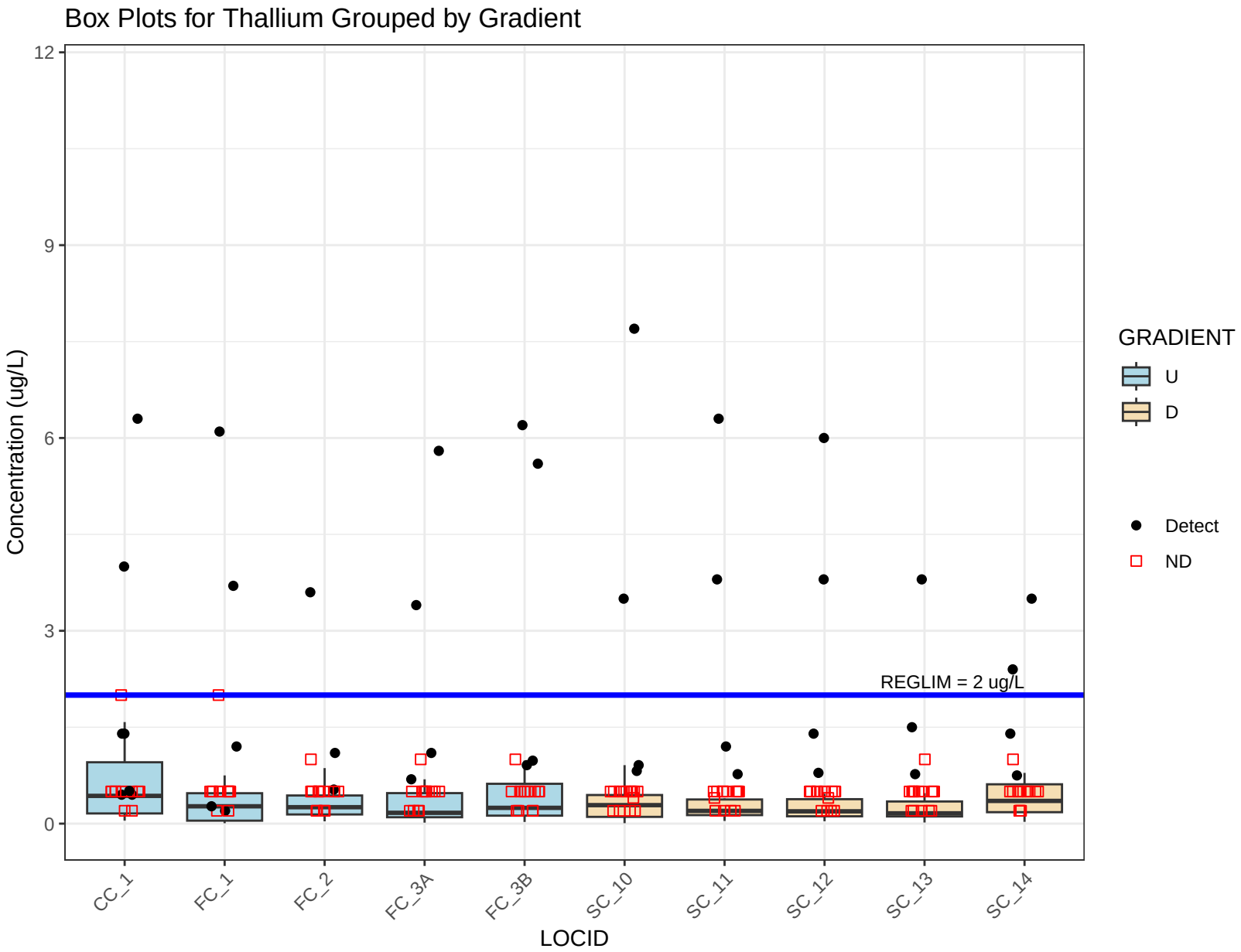

Box Plots for pH Grouped by Gradient
Concentration (SU)
8.5
8.0
7.5
7.0
6.5
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect


Box Plots for Rad226+228 Grouped by Gradient
Concentration (pCi/L)
7.5
5.0
2.5
0.0
−2.5
REGLIM = 5 pCi/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect


Box Plots for Selenium Grouped by Gradient
Concentration (ug/L)
400
300
200
100
0
REGLIM = 50 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND


Box Plots for Sulfate Grouped by Gradient
Concentration (mg/L)
25000
20000
15000
10000
5000
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

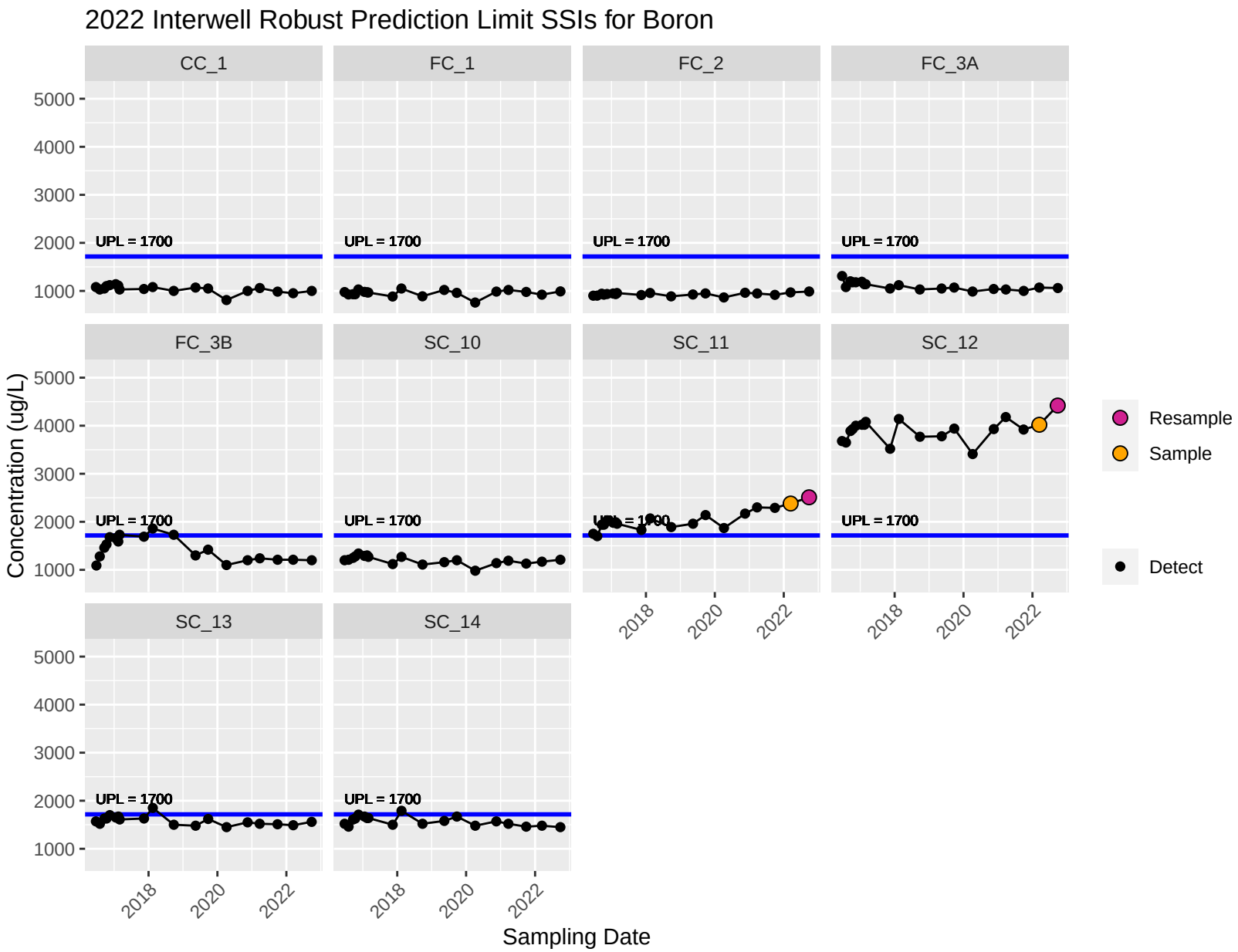

Box Plots for TDS Grouped by Gradient
Concentration (mg/L)
40000
30000
20000
10000
No Limit Available
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect

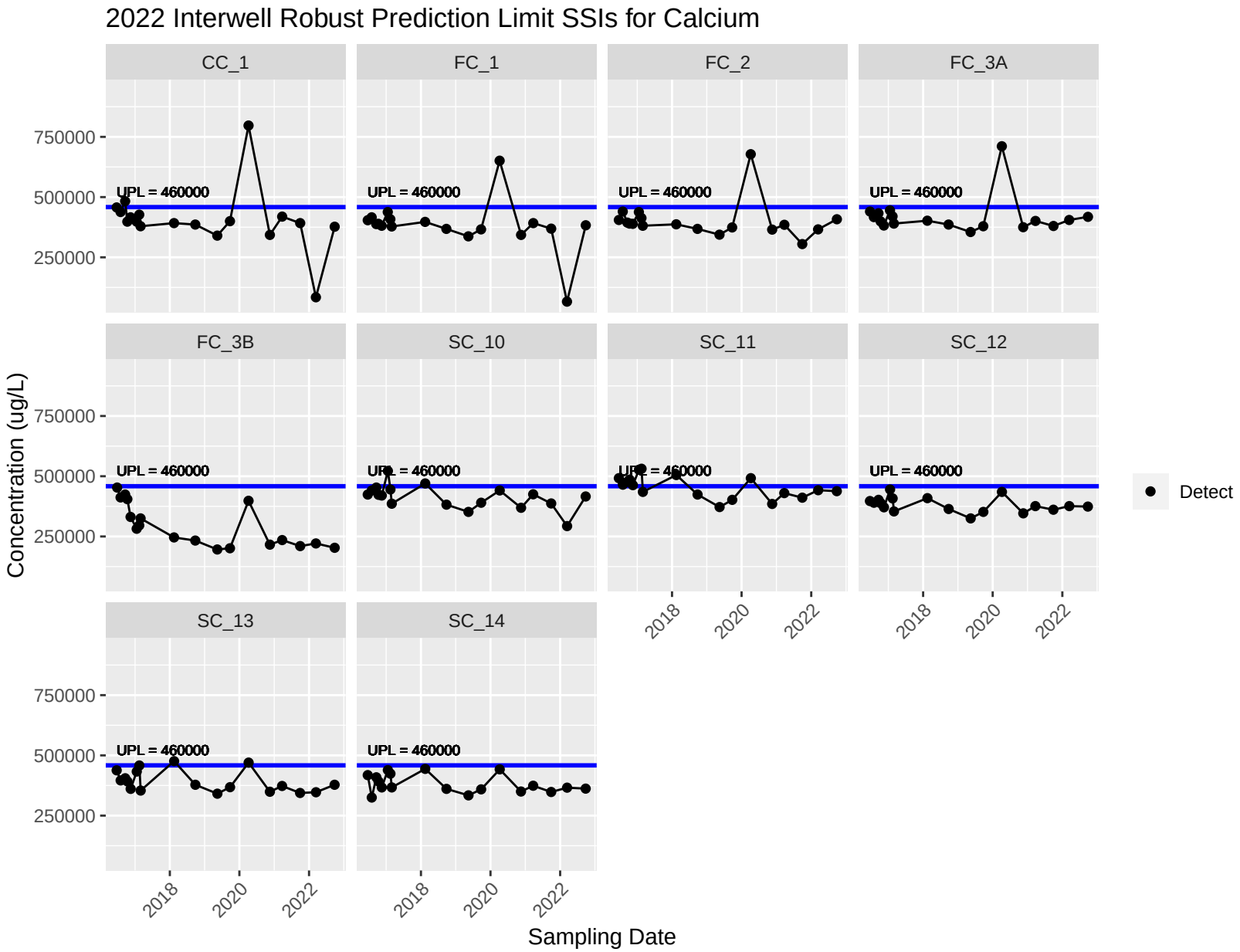

Box Plots for Thallium Grouped by Gradient
Concentration (ug/L)
12
9
6
3
0
REGLIM = 2 ug/L
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
LOCID
GRADIENT
U
D
Detect
ND

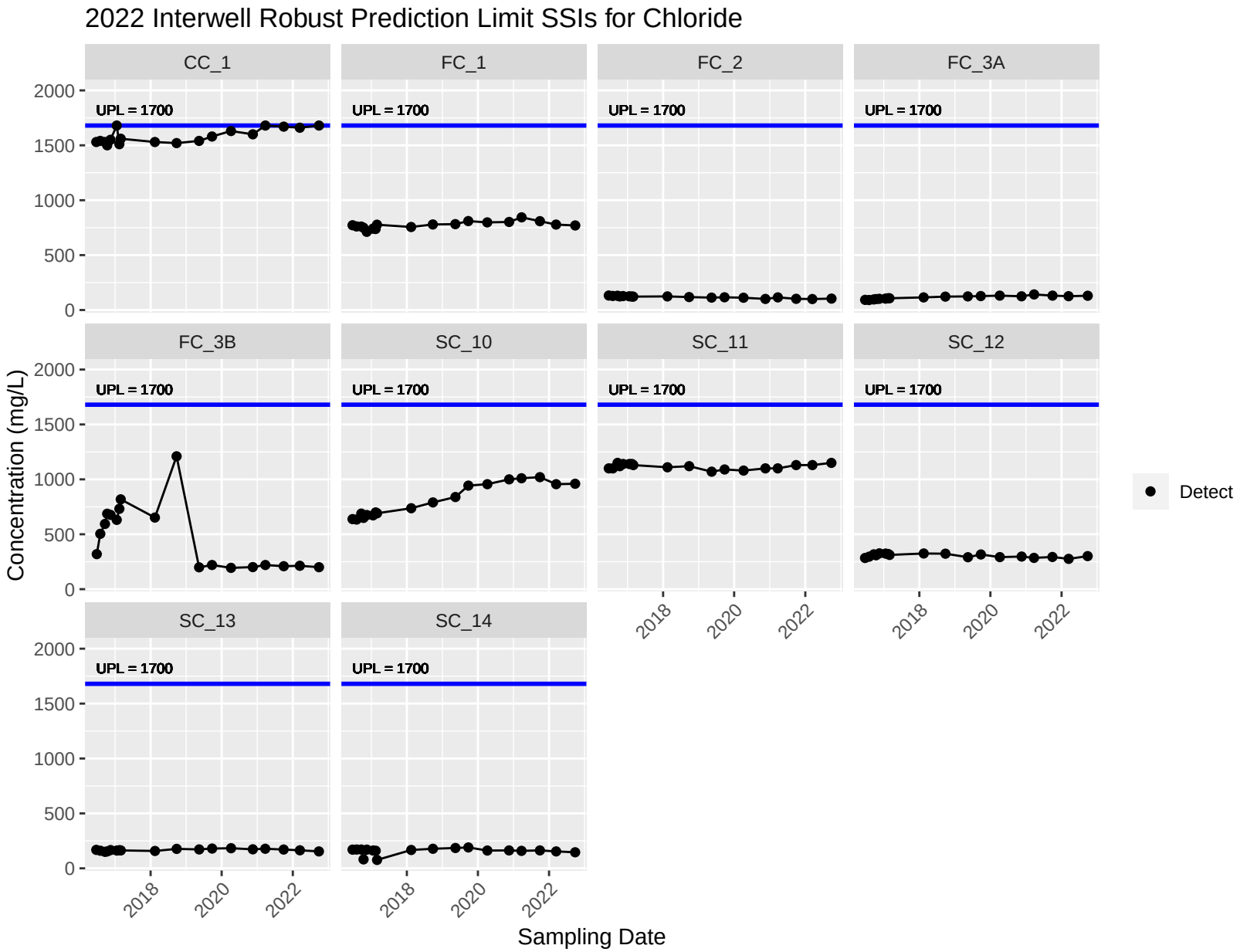
Appendix B: Supporting Graphics

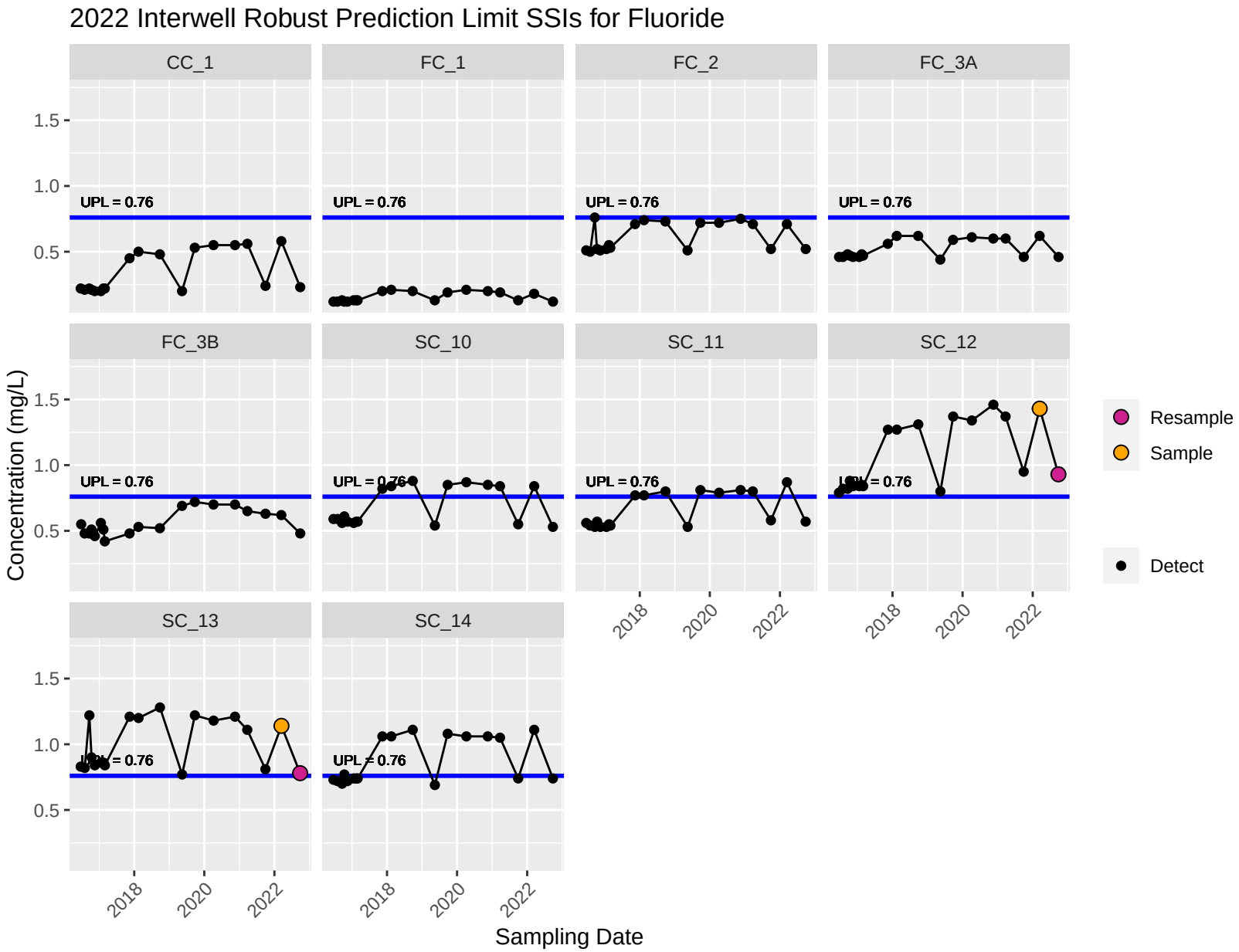
1. Appendix III Prediction Limit Outcome Plots
2. Confidence Interval Band Plots for Appendix IV Parameters

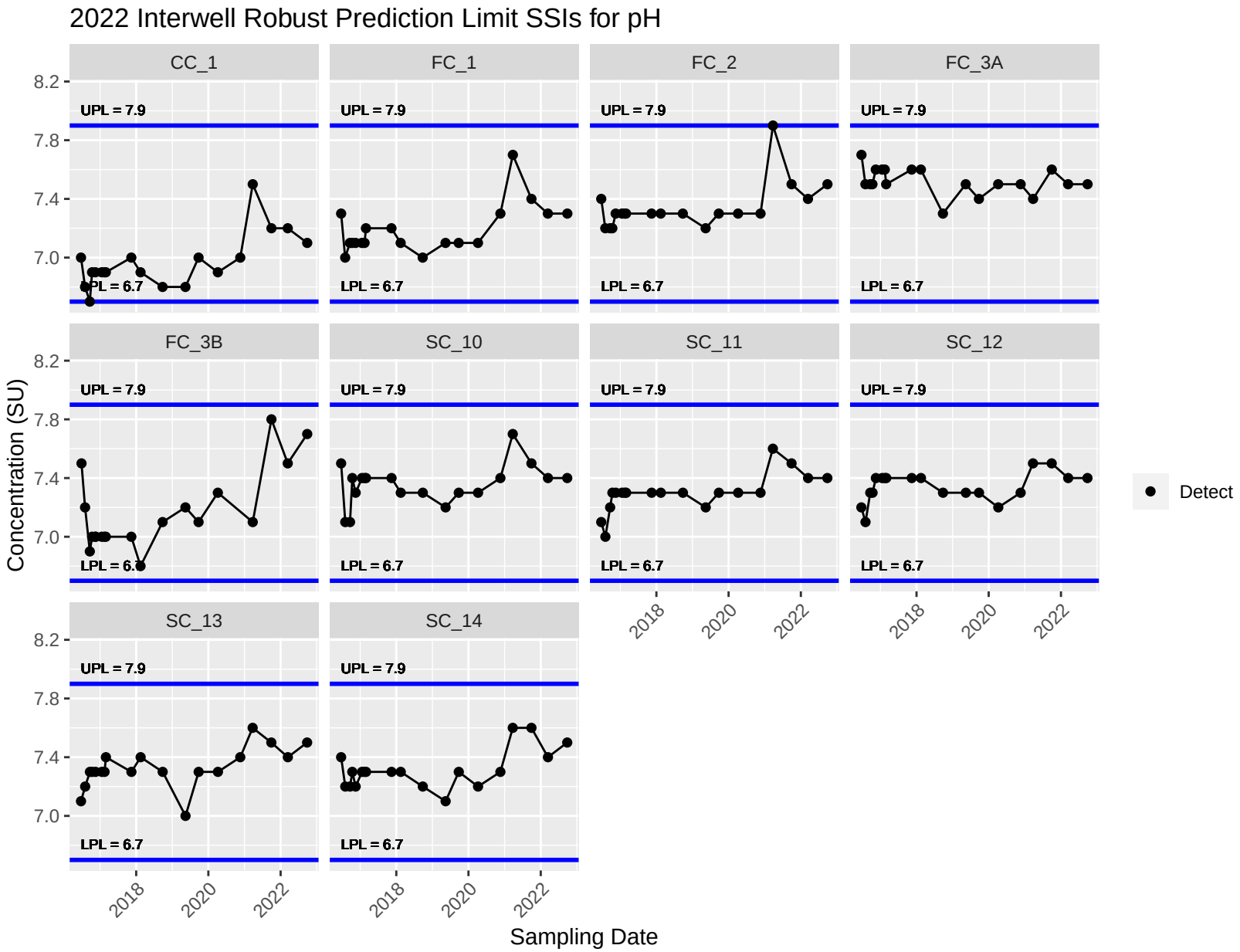
Prediction Limit Outcome Plots, Appendix III Parameters

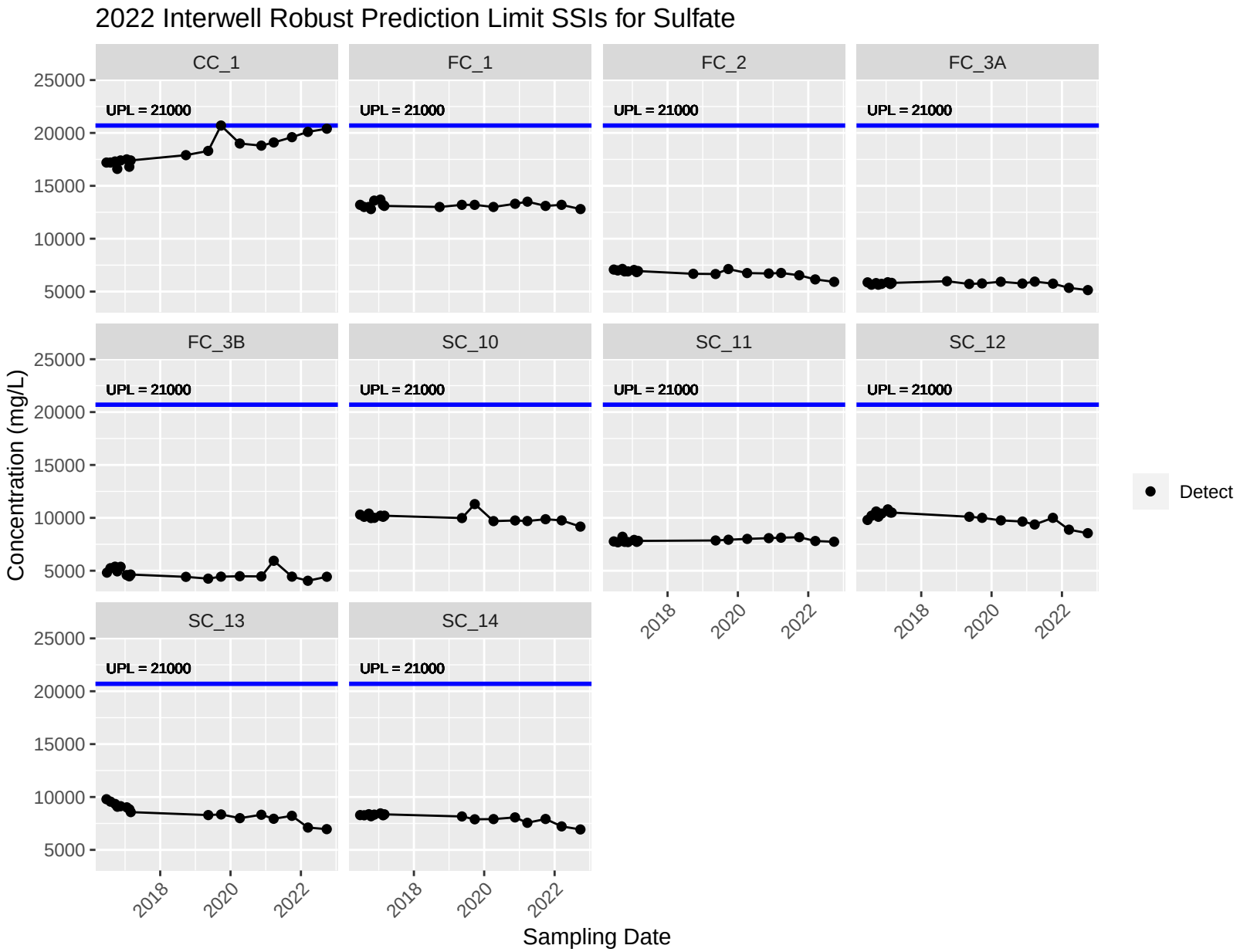


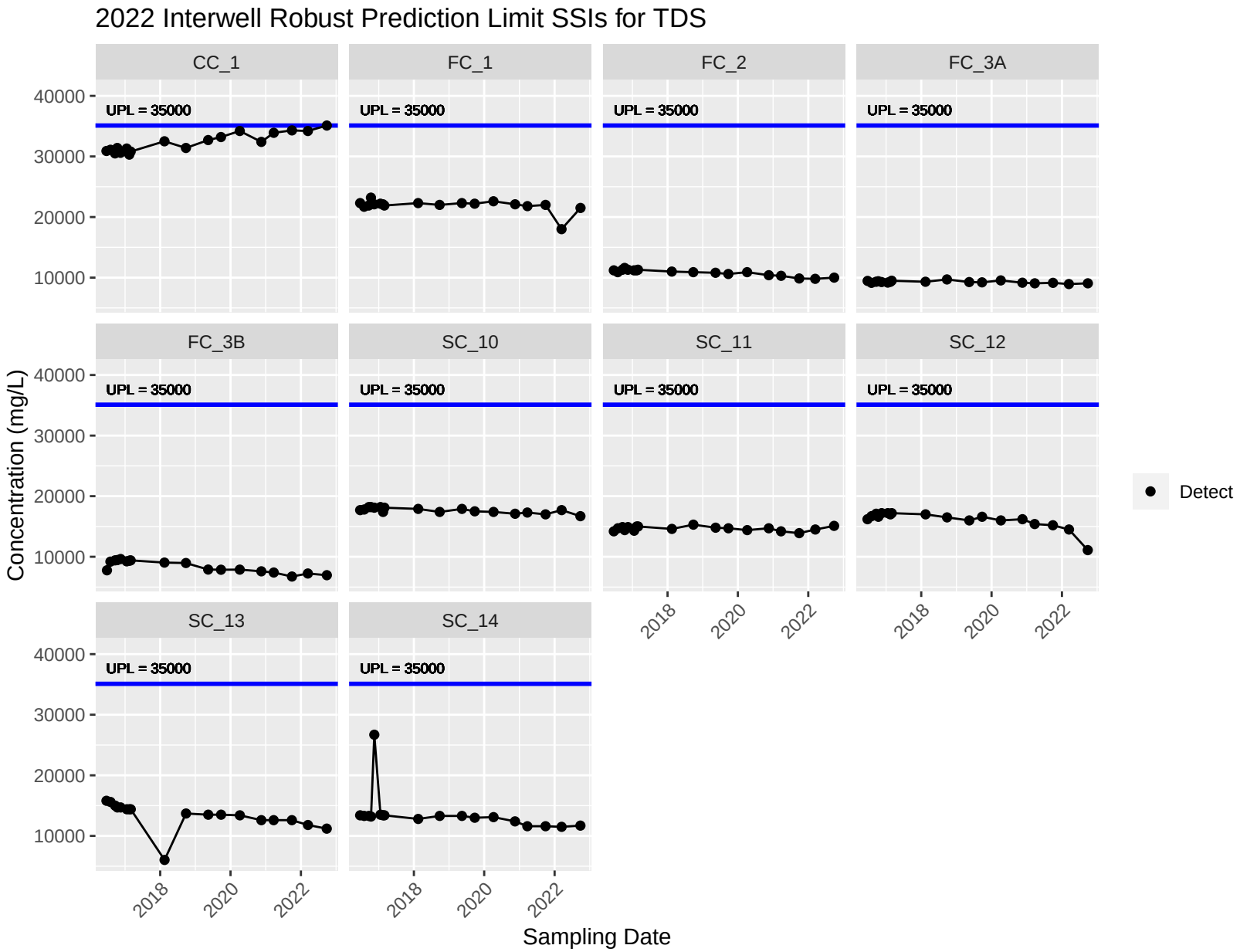

2022 Interwell Robust Prediction Limit SSIs for Calcium
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 460000
750000
500000
250000
2018
2020
2022
Concentration (ug/L)
Sampling Date
Detect


2022 Interwell Robust Prediction Limit SSIs for Chloride
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 1700
Concentration (mg/L)
0
500
1000
1500
2000
2018
2020
2022
Sampling Date
Detect

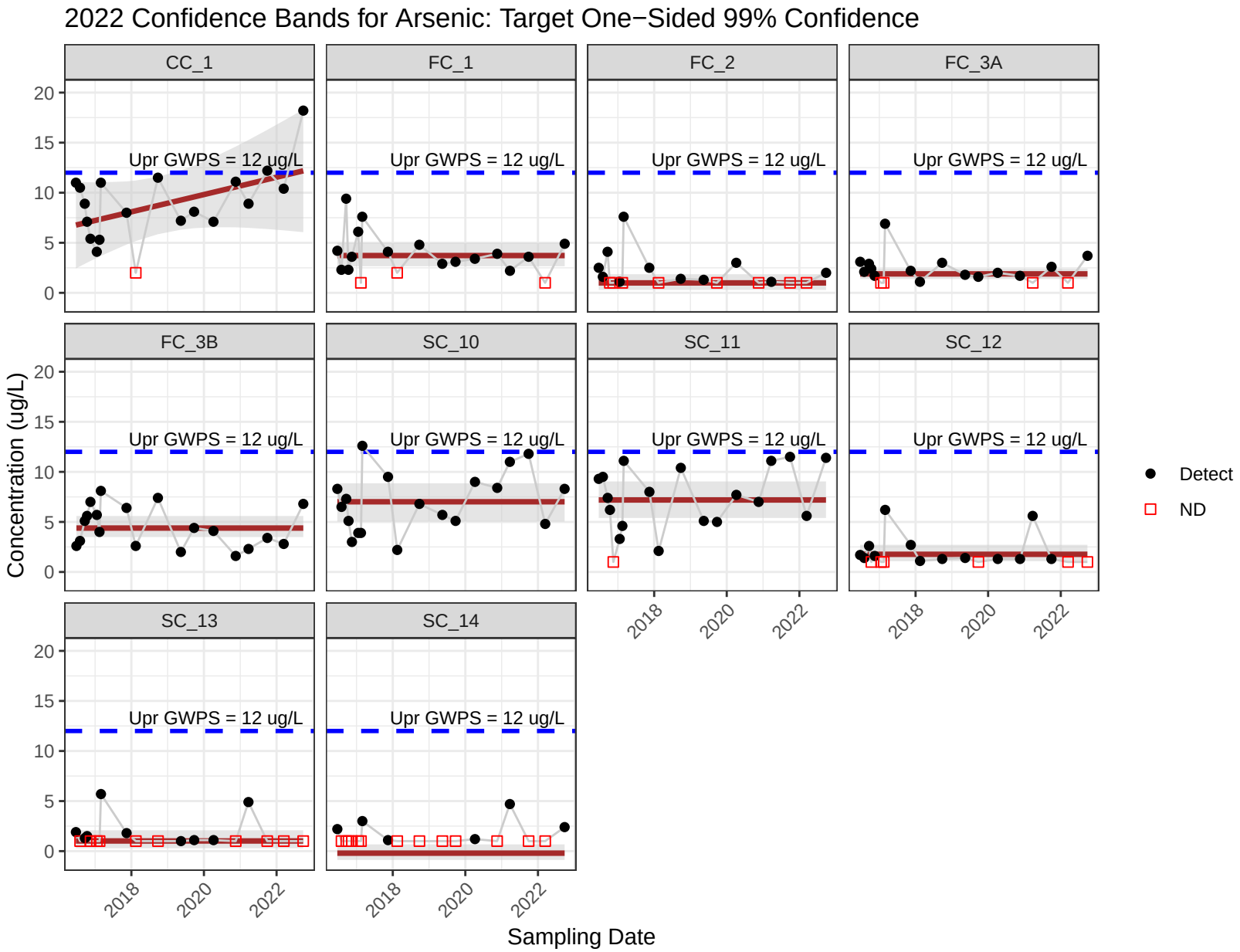

2022 Interwell Robust Prediction Limit SSIs for Fluoride
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 0.76
Concentration (mg/L)
1.5
1.0
0.5
2018
2020
2022
Sampling Date
Resample
Sample
Detect

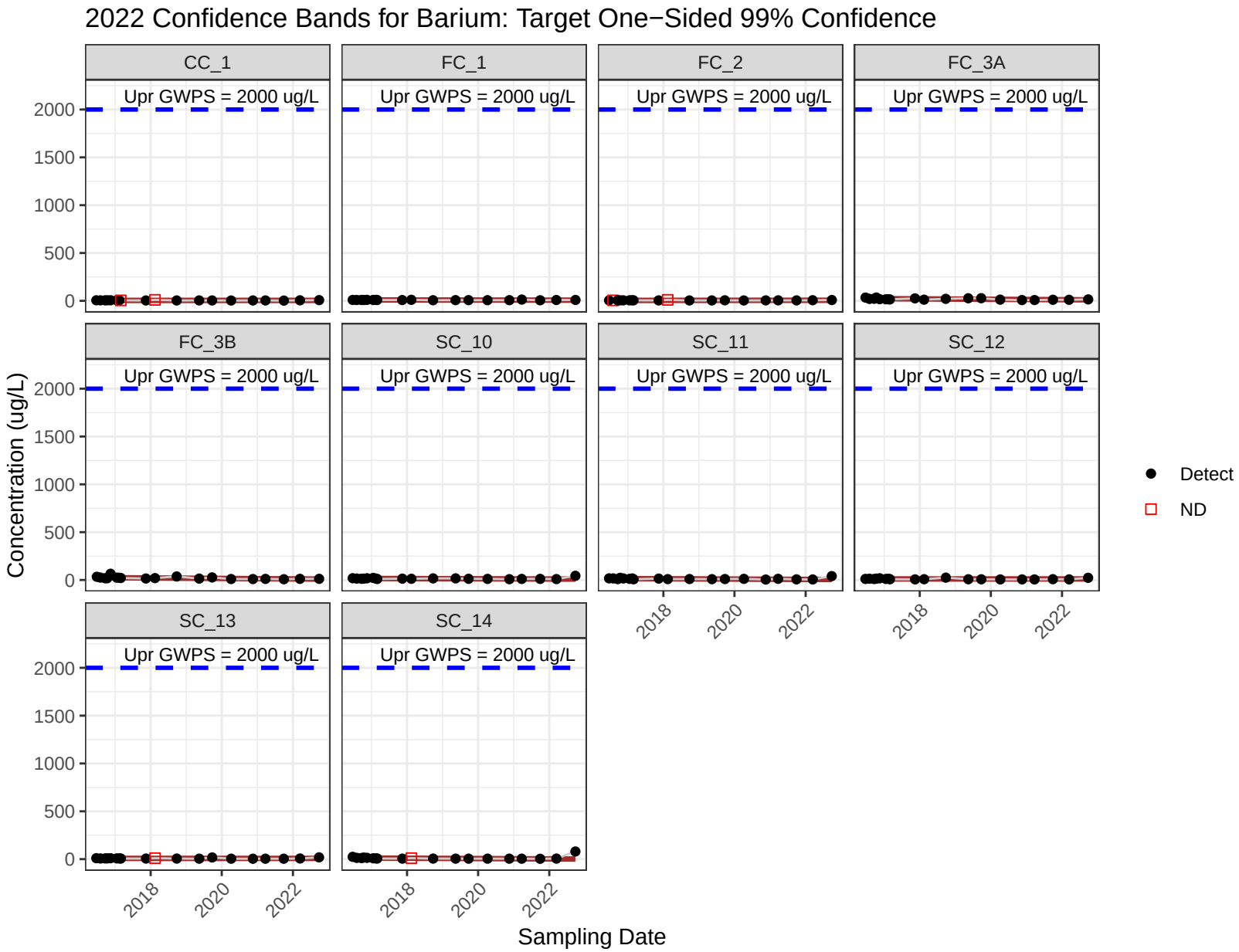

2022 Interwell Robust Prediction Limit SSIs for pH
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 7.9
LPL = 6.7
8.2
7.8
7.4
7.0
Concentration (SU)
2018
2020
2022
Sampling Date
Detect

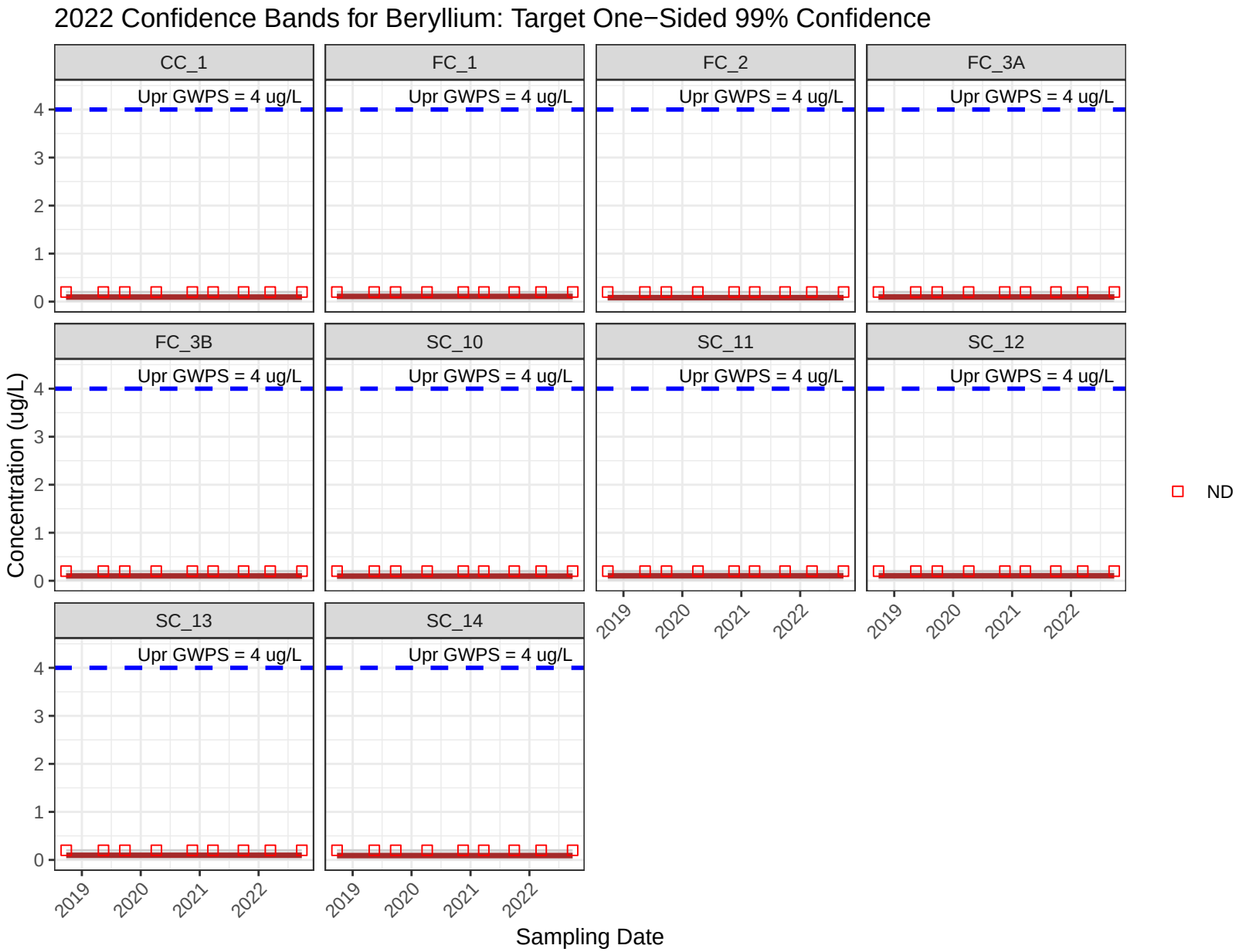

2022 Interwell Robust Prediction Limit SSIs for Sulfate
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 21000
25000
20000
15000
10000
5000
2018
2020
2022
Concentration (mg/L)
Sampling Date
Detect

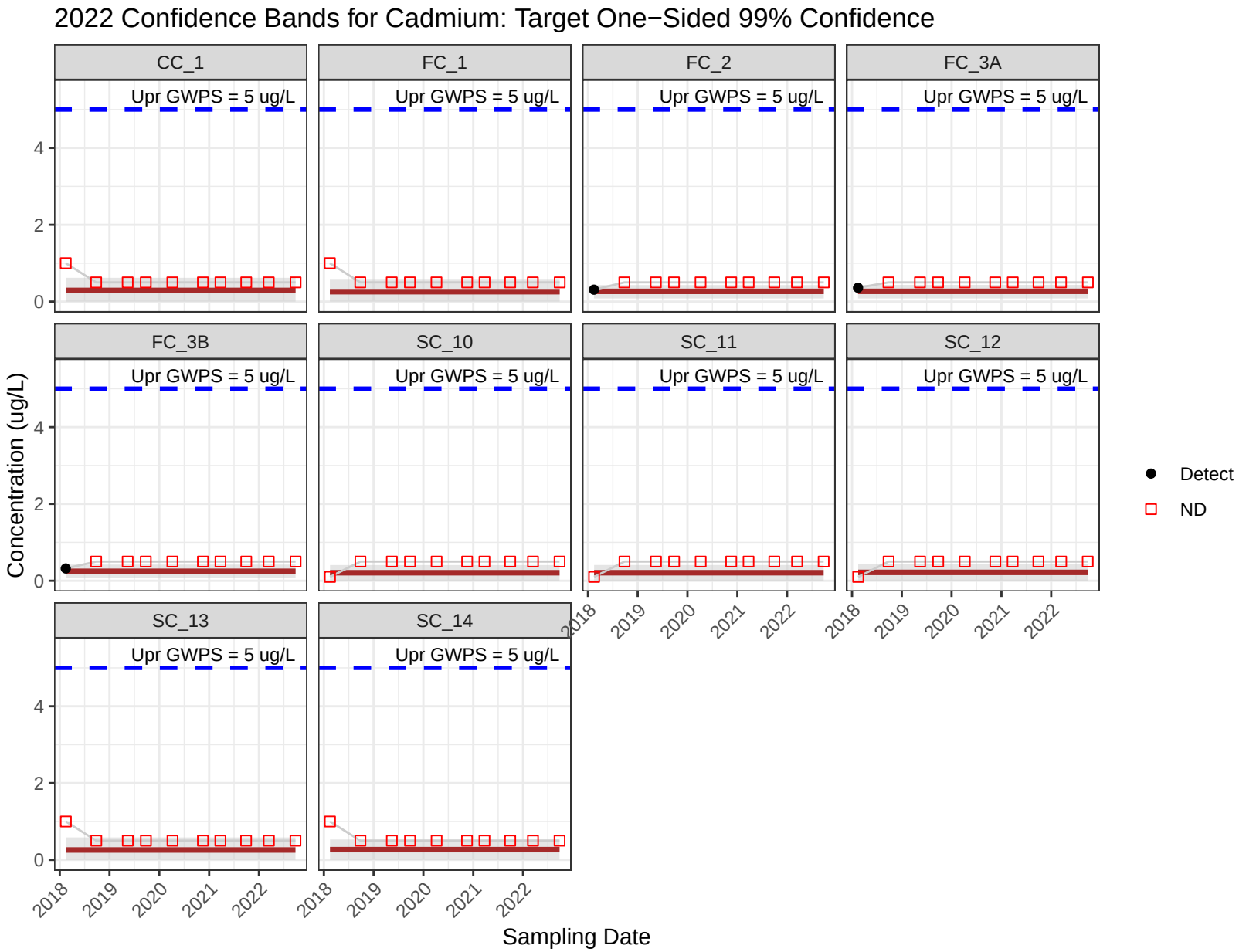

2022 Interwell Robust Prediction Limit SSIs for TDS
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
UPL = 35000
40000
30000
20000
10000
2018
2020
2022
Concentration (mg/L)
Sampling Date
Detect

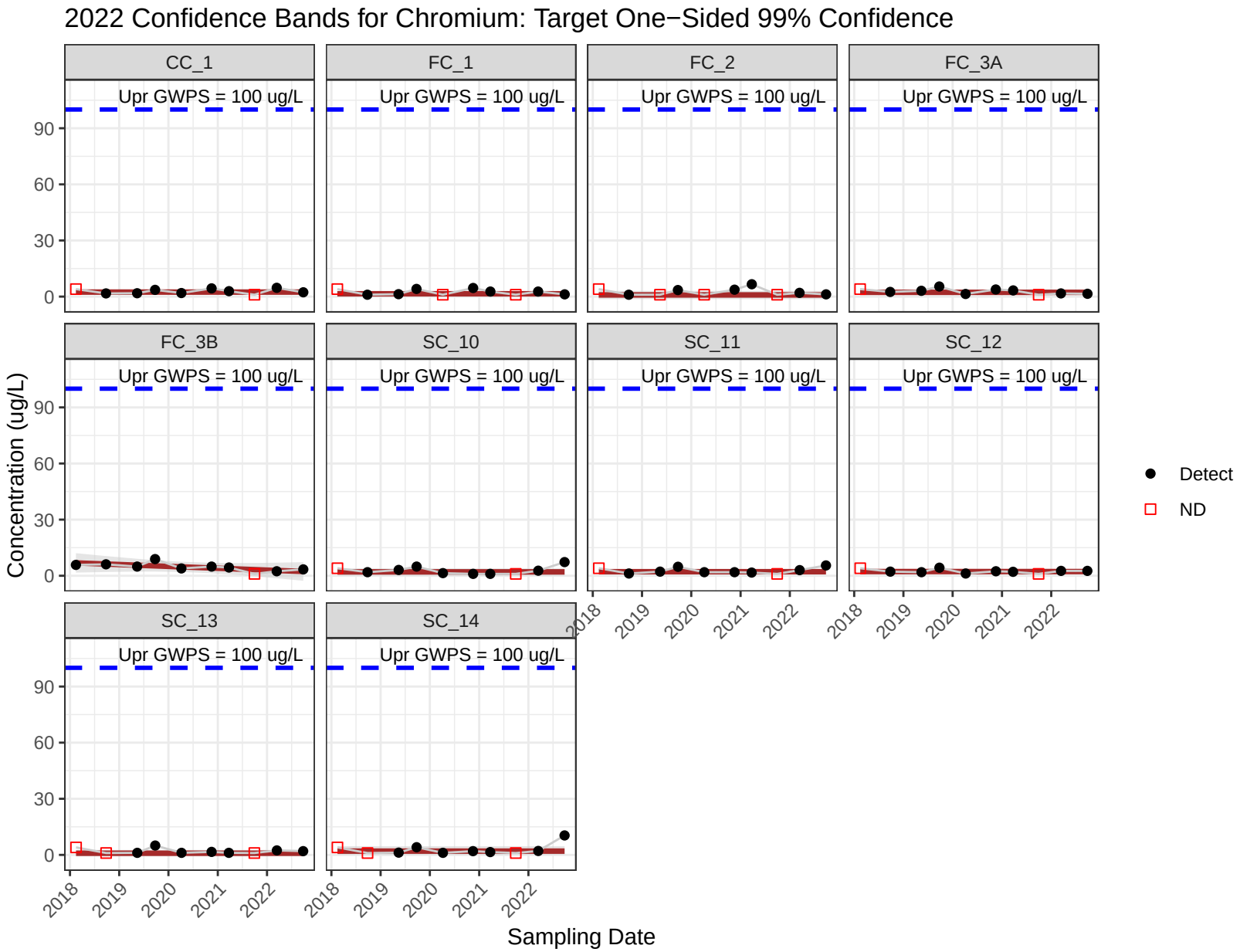
Confidence Interval Band Plots, Appendix IV Parameters


2022 Confidence Bands for Arsenic: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 12 ug/L
Concentration (ug/L)
Sampling Date
Detect
ND
0
5
10
15
20
2018
2020
2022

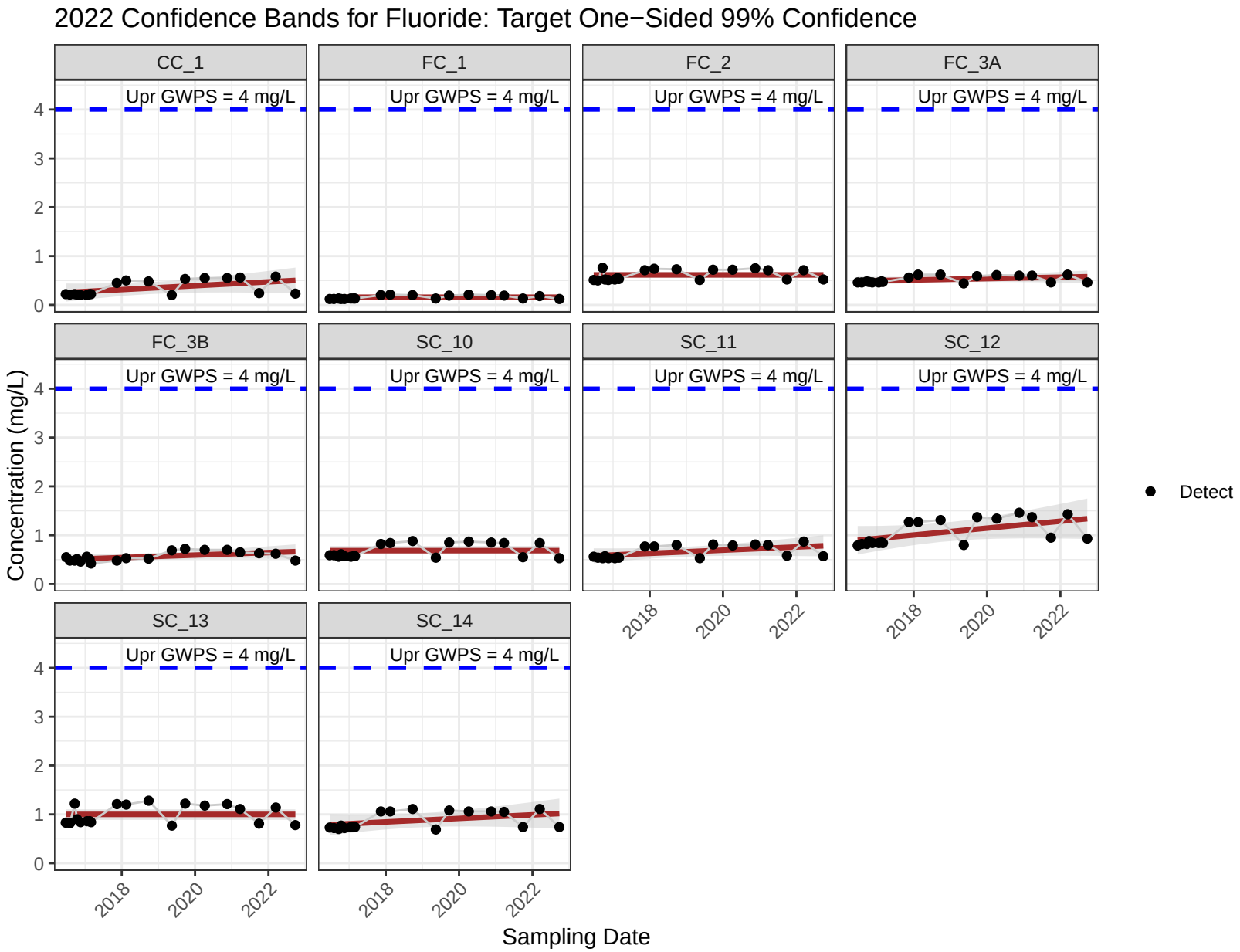

2022 Confidence Bands for Barium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 2000 ug/L
Concentration (ug/L)
2000
1500
1000
500
0
2018
2020
2022
Sampling Date
Detect
ND

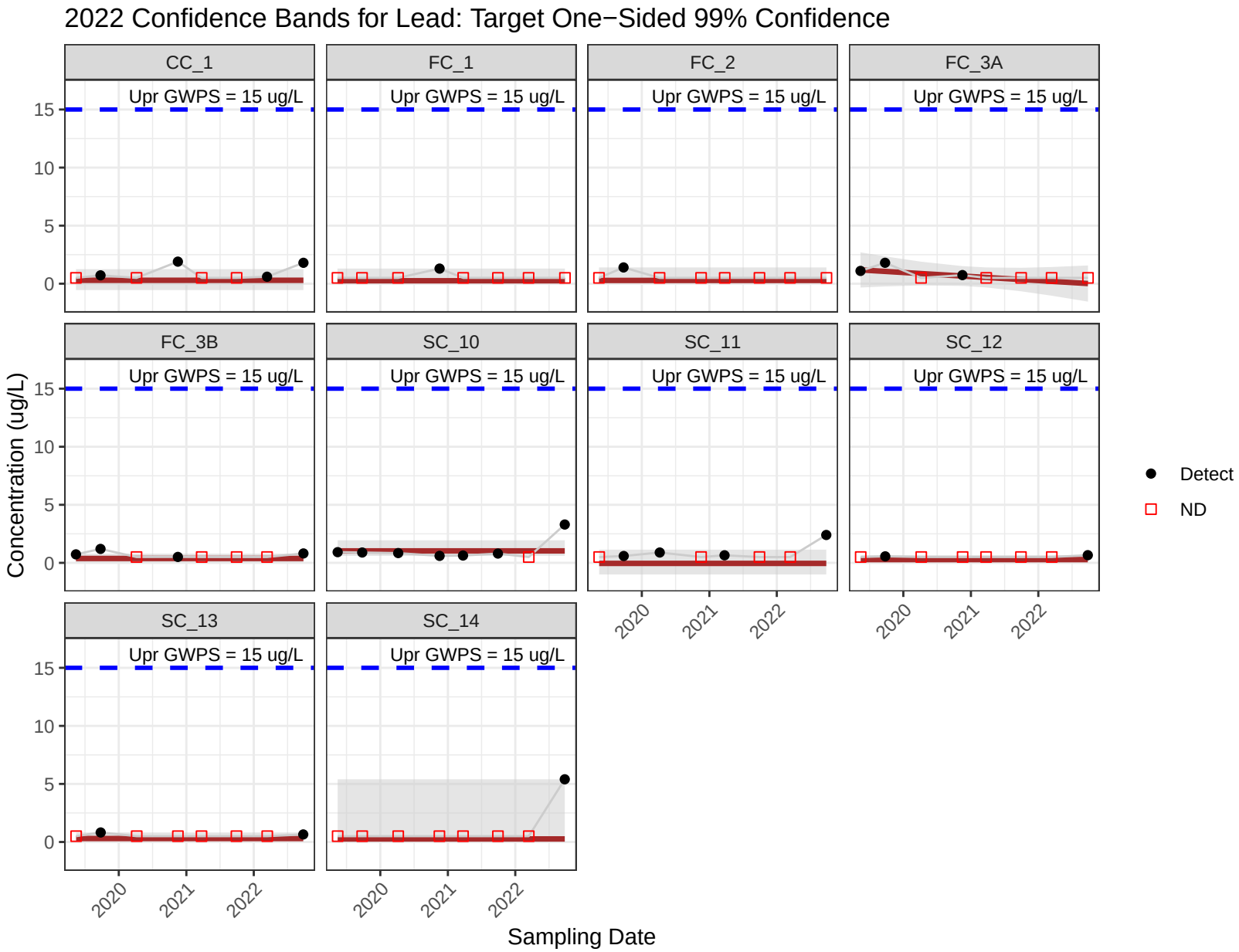

2022 Confidence Bands for Beryllium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 4 ug/L
Concentration (ug/L)
0
1
2
3
4
2019
2020
2021
2022
Sampling Date
ND

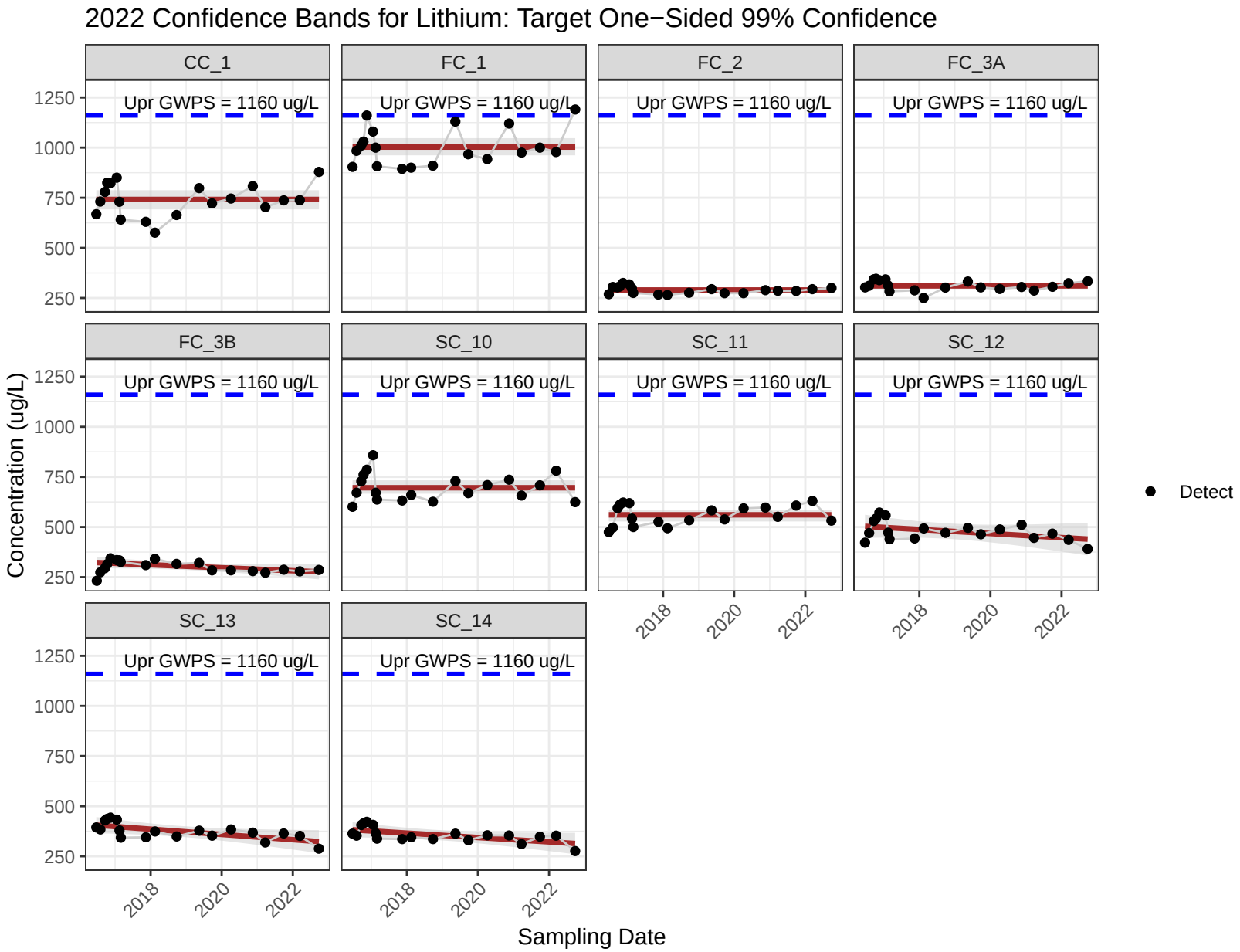

2022 Confidence Bands for Cadmium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 5 ug/L
Concentration (ug/L)
0
2
4
2018
2019
2020
2021
2022
Sampling Date
Detect
ND

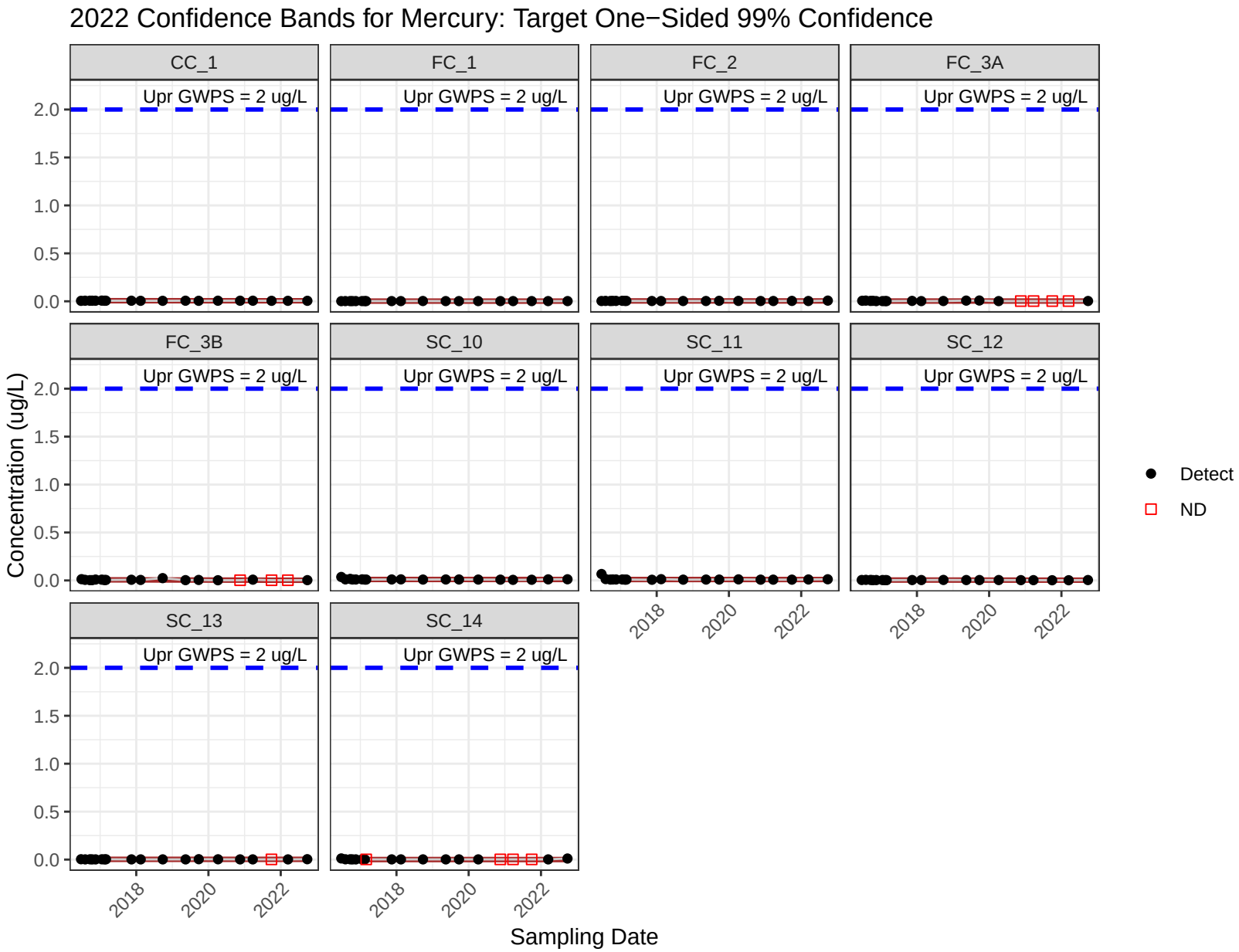

2022 Confidence Bands for Chromium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 100 ug/L
Concentration (ug/L)
0
30
60
90
2018
2019
2020
2021
2022
Sampling Date
Detect
ND

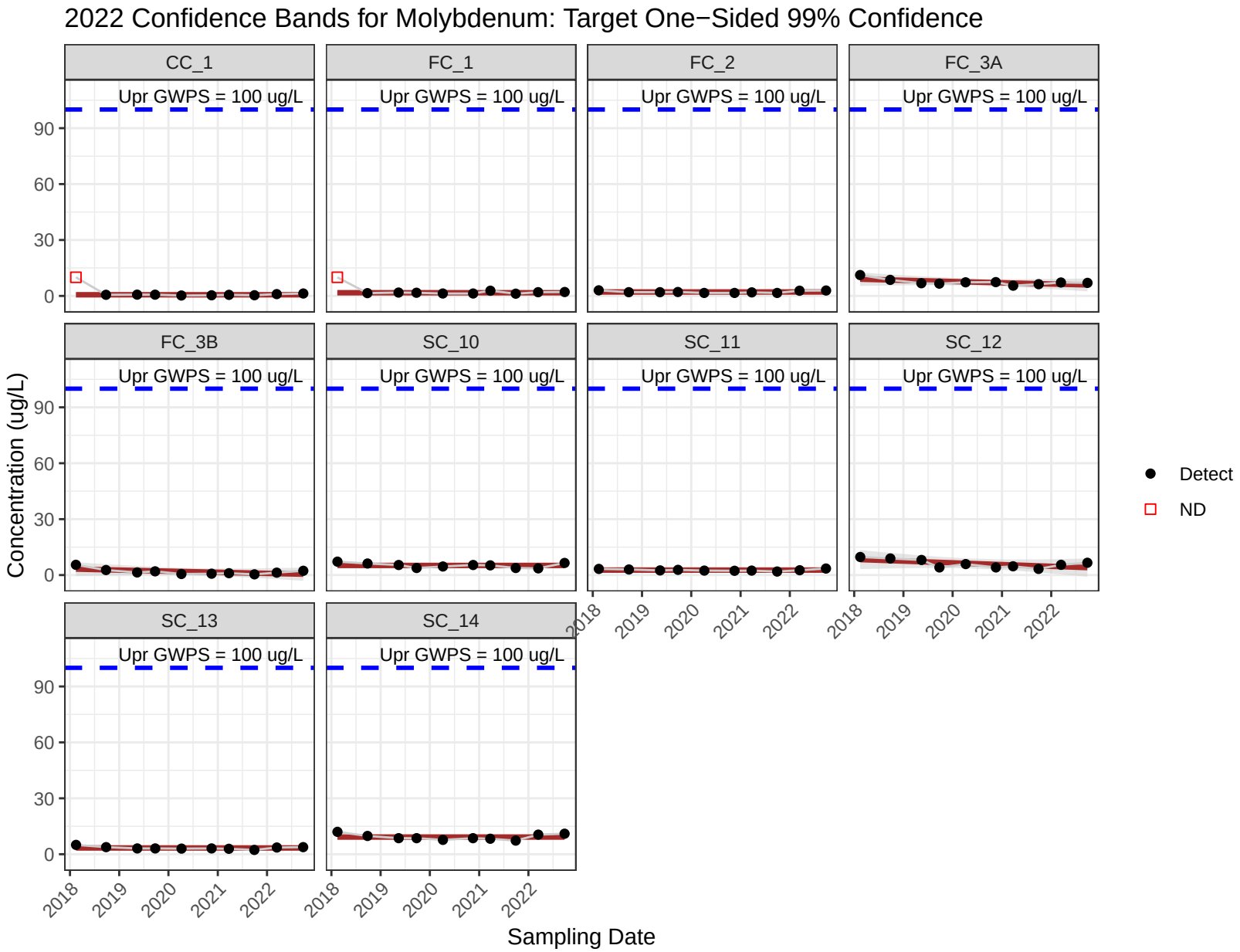

2022 Confidence Bands for Cobalt: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 6.05 ug/L
Concentration (ug/L)
0
2
4
6
2020
2021
2022
Sampling Date
Detect
ND

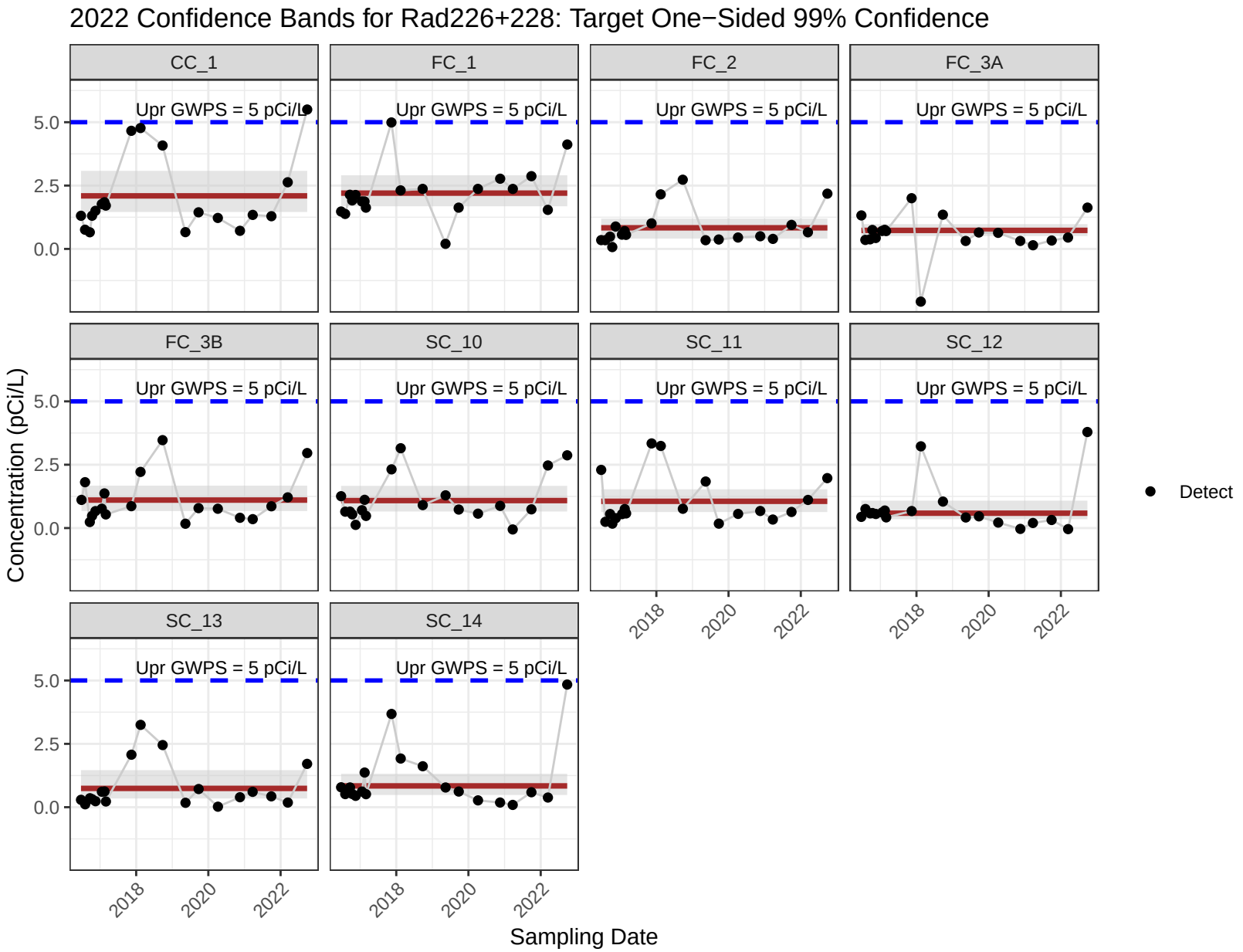

2022 Confidence Bands for Fluoride: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 4 mg/L
Concentration (mg/L)
Sampling Date
Detect
0
1
2
3
4
2018
2020
2022

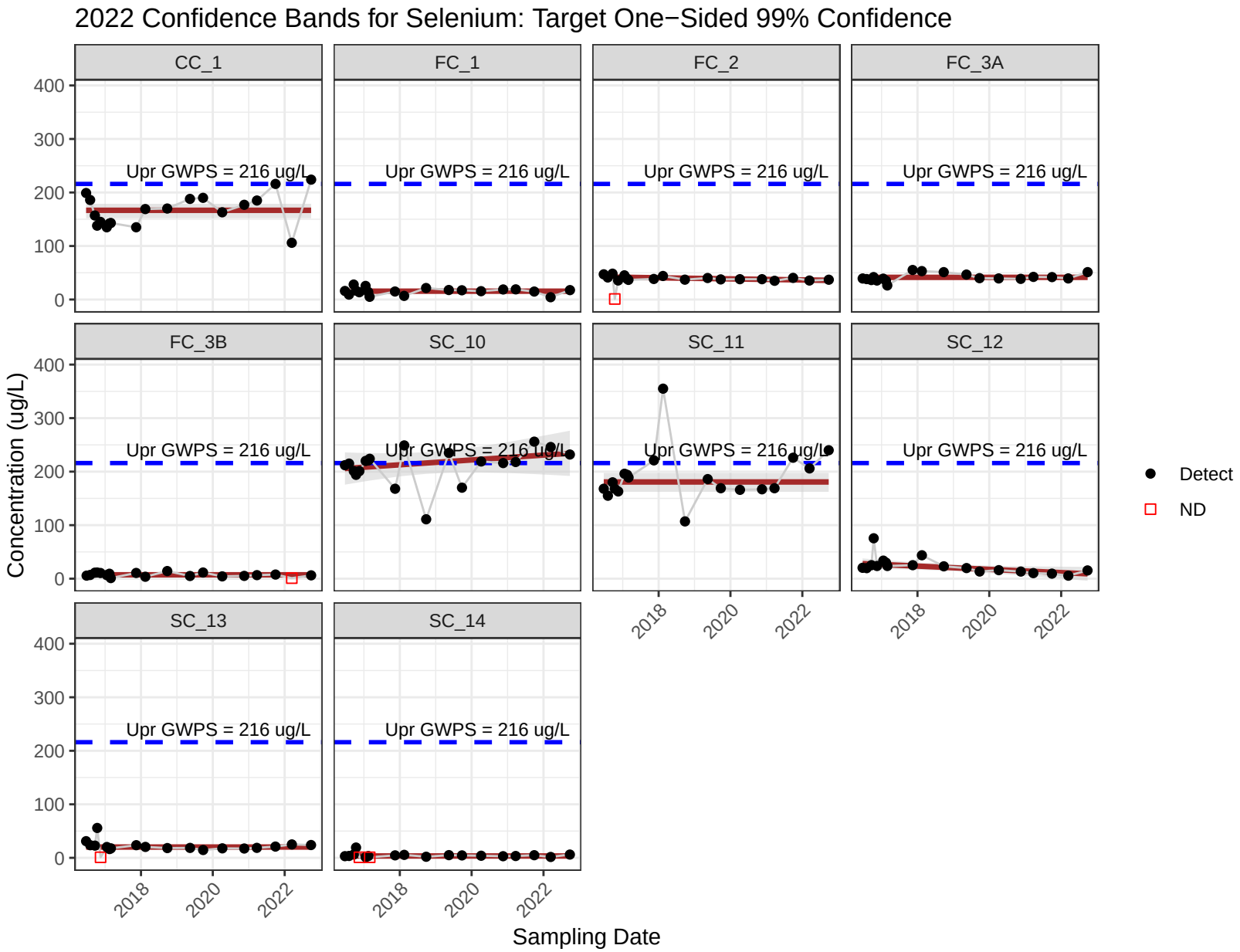

2022 Confidence Bands for Lead: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 15 ug/L
15
10
5
0
2020
2021
2022
Concentration (ug/L)
Sampling Date
Detect
ND

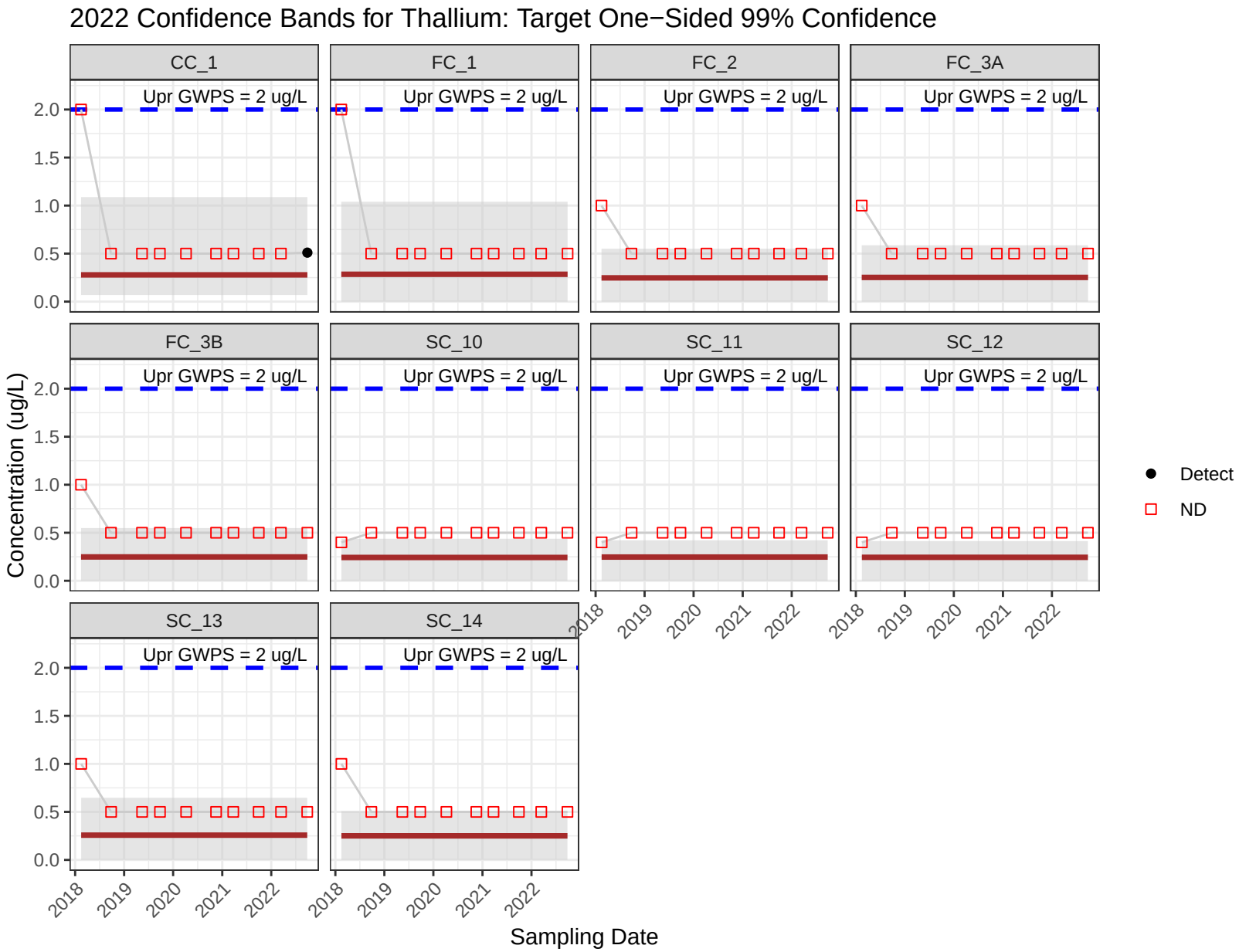

2022 Confidence Bands for Lithium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 1160 ug/L
1250
1000
750
500
250
2018
2020
2022
Concentration (ug/L)
Sampling Date
Detect


2022 Confidence Bands for Mercury: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 2 ug/L
Concentration (ug/L)
2.0
1.5
1.0
0.5
0.0
2018
2020
2022
Sampling Date
Detect
ND


2022 Confidence Bands for Molybdenum: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 100 ug/L
Concentration (ug/L)
0
30
60
90
2018
2019
2020
2021
2022
Sampling Date
Detect
ND


2022 Confidence Bands for Rad226+228: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 5 pCi/L
5.0
2.5
0.0
2018
2020
2022
Concentration (pCi/L)
Sampling Date
Detect


2022 Confidence Bands for Selenium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 216 ug/L
Concentration (ug/L)
Sampling Date
Detect
ND


2022 Confidence Bands for Thallium: Target One−Sided 99% Confidence
CC_1
FC_1
FC_2
FC_3A
FC_3B
SC_10
SC_11
SC_12
SC_13
SC_14
Upr GWPS = 2 ug/L
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
2018
2019
2020
2021
2022
Sampling Date
Detect
ND

APPENDIX E

Alternative Source Demonstration

AECOM Imagine it. Delivered. **Environment**

Prepared for
Colorado Springs Utilities

Submitted by
AECOM
Denver, Colorado
303-694-2770
April 2022

Coal Combustion Residuals (CCR) Landfill Alternative Source Demonstration Assessment Monitoring, Selenium

Clear Spring Ranch
El Paso County, Colorado

Revision 0

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April 2022

Coal Combustion Residuals (CCR) Landfill Alternative Source Demonstration Assessment Monitoring, Selenium

Clear Spring Ranch
El Paso County, Colorado

Revision 0

Prepared By
Mark Levorsen, PG, Principal Hydrogeologist

Reviewed By
Dennis Connair, CPG, PG, Principal Geologist

Approved By
Steve Walker, PE, Senior Project Manager

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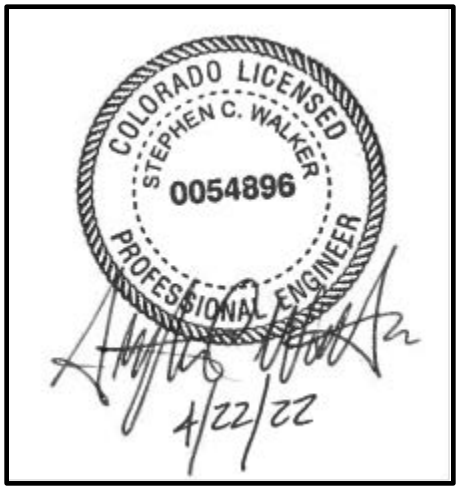
List of Acronyms

ASD	Alternative Source Determination
CCR	coal combustion residuals
CD	Certificate of Designation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CSR	Clear Spring Ranch
CSRRRF	Clear Spring Ranch Resource Recovery Facility
DLD	Designated Land Disposal
DTW	depth to water
GWPS	groundwater protection standards
HSU	hydrostratigraphic unit
µg/L	micrograms per liter
meq/L	milliequivalents per liter
mg/L	milligrams per liter
NHD	National Hydrography Dataset
PCA	Piney Creek Alluvium
RCRA	Resource Conservation and Recovery Act
SNL	Supernatant Lagoon
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Utilities	Colorado Springs Utilities

Alternative Source Demonstration Certification

Certification Statement 40 CFR § 257.95(g)(3) – Alternative Source Demonstration Report for the existing Coal Combustion Residuals (CCR) Landfill, Clear Spring Ranch, El Paso County, CO, managed by the Colorado Springs Utilities.

I, Steve Walker, being a Registered Professional Engineer in good standing in the State of Colorado, do hereby certify, to the best of my knowledge, information, and belief, and in accordance with good engineering practice, that the factual or evidentiary basis of the interpretations and conclusions presented in this Alternative Source Demonstration Report are true and accurate, as required by 40 Code of Federal Regulations § 257.95(g)(3).



Steve Walker
April 22, 2022

Certification Statement: 6 CCR § 1007-2 Part 1, Appendix B, Solid Waste Facility - Investigation. Reviewed and Sealed by a Colorado Professional Engineer or Reviewed by a Professional Geologist, as appropriate.

I, Mark Levorsen, being a Principal Hydrogeologist and Professional Geologist in AECOM's Denver office, having received baccalaureate and post-graduate degrees in the natural sciences, having sufficient training and experience in groundwater hydrology, and related fields, and being registered as a Professional Geologist in Wyoming (#1599), meet the requirements of 6 Code of Colorado Regulations (CCR) § 1007-2 Part1 for a "qualified ground water scientist". As required by 6 CCR § 1007-2 Part 1, I hereby certify to the best of my knowledge, information, and belief, and in accordance with good scientific practice, that the factual or evidentiary basis of the interpretations and conclusions presented in this Alternative Source Demonstration Report are true and accurate.

Mark K. Levorsen

Mark K. Levorsen
April 22, 2022

1 Introduction

At the request of Colorado Springs Utilities (Utilities), AECOM Technical Services, Inc. (AECOM) has prepared this Alternative Source Determination (ASD) for the detection of a statistically significant concentration of selenium in groundwater sampled from a downgradient monitoring well at the Clear Spring Ranch (CSR) Coal Combustion Residuals (CCR) Landfill (CCR Landfill or Site). The statistically significant level (SSL) was reported from groundwater sample results from Assessment monitoring in the Annual Update Statistical Analysis Report (MacStat, 2022) dated January 25, 2022.

This ASD was prepared as allowed by 40 Code of Federal Regulations (CFR) § 257.95(g)(3) of the United States Environmental Protection Agency (USEPA) CCR Rule to evaluate whether the detection of selenium at concentrations that represent SSLs above groundwater protection standards (GWPS) are the result of an alternative source. This ASD also meets the requirements of an investigation under Appendix B of the Colorado Department of Health and Environment (CDPHE) Regulations Pertaining to Solid Waste Sites and Facilities 6 CCR § 1007-2, Part 1 (Solid Waste Regulations).This demonstration will discuss how site geology, site topography and upgradient groundwater geochemistry combine to mobilize selenium naturally present within the Pierre Shale bedrock and alluvial sediments derived from Pierre Shale into groundwater, resulting in increased concentrations that are unrelated to the presence of the CCR Landfill.

1.1 Background

Clear Spring Ranch (CSR) is a 4,759-acre property located at the intersection of Interstate 25 and Ray Nixon Road, approximately 17 miles south of Colorado Springs (Figure 1). The property is in El Paso County, Colorado and located in Township 16 south, Range 65 west, sections 31 and 32, and Township 17 south, Range 65 west, sections 5 and 6. It was acquired in the 1970’s by the City of Colorado Springs and is operated by Colorado Springs Utilities (Utilities). Monitoring well SC-10 is located adjacent to and downgradient of the CCR Landfill (Figure 2).

The land-use is authorized via a Certificate of Designation (CD) obtained from El Paso County (CD #004-001). The primary land uses on the CSR property are those related to utility services: electric generation and transmission, wastewater treatment and waste management (Clear Spring Ranch Resource Recovery Facility [CSRRRF]), and water treatment and delivery. Land use surrounding the CCR Landfill is shown on Figure 1.

The CCR Landfill is regulated by the CDPHE Hazardous Materials and Waste Management Division and the Local Governing Authority (i.e., El Paso County) under the Solid Waste Regulations and El Paso County’s Land Development Code. It is also regulated under the Final CCR Rule promulgated by the USEPA under 40 CFR Part 257, Subtitle D of the Resource Conservation and Recovery Act (RCRA).

2 Monitoring Program

The current groundwater monitoring network is designed to monitor the CCR Landfill, which is bounded on the west by Fort Carson, on the east by the downgradient retention dam, on the south by a bedrock ridge, and on the north by the CSRRRF (Figure 1). Groundwater at the CCR Landfill is monitored by a system of groundwater wells, including hydraulically upgradient (background) and downgradient locations. Specifics related to the wells in the monitoring system are identified in Table 1, below, and the relative locations of the wells are shown in Figure 2.

As detailed in the CCR Landfill Groundwater Detection Monitoring Plan, the current groundwater quality monitoring well network for the CCR Landfill is comprised of five background wells (CC-1, FC-1, FC-2, FC- 3A, and FC-3B), four downgradient wells (SC-10, SC-11, SC-12, and SC-13) along the eastern edge of the landfill, and one cross gradient well (SC-14) on the south side of the landfill. Details of the construction of the monitoring well system are presented in Table 1.

Because of the downgradient detection of EPA CCR Rule Appendix III indicator parameters (boron and fluoride) at concentrations representing statistically significant increases (SSIs) relative to background/upgradient concentrations, the CCR Landfill unit has been subject to Assessment monitoring per 40 CFR § 257.95 since 2018, requiring monitoring of both the EPA CCR Rule Appendix III and IV constituents. Monitoring activities and data are presented in the annual reports that have been prepared to date (Utilities, 2021). Statistical methods are described in the Groundwater Detection Monitoring Plan (AECOM, 2017) and reported in an Annual Update Statistical Analysis Report (MacStat, 2022) each year.

Under Assessment monitoring, the monitoring wells for the CCR Landfill were sampled for Appendix III and IV constituents in March and September 2021. Groundwater Protection Standards (GWPSs) were established for all detected Appendix IV constituents as required by 40 CFR § 257.95(d)(2) and selenium was found to be present at a concentration in downgradient monitoring well SC-10 that represents an SSI above background and represents an SSL over the GWPS. The SSL determination was declared in the facility operating record on January 25, 2022.

Table 1. CCR Detection Monitoring Wells

Well ID	Monitoring Status	Date Installed	Easting	Northing	Ground Elevation (ft AMSL)	Borehole Total Depth (ft bgs)	Total Depth Elevation (ft AMSL)	Approximate Screen Depth (ft bgs)
CC-1	Background	6/1/1993	3223490.10	1280703.22	5476.72	38.00	5438.72	35-38
FC-1	Background	6/1/1993	3223188.50	1283319.32	5484.77	33.00	5451.77	28-33
FC-2	Background	6/1/1993	3223214.18	1282124.35	5480.80	28.00	5452.80	12.5-28
FC-3A	Background	6/6/2016	3223409.78	1282807.35	5481.78	34.75	5447.03	14-34
FC-3B	Background	6/10/2016	3223416.59	1282806.12	5481.29	55.10	5426.19	45-55
SC-10	Downgradient	6/9/2016	3226344.27	1283429.38	5445.51	35.25	5410.26	15-35
SC-11	Downgradient	6/7/2016	3226375.25	1283151.86	5442.18	30.66	5411.52	10-30
SC-12	Downgradient	6/7/2016	3226399.83	1282807.44	5442.11	25.83	5416.28	5-25
SC-13	Downgradient	6/8/2016	3226376.49	1282422.33	5443.61	23.16	5420.45	5-22.5
SC-14	Cross-gradient	6/10/2016	3225699.68	1282348.17	5447.98	28.08	5419.90	8-28

Notes:
Coordinate system: Colorado State Plane (Central Zone)
Horizontal datum: NAD 83/86, US Survey Foot
Vertical datum: NGVD 29, US Survey Foot
Ground surface elevation from February 2022 survey
ft bgs = feet below ground surface
ft AMSL = feet above mean sea level

3 Alternative Source Demonstration (ASD) Under the CCR Rule

Part 257.95(g)(3) of the CCR Rule allows the Owner or Operator 90 days from the date of the initial SSL determination (January 25, 2022) to demonstrate that:

- A source other than the CCR unit caused the SSL or;
- The apparent SSL resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

Accordingly, the potential for alternative sources of this sort to have affected the groundwater monitoring results at the CCR Landfill monitoring well network was evaluated.

The working hypothesis for this ASD is that the SSL for selenium resulted from a source other than the CCR unit; specifically, naturally-occurring selenium within the alluvial sediments and underlying Pierre Shale (bedrock) was released and mobilized into groundwater in response to oxidizing conditions in the groundwater originating upgradient of the CCR Landfill.

Multiple lines of evidence are used for this ASD, as presented in the following subsections.

3.1 Hydrogeologic Site Conceptual Model

3.1.1 Topography and Geology

The CCR Landfill is located in one of the upper reaches of an unnamed drainage area south of Little Fountain Creek (Figure 1). The drainage is a generally west-east trending broad and gently-sloping topographic depression that is bounded to the north and south by outcrops of the Pierre Shale (Figure 3). The land slopes gently up to the west along primarily ephemeral to intermittent drainages from the Fort Carson Military Reservation, originating in the Front Range. Smaller ephemeral to intermittent drainages originate from the north, northwest, and northeast and enter the lower valley in the area above the retention dam. To the east is the Fountain Creek alluvial valley.

The Geologic Map of the Pueblo 1º X 2º Quadrangle published by the United States Geological Survey (Scott et al., 1978), indicates the drainages in the area are comprised of up to 50 feet of Quaternary unconsolidated alluvial sediments overlying bedrock consisting of the Cretaceous-aged Pierre Shale. This is confirmed by over 80 test holes completed by Utilities in the area. AECOM reviewed the available boring logs from these test holes. The depth to bedrock ranged from 2 to 50 feet (average 22 feet) in the boring logs reviewed. These unconsolidated sediments, referred to as the Piney Creek Alluvium (PCA) on the geologic map (Scott et al., 1978), consist of horizontal layers of clay and silty clay with isolated lenses of sand and gravel deposited as alluvial valley fill following the last glacial period roughly 11,000 years ago. The alluvial valley fill was deposited in paleo-valleys eroded down into the Pierre Shale bedrock. Boring logs describe the clayey alluvium as medium stiff to stiff, low to moderate density, low to moderate cohesion, low plasticity, yellowish-brown to grayish-brown to brown clay. Bedding is poorly defined except for a thin layer of sand or gravel near the base of the deposit at some locations. The thickness of the sand and gravel intervals, where present and noted in boring logs for monitoring wells ranged from 0.1 to 7 feet, with an average of roughly 3.6 feet. The thicker sandy intervals observed in monitoring wells were approximately 5 feet thick at wells SC-1, SC-9, SC-10, and CC-2. The thickest sand/gravel interval noted in any of the boring logs from geotechnical borings and monitoring wells was 20 feet at test hole 77-13. Sandy intervals approximately 9 to 11 feet thick were observed at test holes 77-11, 77-17, and 77-18 immediately southeast of the CCR Landfill in the area of the southern drainage.

Higher topographic features to the northeast and south of the CCR Landfill consist of Pierre Shale rock outcrops overlain by Pleistocene-aged gravelly alluvium correlated to the Slocum alluvium (Scott et al., 1978).

The Pierre Shale (Kp) is a Cretaceous-aged marine shale comprising the bedrock underlying the entire site. Boring logs describe the shale as hard, fractured, high density, low moisture, low cohesion, low plasticity, gray shale, often accompanied by “core-barrel refusal”. Many boring logs describe a transitional claystone material above hard shale bedrock. The claystone is very stiff, dark gray, non-plastic, blocky, and mottled brownish-yellow and dark gray.

3.1.2 Paleo-Alluvial Valleys

The PCA was deposited in drainages eroded down into the Pierre Shale bedrock. The original depositional and surface topography of the site area is obscured by construction of the CCR Landfill, and the CSRRRF features at the site since initial operations began in the late 1970s.

Figure 3 is a structure contour map for the elevation of the top of the Pierre Shale bedrock in the area. The base map for Figure 3 is a black and white aerial image taken in 1947, which was used by AECOM to delineate the drainages present prior to construction activities. The bedrock contouring on the map was constructed in ArcMap from review of information available for roughly 80 boreholes from site investigations in the area dating back to 1977. Borehole locations considered are shown on Figure 3. Supplemental information used to inform construction of the contours shown on the bedrock elevation map includes:

- A black and white aerial image of the area from 1947, prior to development in the area. Provided to AECOM by Utilities. Drainages are easily identified in the imagery.
- The National Hydrography Dataset (NHD) Flowline (streams) dataset and NHD Contour (20-foot elevation contours) dataset available from the United States Geological Survey (USGS). The NHD Flowlines were extended up into watersheds by AECOM using the 1947 aerial image.
- The 1994 revision of the 1961 USGS 7.5-minute topographic map for the Buttes quadrangle.

An important observation provided by Figure 3 is the presence of a bedrock high beneath the northwest and central region of the CCR Landfill. This area is currently covered with ash material. The ash extends over this bedrock high and over portions of the paleo-alluvial valleys to the north, west, and south of the bedrock high. The bedrock high forms / delineates two separate paleo-alluvial valleys beneath the CCR Landfill: the North and South Paleo-Alluvial Valleys. A third paleo-alluvial valley is located to the northeast of the CCR Landfill; the Northeast Paleo-Alluvial Valley.

3.1.3 Groundwater Conditions

Based on review of boring logs in the Site area, two hydrostratigraphic units (HSUs) have been identified: the shallow PCA HSU (where it exists) and the uppermost weathered and unweathered zone of the underlying Pierre Shale (Kp) HSU. The PCA HSU is underlain by approximately 3,500 to 4,000 feet of Pierre Shale (Kp) that forms a hydraulic barrier between the alluvium and any potential deeper water-bearing formations, if present.

Water level measurements indicate that the saturated thickness of the PCA HSU ranges from approximately zero (dry) to 22 feet, with an average of 12 feet based on depth to water measured in monitoring wells and depth to water encountered or absence of water noted during drilling a borehole.

Figure 3 includes an outline of the interpreted contact between the saturated PCA HSU sediments within the paleo-alluvial valleys and the non-saturated soil / bedrock at higher elevations along the valley margins. The location of the interpreted boundary line is approximate and based on comparison of groundwater elevations calculated from depth to groundwater noted in many boring logs and interpolation of groundwater elevation from existing wells. This boundary line represents the approximate lateral extent of saturated PCA HSU sediments (alluvial valley fill) within each drainage.

Groundwater present within the PCA HSU flows hydraulically downgradient to the east-southeast following the contour of the top of the alluvium-Pierre Shale contact. The extent of the PCA HSU is restricted to the aforementioned paleo-alluvial valleys, and therefore groundwater flow in the uppermost saturated unit both upgradient and downgradient of the CCR Landfill is controlled by the locations of the paleo-alluvial valleys. The CCR Landfill is constructed over portions of two paleo-alluvial valleys separated by a bedrock high.

3.1.4 Groundwater Flow Directions and Streamlines

Figure 4 is a potentiometric surface contour map of the PCA HSU constructed using depth to water (DTW) measurements obtained on February 8 and 9, 2022 from the 10 monitoring wells defined as the CCR Landfill's Detection Monitoring Network, and from 10 additional monitoring wells historically drilled at the Site. Utilities obtained the DTW measurements and groundwater samples from these monitoring wells to provide a fuller understanding of groundwater conditions around the CCR Landfill for purposes of this ASD. Three of the 20 wells monitored are completed with long screen intervals that are largely within the Kp HSU (WW-3A, WW-5A, and WW-6A). Due to the lack of wells completed in the PCA HSU in these upgradient locations, groundwater

elevations for these three Kp HSU wells were used as general guidance to construct the potentiometric surface map for the PCA HSU. The potentiometric contour lines are dashed in the upper portions of the North and Northeast Paleo-Alluvial Valleys. The groundwater elevation for well FC-3B, which is completed entirely within the Kp HSU, was not used to construct the contour map.

Three paleo-valley areas are shown on Figure 3, and they all converge immediately downgradient and east of the CCR Landfill and above the retention dam. Groundwater flow beneath the north side of the CCR Landfill originates to the north and northwest of the CCR Landfill. Well SC-10 is completed in groundwater present within this drainage. Two monitoring wells (SC-8 and SC-9) are located along the north perimeter of the CCR Landfill facility but are not currently monitored as part of the CCR Landfill Detection Monitoring Plan. The presence of this upgradient flow from the north suggests that groundwater quality data used currently to compute background concentrations for the CCR Assessment monitoring program may not accurately reflect the full effect of background groundwater quality below the north portion of the CCR Landfill.

Groundwater flow beneath the south side of the CCR Landfill enters the Clear Spring Ranch property from the Fort Carson area to the west. Upgradient monitoring wells CC-1, FC-1, FC-2, FC-3A, and FC-3B are situated at the head of this drainage and are currently used to compute background concentrations for the CCR Assessment monitoring program. Well SC-14 is designated a cross-gradient monitoring well and wells SC-12 and SC-13 as CCR Landfill downgradient monitoring wells. Groundwater quality data used currently to compute background concentrations for the CCR Assessment monitoring program are located upgradient of these monitoring wells and reflect groundwater quality upgradient of the *south* side of the CCR Landfill.

Figure 5 is a map showing the addition of groundwater flow lines on the groundwater potentiometric surface presented in Figure 4. The groundwater flow lines are shown as light blue colored lines drawn perpendicular to potentiometric surface contours. Groundwater flow lines are subparallel streamlines that do not cross adjacent streamlines. As interpreted from review of the bedrock structural contour map and the paleo-alluvial valleys present in the area prior to development of the facility, groundwater present beneath the south side of the CCR Landfill is hydraulically separated from and cannot flow to wells SC-10 and SC-11. This line of evidence is based on existing hydrogeologic conditions and is further supported by analysis of patterns in groundwater chemistry presented in the next section.

Three hydrogeologic cross sections are provided as Figures 6, 7, and 8. The cross-sections illustrate locations of groundwater flow paths in the two paleo-alluvial valleys present beneath the CCR Landfill. Cross section locations are shown on the inset map provided on each figure.

Figure 6 (cross section A-A') extends from west to east in the drainage present immediately south of the CCR Landfill. The line of section is not an exact streamline but is a fair representation of geologic conditions along a streamline in this drainage. Groundwater originates on the west edge of the property, represented by upgradient background well FC-2 adjacent to Fort Carson, and flows within the PCA HSU within the confines of the drainage. The south side of the CCR Landfill extends across the top of the north edge of this paleo-alluvial valley. Well SC-14 is designated a cross-gradient monitoring well and well SC-13 as a downgradient monitoring well.

Cross section B-B' (Figure 7) is oriented from northwest to southeast and includes well SC-10. The upgradient extent of Figure 7 is well WW-3A, which is screened predominantly in the Kp HSU, and therefore the groundwater elevation shown is likely lower than the groundwater elevation in the PCA HSU in this area. Well SC-9 is located on the north perimeter of the CCR Landfill and hydraulically upgradient of well SC-10, and nearly on a coincident streamline. Downgradient well SC-7, although not included in the CCR Landfill Detection Monitoring Plan, is also closely aligned with these streamlines. The horizontal hydraulic gradient is relatively steep to the west of well SC-10 and becomes gentler as groundwater enters the lower reaches of the alluvial valley which is broader and gentler than the upper reaches.

Figure 8 shows cross section C-C', which extends north to south through the downgradient edge of the CCR Landfill. The cross section shows the relatively abrupt transition in elevation from the bedrock high (77-15) to the north of well SC-10 down into the paleo-alluvial valley (SC-13 and 77-17). Cross section C-C' orientation (north-south) is essentially perpendicular to the direction of groundwater flow along the toe of the CCR Landfill.

Groundwater elevations in wells SC-10, SC-11, and SC-12 vary by less than two thirds of a foot. A dashed potentiometric surface contour for elevation 5432.5 ft MSL is shown on Figures 4 and 5 across the downgradient edge of the CCR Landfill. The similarity of groundwater elevations between these three wells increases the

accuracy of the interpolation and the placement and shape of the 5432.5-foot contour guides the orientation of nearby potentiometric contours in this area.

Approximately one mile east of the CCR Landfill, the combined South, North, and Northeast drainages intersect the north-south alluvial channel of Fountain Creek. The Fountain Creek Alluvium serves as a productive aquifer used primarily for agricultural and industrial purposes near CSR. The hydraulically-upgradient portion of the paleo-alluvial valleys occupied by the CCR Landfill is isolated from the Fountain Creek aquifer by a retention dam installed by Utilities in 1978 (Figure 1). The retention dam, located approximately 3,000 feet downgradient (east) of the landfill (Figure 1), has a bentonite core and is keyed into the Pierre Shale bedrock. It captures surface water runoff from the CCR Landfill and also restricts groundwater flow in the PCA HSU. A French drain or interceptor trench is present on the southern portion of the downgradient (east) side of the retention dam. Groundwater intercepted by the drain is pumped back into the upstream side of the retention dam.

3.1.5 Summary of ASD Hydrogeologic Lines of Evidence

Groundwater flow within the PCA HSU beneath the CCR Landfill is split between two buried paleo-alluvial valley drainages, a North Paleo-Alluvial Valley, and a South Paleo-Alluvial Valley. The North and South Paleo-Alluvial Valleys are separated by a bedrock high situated beneath the west-central region of the CCR Landfill.

Groundwater present in the North Paleo-Alluvial Valley originates from a different upgradient area than groundwater present in the South Paleo-Alluvial Valley.

Groundwater beneath the CCR Landfill downgradient compliance boundary originates from multiple discrete flow paths. Groundwater samples from compliance wells SC-10 and SC-11 are derived from the North Paleo-Alluvial Valley. Groundwater samples from wells SC-12, SC-13, and SC-14 are derived from the South Paleo-Alluvial Valley.

Current Program wells used to establish background concentrations of constituents are located within and are only representative of groundwater in the South Paleo-Alluvial Valley.

3.2 Chemical Signature Evaluation

The second line of evidence explored for the ASD is a comparison of the chemical signature of the affected groundwater at SC-10 to that of the other monitoring wells surrounding the CCR Landfill. To accomplish this, samples were collected from 20 groundwater wells in and around the CCR Landfill. These include groundwater samples collected from the 10 CCR Landfill Detection Monitoring Plan wells plus additional wells in the area.

All samples were collected in general accordance with the procedures established in the 2017 Groundwater Detection Monitoring Plan (AECOM, 2017). Field parameter measurements were collected at the time of sample collection. All samples were submitted for analysis of the CCR Rule Appendix III and Appendix IV parameters. In addition, samples from all wells were submitted for ionic chemistry parameters including alkalinity, magnesium, potassium, sodium, sulfate, chloride, total dissolved solids (TDS) and nitrate. The sample analytical data from groundwater samples collected in February 2022 are in summary tables presented in Appendix B.

As discussed below, the data support the conclusion of the hydrogeologic line of evidence that the background chemistry affecting the southern compliance wells SC-12, SC-13, and SC-14 is different from the background affecting the northern compliance wells SC-10 and SC-11.

Ionic Chemistry

Figure 9 is a map illustrating the general water chemistry from concentrations of the major cations and anions and TDS. This data is overlaid on the February potentiometric surface. Concentrations of major ions were converted to milliequivalents per liter (meq/L), which normalizes the concentrations based on molecular weight and valence (+ or -) of the ion. The results are shown using a Stiff diagram to visualize the relative distribution or percentage of individual cations on the left side of the diagram (Na+K, Ca, and Mg) and anions on the right side of the diagram (Cl, HCO^3, and SO^4) in each sample. The relative width of the diagram for each ion represents the relative proportion of the ion in the sample. Ion concentrations in milligrams per liter (mg/L) and meq/L equivalents are summarized in Table 2.

The Stiff diagrams show similar shapes along groundwater streamlines in two areas on Figure 9. Major ion distributions are similar between wells SC-9 and SC-10 in the North Paleo-Alluvial Valley, with similar proportions

of sodium, magnesium, sulfate, and chloride. In the South Paleo-Alluvial Valley, the Stiff diagrams for wells SC-14, SC-13, and SC-2 are similar and located along the same groundwater streamline. Unfortunately, direct comparison of the data is compromised due to unequal amounts of cation versus anion ions for several groundwater samples. The charge balance error exceeded 20 percent for samples FC-1, FC-2, SC-2, SC-3, SC-8, SC-11, SC-13, SC-14, and WW-3A. This potentially represents a disequilibrium in the groundwater chemistry at some locations potentially associated with the chemically reactive nature of the recharge that it receives. The charge balance error may also be caused by interference between groundwater constituents in some laboratory analyses. It appears that for the samples with charge balance errors exceeding 20 percent, the relative proportion of sulfate and chloride (both anions) are biased low when compared to other sample results. Although the charge balance error is high for the three locations in the South Paleo-Alluvial Valley (SC-14, SC-13, and SC-2), ion concentrations and relative ratios for the major ions are all quite similar.

Selenium Relationships

Figure 10 is a map illustrating the selenium and nitrate concentrations from the 20 wells sampled in February 2022. This data is overlaid on the February potentiometric surface and groundwater streamlines (Figure 5). Review of this map shows the difference between groundwater concentrations of selenium and nitrate in samples collected from the North Paleo-Alluvial Valley that are many times higher than concentrations for wells located in the South Paleo-Alluvial Valley. This is significant because high nitrate concentrations can aid in the dissolution of selenium from shale.

The selenium concentration in well SC-10 exceeded the GWPS and was reported as an SSL on January 25, 2022. The GWPS calculated from sample analysis of upgradient/background groundwater samples at the time of the 2021 September sampling event was 199 ug/L (0.199 mg/L) for selenium. However, the background monitoring wells currently used to calculate this GWPS are located in the South Paleo-Alluvial Valley and are not located in the North Paleo-Alluvial Valley that provides groundwater flow to wells SC-10 and SC-11.

Table 3 summarizes the selenium and nitrate concentrations for the monitoring wells sampled in February 2022. The Table 3 results for the wells are separated by paleo-alluvial valley location into the South Paleo-Alluvial Valley, the North Paleo-Alluvial Valley, and Northeast Paleo-Alluvial Valley areas. Twelve (12) of the wells are located within the South Paleo-Alluvial Valley, including all 5 of the background wells used in the CCR Landfill Detection Monitoring Plan. The average, minimum, and maximum selenium concentrations for wells in the South Paleo-Alluvial Valley are 31, 4.1, and 184 µg/L, respectively. The corresponding nitrate concentrations in the South Paleo-Alluvial Valley are 9, 0.1, and 31 mg/L (average, minimum, and maximum, respectively). In the North Paleo-Alluvial Valley there are only 5 monitoring wells, including 2 of the 5 compliance downgradient wells (SC-10 and SC-11). The average, minimum, and maximum selenium concentrations for wells in the North Paleo-Alluvial Valley are 171, 63.3, and 213 ug/L, respectively. The corresponding nitrate concentrations in the North Paleo-Alluvial Valley are 430, 150, and 1100 mg/L (average, minimum, and maximum, respectively).

Further evidence of the association of elevated nitrate concentrations enhancing the dissolution of selenium from the Pierre Shale bedrock at the site is illustrated by groundwater concentrations of nitrate and selenium at wells WW-5A and WW-6A and shown on Figure 10. Both monitoring wells are located in the Northeast Paleo-Alluvial Valley, and groundwater within this drainage does not flow beneath the CCR Landfill. Both wells encountered “hard black, green shale” at 22 to 23 feet below ground surface and noted groundwater at the contact between oxidized shale and underlying hard bedrock. Both wells are completed with 40-foot-long screens straddling the lower 10 feet of oxidized shale and underlying 30 feet of hard shale. Groundwater concentrations in samples collected in February 2022 of selenium and nitrate, respectively, are 412 µg/L and 750 mg/L at well WW-6A and 205 µg/L and 160 mg/L at well WW-5A. The presence of elevated selenium and nitrate concentrations at these two wells is clearly unrelated to the presence and operation of the CCR Landfill.

An additional line of evidence is provided based on the distribution of boron in the February 2022 groundwater sample data (Figure 11). Boron concentrations in groundwater initially triggered the move from Detection to Assessment monitoring at the CCR Landfill several years ago. The concentration of boron in well SC-10, the well triggering the SSL for selenium, is one-half to one-third of the concentration of boron that triggered Assessment monitoring and remains below the upper predictive limit for background, suggesting that the selenium is unrelated to the landfill.

Table 2. Concentrations of Major Ions – February 2022 Sampling Event

Well-ID	Sodium (mg/L)	Sodium (meq/L)	Calcium (mg/L)	Calcium (meq/L)	Magnesium (mg/L)	Magnesium (meq/L)	Potassium (mg/L)	Potassium (meq/L)	Chloride (mg/L)	Chloride (meq/L)	Bicarbonate (mg/L)	Bicarbonate (meq/L)	Sulfate (mg/L)	Sulfate (meq/L)	Ion Balance (percent)
CC-1	5900	256.63	422	21.06	2320	190.87	32.4	0.83	1690	47.67	588	9.64	21200	441.39	-3
FC-1	5330	231.84	383	19.11	692	56.93	31.2	0.80	389	10.97	926	15.18	7350	153.03	26.5
FC1A	5890	256.20	421	21.01	1440	118.47	24.5	0.63	1390	39.21	803	13.16	16900	351.86	-1
FC-2	1640	71.34	395	19.71	613	50.43	2.58	0.07	58.6	1.65	350	5.74	3400	70.79	28.8
FC-2A	2370	103.09	425	21.21	636	52.32	15.1	0.39	168	4.74	367	6.01	7610	158.44	2.3
FC-3A	1450	63.07	405	20.21	536	44.10	2.74	0.07	130	3.67	369	6.05	5840	121.59	-1.5
FC-3B	2050	89.17	218	10.88	140	11.52	11.8	0.30	222	6.26	750	12.29	4530	94.32	-0.4
SC-10	3750	163.11	440	21.96	875	71.99	10.3	0.26	997	28.12	584	9.57	10300	214.45	1
SC-11	3040	132.23	437	21.81	702	57.75	12.2	0.31	554	15.63	385	6.31	4310	89.74	31
SC-12	2710	117.88	381	19.01	751	61.79	3.96	0.10	298	8.41	388	6.36	8560	178.22	1.5
SC-13	1940	84.38	379	18.91	733	60.30	2.95	0.08	82	2.31	405	6.64	3870	80.57	29.3
SC-14	1970	85.69	382	19.06	742	61.04	3.5	0.09	77.8	2.19	407	6.67	3960	82.45	29
SC-2	2020	87.86	375	18.71	741	60.96	2.85	0.07	160	4.51	421	6.90	3770	78.49	30.2
SC-3	4390	190.95	377	18.81	1250	102.84	6.75	0.17	352	9.93	292	4.79	7270	151.36	30.6
SC-7	4040	175.73	383	19.11	1010	83.09	12.5	0.32	531	14.98	836	13.70	11400	237.35	2.3
SC-8	1790	77.86	588	29.34	883	72.65	6.54	0.17	1340	37.80	762	12.49	3260	67.87	20.7
SC-9	4170	181.38	434	21.66	1240	102.02	19.1	0.49	1410	39.77	724	11.87	11400	237.35	2.8
WW-3A	3560	154.85	391	19.51	796	65.49	32.7	0.84	163	4.60	914	14.98	5690	118.47	27.1
WW-5A	1580	68.73	477	23.80	468	38.50	6.96	0.18	374	10.55	584	9.57	5040	104.93	2.4
WW-6A	13700	595.91	425	21.21	1410	116.00	72.8	1.86	750	21.16	1570	25.73	31500	655.84	2.2

Notes:
mg/L = milligrams per liter
meq/L = milliequivalents per liter

Table 3. Concentrations of Selenium and Nitrate – February 2022 Sampling Event

Well ID	Monitoring Status	HSU	Paleo-Alluvial Valley	Selenium (ug/L)	Nitrate + Nitrite (mg/L)
CC-1	Background	PCA	South	184	26
FC-1	Background	PCA	South	9.8	18
FC-2	Background	PCA	South	34.4	4.5
FC-3A	Background	PCA	South	38.5	3.2
FC-3B	Background	Kp	South	4.8	<0.1
SC-12	Downgradient	PCA	South	13.8	9.9
SC-13	Downgradient	PCA	South	25.1	2.8
SC-14	Cross-gradient	PCA	South	5.2	1.6
FC-1A	Not (upgradient)	PCA	South	20.1	31
FC-2A	Not (upgradient)	PCA	South	4.1	0.34
SC-2	Not (downgradient)	PCA	South	12.9	2.5
SC-3	Not (downgradient)	PCA	South	21.7	5.5
	Average		**South**	**31**	**9**
	Minimum		**South**	**4.1**	**0.1**
	Maximum		**South**	**184**	**31**
SC-10	Downgradient	PCA	North	210	240
SC-11	Downgradient	PCA	North	213	150
SC-7	Not (downgradient)	PCA	North	162	230
SC-8	Not (upgradient)	PCA	North	63.3	1100
SC-9	Not (upgradient)	PCA	North	205	430
WW-3A	*	Kp	North	4.1	82
WW-6A	*	Kp	North	412	750
	Average*		**North**	**171**	**430**
	Minimum		**North**	**63.3**	**150**
	Maximum		**North**	**213**	**1100**
WW-5A	*	Kp	Northeast	205	160

Notes:

*Wells WW-3A (Kp HSU), WW-5A (Northeast Paleo-Alluvial Valley, Kp HSU), and WW-6A (Northeast Paleo-Alluvial Valley, Kp HSU) shown but not included in calculations of average, minimum or maximum because they are screened primarily in the Kp HSU.

Monitoring Status refers to whether the well is in the CCR Landfill Detection Monitoring Program or whether it is not in the CCR Landfill Monitoring Program (“Not”). Also, if the well is a background monitoring well, an upgradient monitoring well (not in the CCR Landfill Monitoring Program), or a downgradient monitoring well.

ug/L = micrograms per liter

mg/L = milligrams per liter

Selenium Groundwater Chemistry

The detection of selenium above the GWPS at well SC-10 appears to be related to the occurrence of elevated groundwater nitrate concentrations in the North Paleo-Alluvial Valley and is likely from conditions that are unrelated to the presence or operation of the CCR Landfill as discussed below.

Selenium (Se) is known to be naturally elevated in the Pierre Shale bedrock (Kp HSU) and in the overlying PCA HSU clay-dominated sediments that comprise the uppermost aquifer at the Site. This condition and the potential for selenium to be mobilized into groundwater from the shale and shale-derived sediments is well documented in literature for the Colorado Front Range and in the Site vicinity as discussed below.

The geochemical conditions that create the potential for selenium to mobilize from the Pierre Shale involve the oxidizing conditions in the groundwater present at the site. The term “oxidizing conditions” refers to the oxidation-reduction potential, or redox state, of the groundwater. Redox processes require one chemical species that donates electrons and another chemical species that accepts those electrons. As a chemical species donates electrons it is oxidized and as the other species accepts electrons it is reduced. In general, if dissolved oxygen is present in the water, it is the preferred electron acceptor, however, oxygen present in oxygen-bearing compounds such as nitrate can also provide a source of electron acceptance in groundwater.

According to Bailey et al. (2012), “oxidation of reduced Se from shale by autotrophic denitrification is a major driver in the release of SeO_4 and sulfate. For the process of autotrophic reduction, O_2–rich or NO_3–rich groundwater coming into contact with shale present in the shallow or deep subsurface layers oxidizes reduced Se to mobile forms. Also, SeO_4 can be produced through oxidation of residual Se by O_2 or NO_3 (Plate 1), for example in the oxidation of $FeSe_2$ within geologic formations:”

$$5FeSe_2 + 14NO_3^- + 4H^+ \rightarrow$$
$$5Fe^{2+} + 10SeO_4^{2-} + 7N_2 + 2H_2O$$

Bailey (2012) also states that, “Selenium is present in nature primarily in the four oxidation states of (Se VI) selenate [SeO_4^{2-}], (Se IV) selenite [SeO_3^{2-}], elemental selenium [Se^0], and Se (-II) selenide [Se^{2-}]. Soluble species of Se include SeO_4, SeO_3, whereas Se^0 and forms of Se^{2-} are insoluble and hence immobile unless suspended. Due to the biogeochemistry of Se and its dependence on redox conditions, Se speciation is largely dependent on local environmental conditions, although SeO_4 has been reported to account for approximately 90 to 95% of soluble Se in oxygenated agricultural waters (Masscheleyn et al., 1990; Gates et al., 2009).”

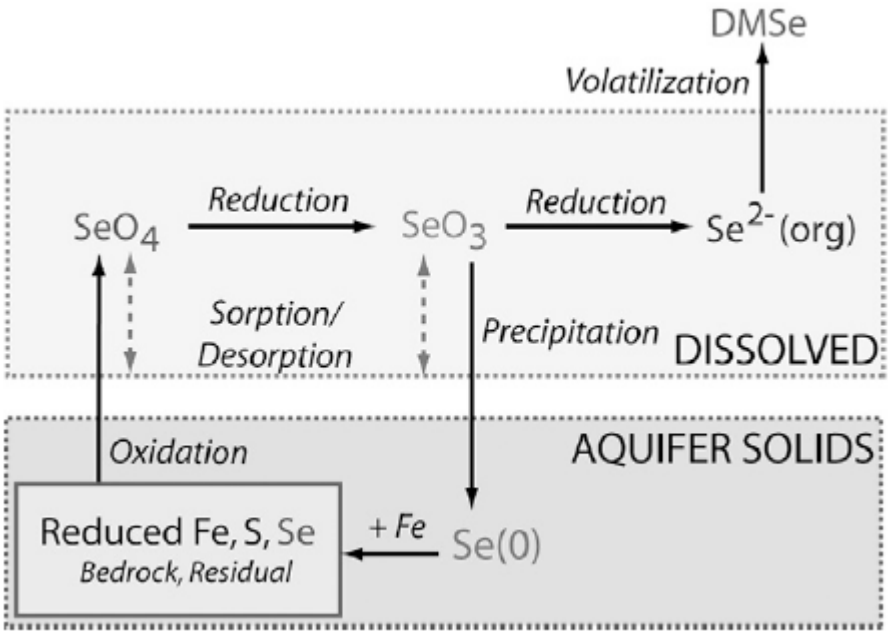


Plate 1. Oxidation-reduction transformations of Se species in a soil and groundwater system. DMSe, dimethyl-selenide. From Bailey et al. (2012)

Cretaceous-aged marine shales were deposited across a broad region of Colorado during the time the Cretaceous Interior Seaway was present in the mid-continent. The Colorado Cretaceous-aged marine shales present east of the Continental Divide are named the Pierre Shale, and west of the divide the Mancos Shale. Mills et al. (2016) studied selenium distribution and mobilization in the Mancos Shale in the Uncompahgre River Basin and reported: “We analyzed Se species, major and trace elements, and stable nitrogen and oxygen isotopes of nitrate in groundwater and aquifer sediments to examine processes governing selenium release and transport in the shallow groundwater system.” Groundwater Se concentrations ranged from below detection limit (< 0.5 micrograms per liter [µg/L]) to 4070 µg/L, and primarily are controlled by high groundwater nitrate concentrations that maintain oxidizing conditions in the aquifer despite low dissolved oxygen concentrations. High nitrate concentrations in non-irrigated soils and nitrate isotopes indicate nitrate is largely derived from natural sources in the Mancos Shale and alluvial material.

A study of the occurrence of selenium in groundwater at Fort Carson, Colorado (Summit, 2011) concluded the following:

> “The percentage of well screen in contact with the Pierre Shale is positively correlated with the maximum concentrations of selenium in groundwater. The high degree of correlation between selenium and nitrate concentrations may point toward a common source and underscores the oxidative nature of nitrate as a release mechanism for the dissolution of selenium associated with shale deposits. Qualitative and quantitative data analysis indicate a naturally occurring source (Pierre Shale) for relatively high selenium concentrations in Fort Carson’s compliance monitoring wells.”

As discussed above, Fort Carson borders Clear Spring Ranch to the West.

The documented presence of elevated selenium in Pierre Shale bedrock and the documented potential for selenium to be mobilized into groundwater in the presence of nitrate supports the conclusion that the selenium detected at SC-10 is not related to the CCR Landfill and is instead a function of background influences. Calculations to derive background concentrations for CCR Landfill Assessment monitoring of selenium do not currently include groundwater samples collected from monitoring wells located hydraulically upgradient of wells SC-10 and SC-11.

4 Conclusions

The lines of evidence supporting an ASD for the elevated selenium concentration and SSL in samples from well SC-10 are:

1. Groundwater flow within the PCA HSU beneath the CCR Landfill is present within two hydraulically-separate buried paleo-alluvial valley drainages, a North Paleo-Alluvial Valley and a South Paleo-Alluvial Valley. The paleo-alluvial valleys are separated by a bedrock high located beneath the west-central region of the landfill. Groundwater in the North and South Paleo-Alluvial Valleys is entirely separated by the geologic structure down the valleys until groundwater encounters the retention dam and slurry wall.
2. Groundwater chemistry is significantly different in the North Paleo-Alluvial Valley as compared to the South Paleo-Alluvial Valley. Groundwater samples used to calculate background or upgradient concentrations of Appendix III and Appendix IV constituents are *all* obtained from monitoring wells completed within the PCA HSU in the South Paleo-Alluvial Valley. Background concentrations for Appendix IV constituents are applied to downgradient monitoring wells located in both the South and North Paleo-Alluvial Valleys. However, groundwater chemistry upgradient of the north side of the CCR Landfill is significantly different than the chemistry of groundwater flowing in the South Paleo-Alluvial Valley.
3. Nitrate concentrations in groundwater samples from monitoring wells located in the North Paleo-Alluvial Valley are significantly higher than samples obtained from wells located in the South Paleo-Alluvial Valley. Concentrations of selenium are correspondingly significantly higher in wells located in the North Paleo-Alluvial Valley than wells located in the South Paleo-Alluvial Valley.
4. Laboratory column studies and field studies described in the literature in areas where Cretaceous marine shales (Pierre and Mancos) are present have shown that the presence of elevated concentrations of nitrate in groundwater can maintain oxidizing conditions sufficient to mobilize and transport selenium despite low dissolved oxygen concentrations. Selenium is naturally occurring in the Pierre Shale and likely within clayey alluvial sediments derived from the Pierre Shale in the Clear Spring Ranch region.
5. Boron concentrations in groundwater initially triggered the move from Detection to Assessment monitoring at the CCR Landfill. The concentration of boron in well SC-10, the well triggering the SSL for selenium, is one-half to one-third of the concentration of boron that triggered Assessment monitoring and remains below the upper predictive limit for background, suggesting that the selenium is unrelated to the landfill.

These lines of evidence support the determination that the elevated concentrations of selenium in well SC-10 are due to background conditions and are not related to the presence or operation of the CCR Landfill.

5 Limitations

The signature of Consultant’s authorized representative on this document represents that, to the best of Consultant’s knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant’s experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

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Scott, G.R., R.B. Taylor, R.C. Epis, and R.A. Wobus. 1978. Geologic Map of the Pueblo 1° x 2° Quadrangle, South-Central Colorado. U.S. Geological Survey Miscellaneous Investigations Series Map I-1022, 1:250,000 Scale.

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FIGURES

Project Manager initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

Legend

- Boundary Certificate of Designation
- Boundary CCR Landfill

Note: Aerial imagery from ESRI.

1 inch = 1,500 feet

0 500 1,000 2,000

Feet

N

AECOM

Title:

Site Location Map
Clear Spring Ranch Facilities

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	1

Project Manager Initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

Legend

HSU

- Well in PCA HSU
- Well in Kp HSU
- Boundary CCR Landfill
- Boundary Certificate of Designation

N

1 inch = 500 feet

0 250 500 1,000

Feet

Note: .

AECOM

Title:

CCR Landfill
Monitoring Well Location Map

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	2

Project Manager Initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

HA-208 NL
HA-206 NL
HA-207 NL
WW-6A 5479.00
B-14 5467.50
LD-7 5507.00
LD-8 5508.00
K-1 5506.41
HA-211 NL
K-2 5501.02
B-15 5499.00
K-3 5481.00
HA-209 NL
WW-3A 5459.90
77-25 5448.40
K-4 5476.54
77-14 5459.40
HA-21 5462.00
HA-20 5449.00
HA-19 5430.00
HA-18 5427.00
HA-17 5435.00
HA-16 5456.00
K-11 5495.01
WW-2A NA
WW-7A 5473.17
77-26 5457.20
77-24 5440.00
77-15 5445.80
WW-5A 5426.33
77-13 5409.80
K-5 5477.89
R-33 5475.36
SC-8 5441.41
SC-9 5430.83
SC-6 5446.00
R-32 5465.32
R-30 5471.24
R-21 5463.85
FC-1 5451.90
R-31 5466.30
R-26 5461.73
K-7 5462.16
FC-1A 5471.45
R-28 5458.94
R-25 5466.93
K-6 5463.37
SC-10 5415.18
SC-1A NE
SC-5 NE
SC-1 5415.50
SC-11 5411.94
SC-7 5408.67
77-23 5453.40
77-16 5426.80
77-12 5410.80
FC-3A 5447.95
FC-3B 5447.54
R-11 5456.60
SC-12 5417.07
K-8 NDE
77-27 5444.20
SC-14 5420.20
77-17 5419.80
SC-2 5420.80
SC-3 NE
77-18 5420.00
77-19 5422.50
FC-2 NE
FC-2A 5455.63
77-28 5441.40
77-22 5432.80
77-20 5424.90
77-11 5417.40
WC-77-201 5442.80
WC 77-203 5438.90
WC-77-204 5444.90
CC-1 5439.60

5480
5470
5460
5450
5440
5430
5420
5410

Northeast Paleo-Alluvial Valley
North Paleo-Alluvial Valley
South Paleo-Alluvial Valley

Legend

- Borehole Top of Bedrock Elevation
- Top of Shale Bedrock (10-ft Interval)
- Boundary - Piney Creek Alluvium HSU, Approximate
- NHDFlowline +Additions
- Boundary Certificate of Designation
- Boundary CCR Landfill

Note: bedrock elevations derived from existing historical borhole logs. Supplemented with NHD Contours from historic USGS topographic map of Butte Quadrangle. Supplemented with NHD Flowlines and additional drainage discretization from 1947 aerial imagery.

1 inch = 700 feet
0 250 500 1,000
Feet

N

AECOM

Title:

Top of Pierre Shale Bedrock Structure Contour Map

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	3

Project Manager initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

WW-6A
WW-3A
WW-5A
SC-8 5455.9
SC-9 5440.33
SC-10 5432.73
SC-11 5432.15
SC-7 5431.1645
SC-12 5432.61
SC-13 5434.05
SC-14 5438.19
SC-2 5432.19
SC-3 5419.22
FC-1 5468.8
FC-1A 5468.09
FC-3A 5461.79
FC-3B
FC-2 5468.31
FC-2A 5464.89
CC-1 5461.4

Legend

HSU

- Well in PCA HSU
- Well in Kp HSU

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary - Piney Creek Alluvium HSU Approximate
- Boundary Certificate of Designation
- Boundary CCR Landfill

N

1 inch = 700 feet

0 250 500 1,000

Feet

Note: Groundwater elevations at monitoring wells completed predominantly in the Kp HSU used as general guidance for construction of PCA HSU elevation contours

AECOM

Title:

Potentiometric Surface Map
Piney Creek Alluvium HSU Wells

Depth to Water Measured
February 8 and 9, 2022

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	4

Project Manager initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

WW-6A
WW-3A
WW-5A
SC-8 5455.9
SC-9 5440.33
SC-10 5432.73
SC-11 5432.15
SC-7 5431.1645
SC-12 5432.61
SC-13 5434.05
SC-14 5438.19
SC-3 5419.22
SC-2 5432.19
FC-1 5468.8
FC-1A 5468.09
FC-3A 5461.79
FC-3B
FC-2 5468.31
FC-2A 5464.89
CC-1 5461.4

Legend

HSU

- Well in PCA HSU
- Well in Kp HSU
- Groundwater Flow Line

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary - Piney Creek Alluvium HSU
- Boundary CCR Landfill
- Boundary Certificate of Designation

Note: Groundwater elevations at monitoring wells completed predominantly in the Kp HSU used as general guidance for construction of PCA HSU elevation contours

Groundwater flow lines are drawn perpendicular to potentiometric surface contours.

N

1 inch = 700 feet

0 250 500 1,000

Feet

AECOM

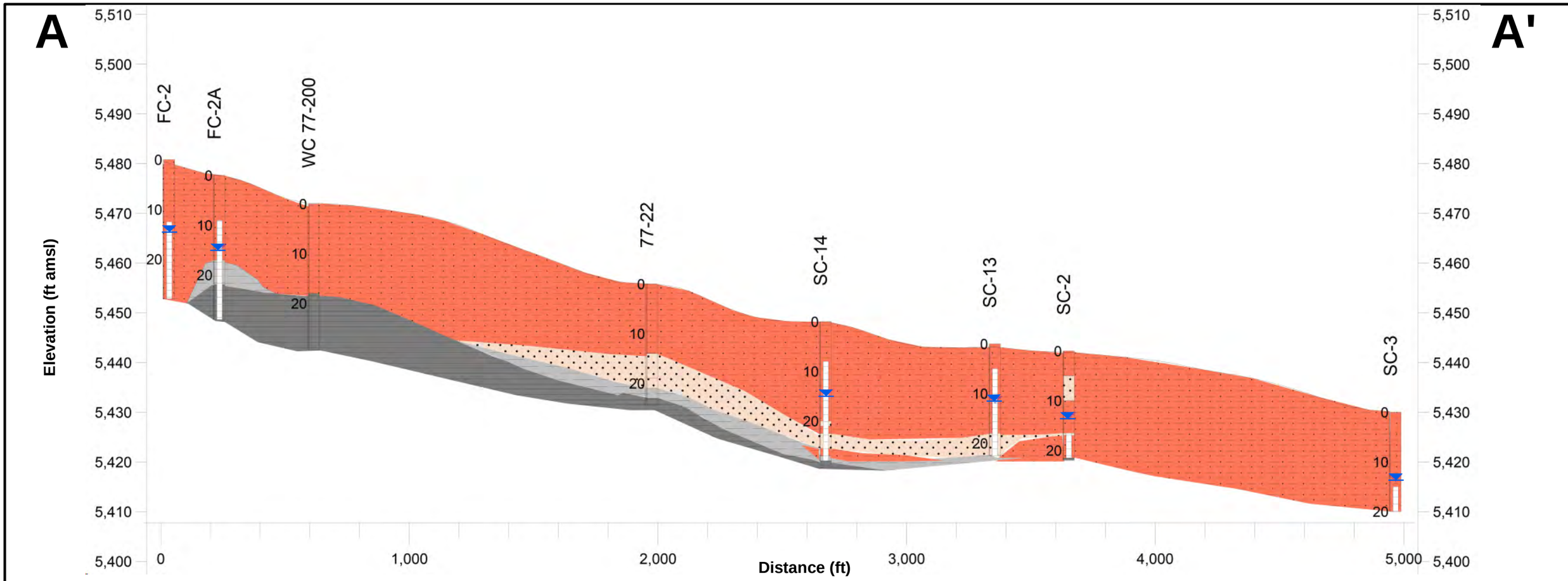
Title:
Potentiometric Surface Map and Groundwater Flow Lines Piney Creek Alluvium HSU Wells

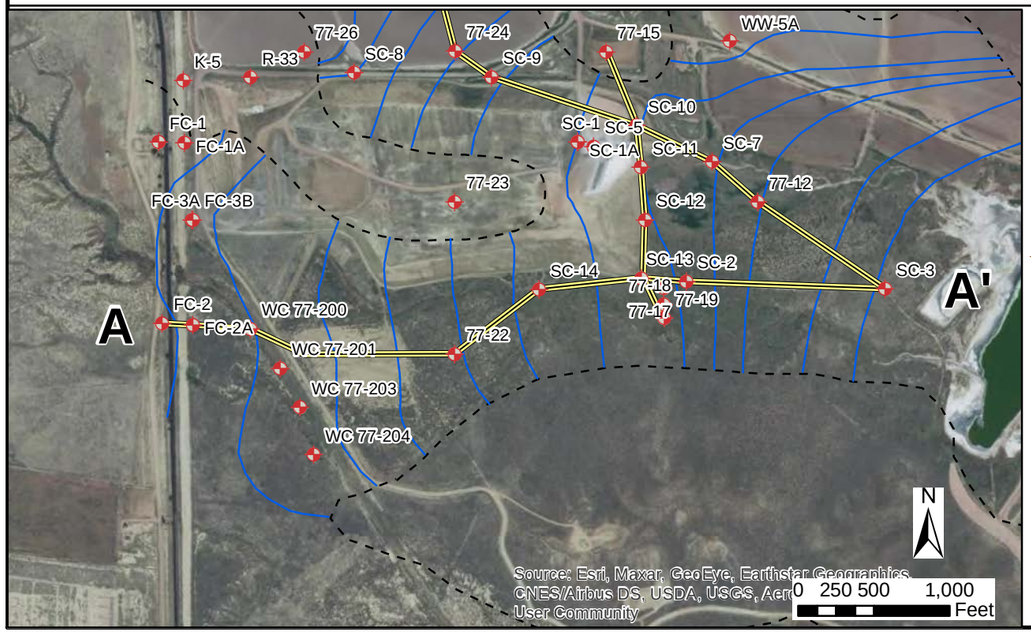
Depth to Water Measured February 8 and 9, 2022

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	5

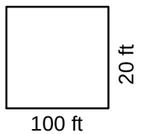




Legend

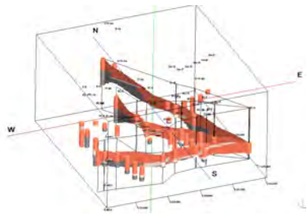
- Borehole Locations
- Cross Section Transects
- 2022 Potentiometric Surface Contours (ft)
- Boundary for Piney Creek Alluvium HSU
- 2022 Groundwater elevation
- Well Screen Interval

Note:
Vertical and horizontal distances not to same scale.
20x Vertical exaggeration.
Select borehole logs omited from map for clarity.



Lithology

- Sandy and Gravelly Alluvium
- Clayey Alluvium
- Claystone
- Pierre Shale



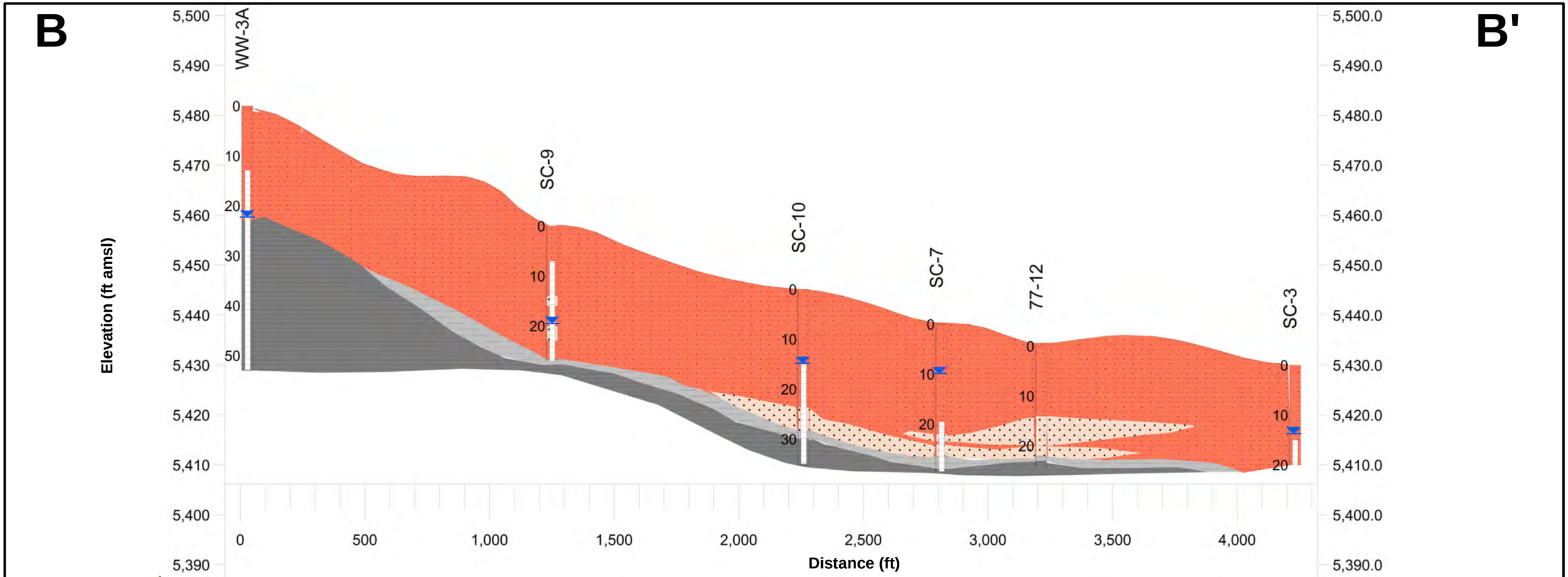
AECOM

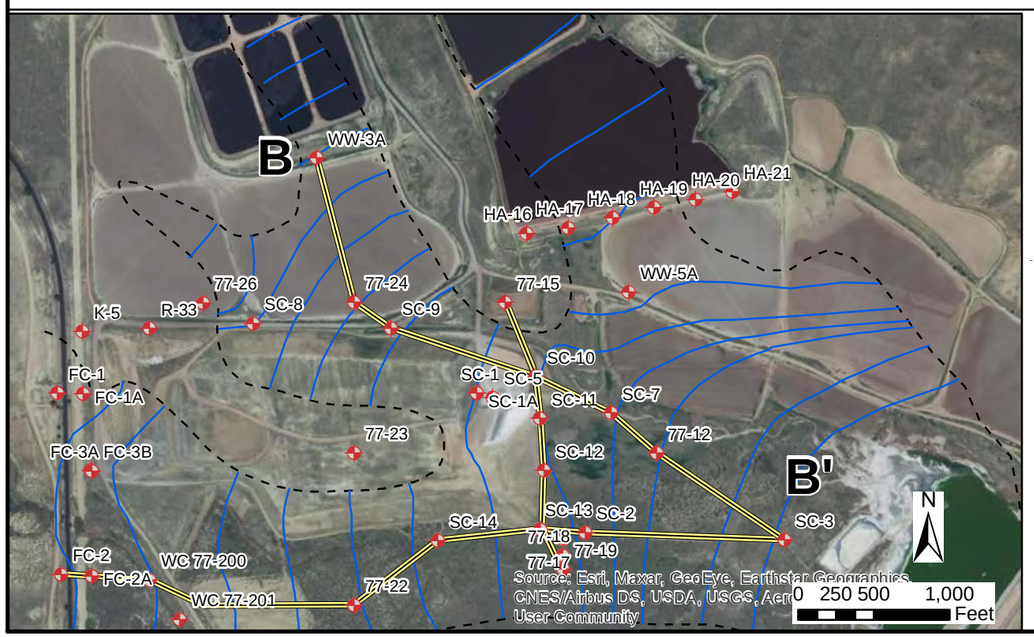
Title: **Cross Section A-A'**

Project: Colorado Springs Utilities ASD

Location: Colorado Springs Utilities Fountain, CO 80817

Project No.:	Date:	Figure:
60681138	4/21/2022	6





Legend

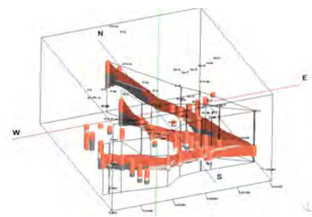
- Borehole Locations
- Cross Section Transects
- 2022 Potentiometric Surface Contours (ft)
- Boundary for Piney Creek Alluvium HSU
- 2022 Groundwater elevation
- Well Screen Interval

Note:
Vertical and horizontal distances not to same scale.
20x Vertical exaggeration.
Select borehole logs omitted from map for clarity.

20 ft
100 ft

Lithology

- Sandy and Gravelly Alluvium
- Clayey Alluvium
- Claystone
- Pierre Shale



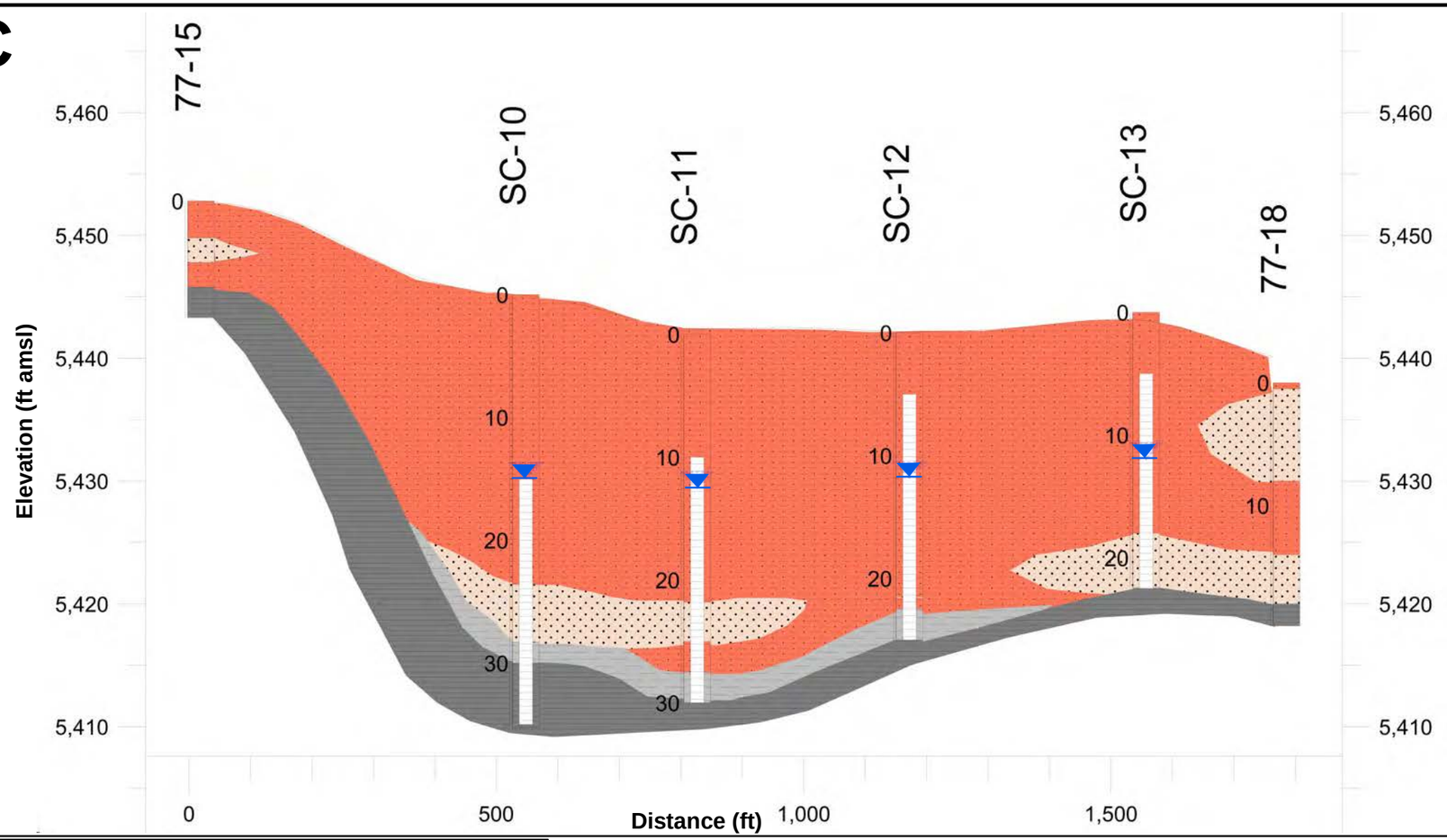
AECOM

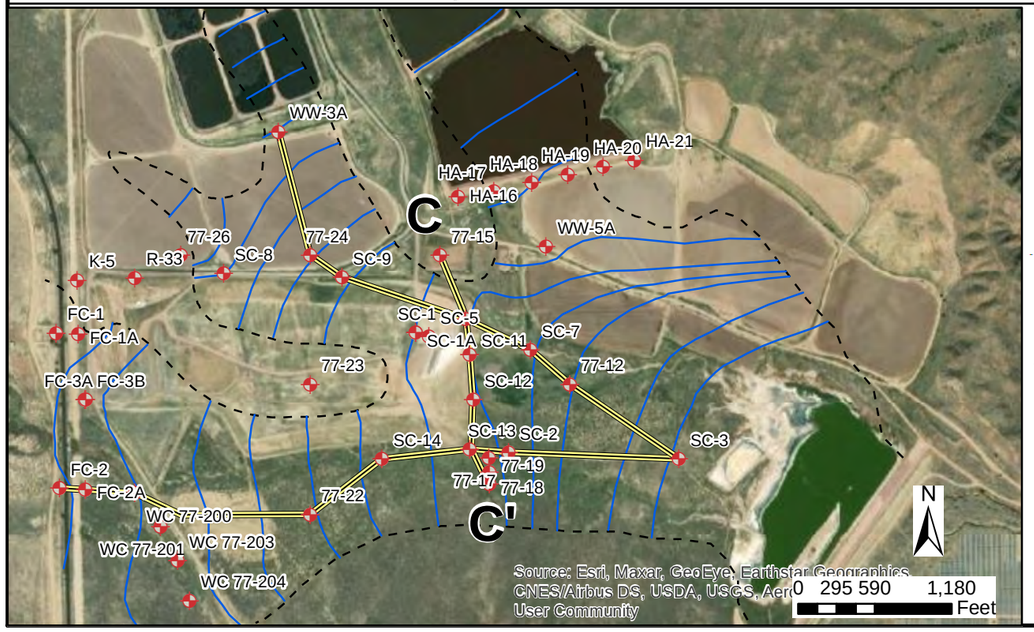
Title: **Cross Section B-B'**

Project: Colorado Springs Utilities ASD

Location: Colorado Springs Utilities Fountain, CO 80817

Project No.:	Date:	Figure:
60681138	4/21/2022	7

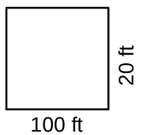




Legend

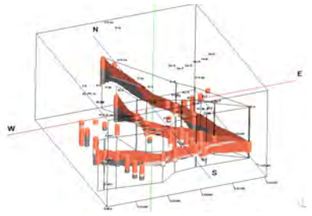
- Borehole Locations
- Cross Section Transects
- 2022 Potentiometric Surface Contours (ft)
- Boundary for Piney Creek Alluvium HSU
- 2022 Groundwater elevation
- Well Screen Interval

Note:
Vertical and horizontal distances not to same scale.
20x Vertical exaggeration.
Select borehole logs omitted from map for clarity.



Lithology

- Sandy and Gravelly Alluvium
- Clayey Alluvium
- Claystone
- Pierre Shale



AECOM

Title:	**Cross Section C-C'**
Project:	Colorado Springs Utilities ASD
Location:	Colorado Springs Utilities Fountain, CO 80817
Project No.: 60681138	Date: 4/21/2022
Figure:	**8**

Project Manager Initials:CRG Designer:NEF Checked:CRG Approved:CRG ANSI 11" x 17"

Legend

HSU

- Well in PCA HSU
- Well in Kp HSU

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary - Piney creek Alluvium HSU Approximate
- Boundary CCR Landfill
- Boundary Certificate of Designation

N

1 inch = 800 feet

0 400 800 1,600

Feet

Note: Charge balance errors for several samples exceeded 10% but results are included on this figure.

AECOM

Title:	**Major Ion Concentration Stiff Diagram Map**
Project:	ASD for Well SC-10 CCR Landfill
Location:	Clear Spring Ranch El Paso County, CO
Project No.:	60681138
Date:	4/21/2022
Figure:	**9**

Project Manager initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

412 5430 WW-6A 750 5475 5470 5465 5475 5470 5465 5460 5460 4.1 82 WW-3A 5455 5450 5445 5465 5460 5455 5450 5445 5440 205 160 WW-5A 5435 5432.5 5430 5425 1100 63.3 SC-8 205 430 SC-9 210 240 SC-10 213 150 SC-11 162 SC-7 13.8 9.9 SC-12 9.8 20.1 18 FC-1A 38.5 2.2 FC-3A FC-3B 25.1 12.9 5.2 1.6 SC-14 2.8 SC-13 2.5 SC-2 21.7 5.5 SC-3 34.4 4.1 4.5 0.34 FC-2 FC-2A 184 26 CC-1

Legend

HSU

- Well in PCA HSU
- Well in Kp HSU

Analyte

Nitrate (mg/L)

- 0.1 - 10
- 10 - 100
- 100 - 200
- 200 - 1100

Selenium (ug/L)

- 4.1 - 10.0
- 10 - 100
- 100 - 200
- 200 - 500

- Groundwater Flow Line

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary - Piney Creek Alluvium HSU
- Boundary CCR Landfill
- Boundary Certificate of Designation

0 250 500 1,000
Feet

Note: 1 inch = 700 feet

N

AECOM

Title:

Selenium and Nitrate Concentrations and PCA HSU Potentiometric Surface Piney Creek Alluvium and Kp HSU Wells February 8 and 9, 2022

Project:
ASD for Well SC-10
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	10

Project Manager Initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

WW-6A 1920
WW-3A 1410
SC-8 1190
SC-9 1350
SC-10 1250
SC-11 2530
SC-7 1190
SC-12 4480
SC-13 1600
SC-2 1680
SC-14 1600
SC-3 1130
WW-5A 832
FC-1FC-1A 1090
FC-3B 1300
FC-2A 746
CC-1 1000

Legend

Total Boron (ug/L)

- 746 - 1000
- 1000 - 1500
- 1500 - 2000
- 2000 - 4500
- Groundwater Flow Line

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary CCR Landfill
- Boundary - Piney Creek Alluvium HSU
- Boundary Certificate of Designation

1 inch = 700 feet

0 250 500 1,000

Feet

N

Note: Groundwater elevations from depth to water measured February 8 and 9, 2022.

AECOM

Title:

Boron Concentrations and PCA HSU Potentiometric Surface Piney Creek Alluvium and Kp HSU Wells February 8 and 9, 2022

Project:

ASD for Well SC-10
CCR Landfill

Location:

Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60681138	4/21/2022	11

Appendix A CCR Landfill Monitoring Well Completion Logs

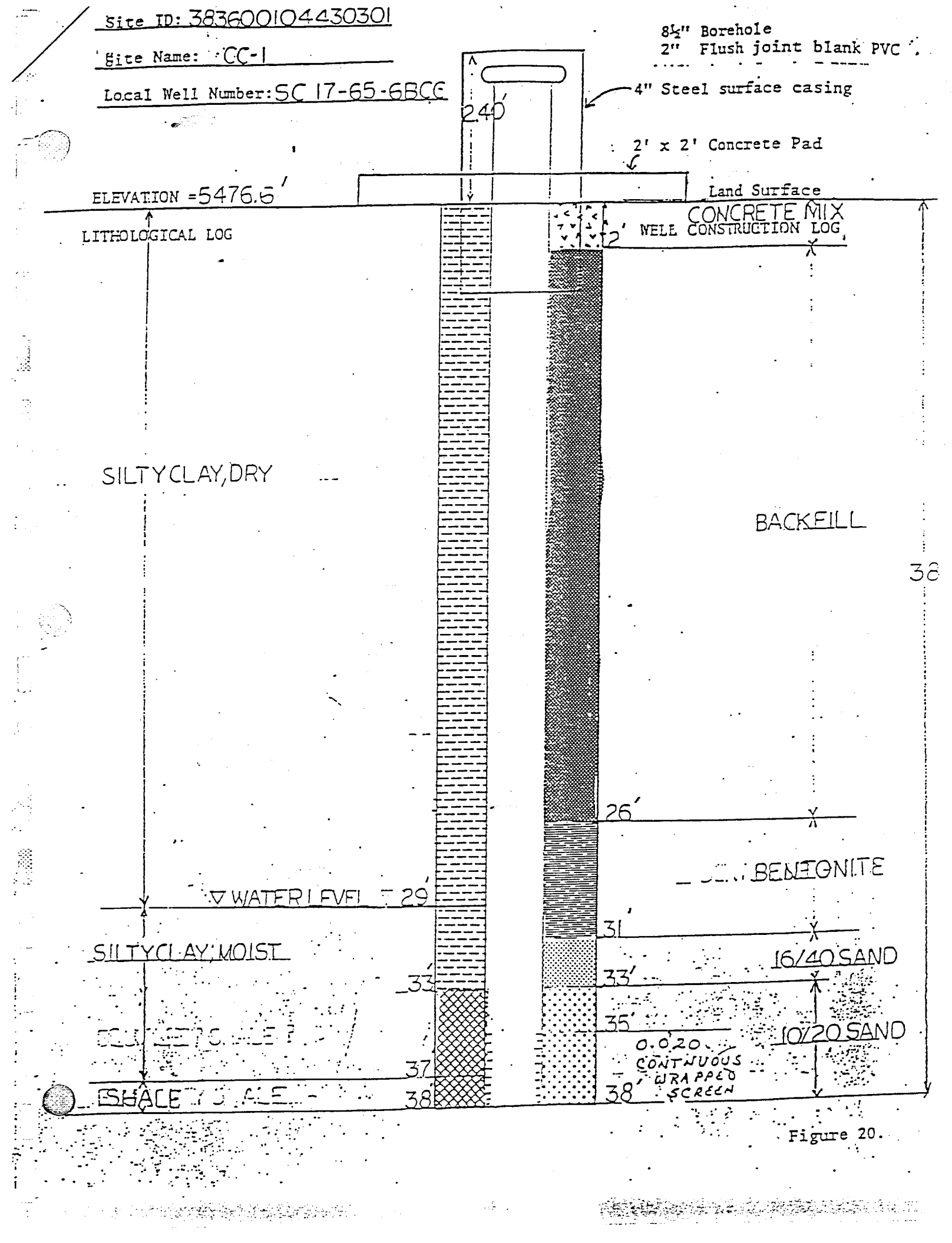

Site ID: 383600104430301
Site Name: CC-1
Local Well Number: SC 17-65-6BCC
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
Land Surface
ELEVATION = 5476.6'
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
CONCRETE MIX
2'
2.40'
SILTY CLAY, DRY
BACKFILL
26'
BENTONITE
WATER LEVEL 29'
31'
SILTY CLAY; MOIST
16/40 SAND
33'
33'
35'
10/20 SAND
0.020" CONTINUOUS WRAPPED SCREEN
37'
38'
38'

Figure 20.

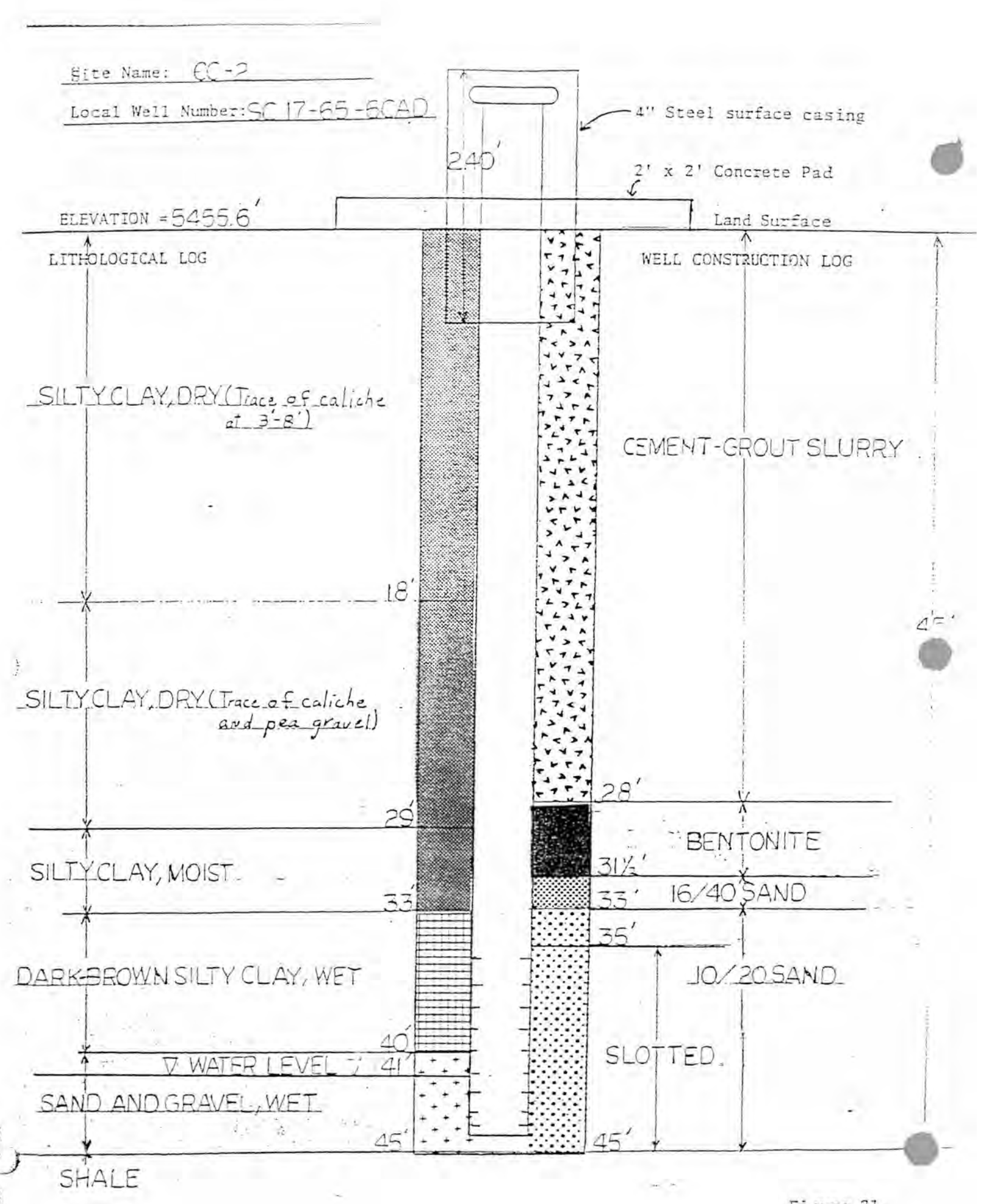

Site Name: EC-2
Local Well Number: SC 17-65-6CAD
4" Steel surface casing
240'
2' x 2' Concrete Pad
ELEVATION = 5455.6'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
SILTY CLAY, DRY (Trace of caliche at 3'-8')
CEMENT-GROUT SLURRY
18'
SILTY CLAY, DRY (Trace of caliche and pea gravel)
28'
29'
BENTONITE
SILTY CLAY, MOIST
31½'
33'
16/40 SAND
35'
DARK-BROWN SILTY CLAY, WET
10/20 SAND
40'
SLOTTED
▽ WATER LEVEL 41'
SAND AND GRAVEL, WET
45'
45'
SHALE

Figure 21.

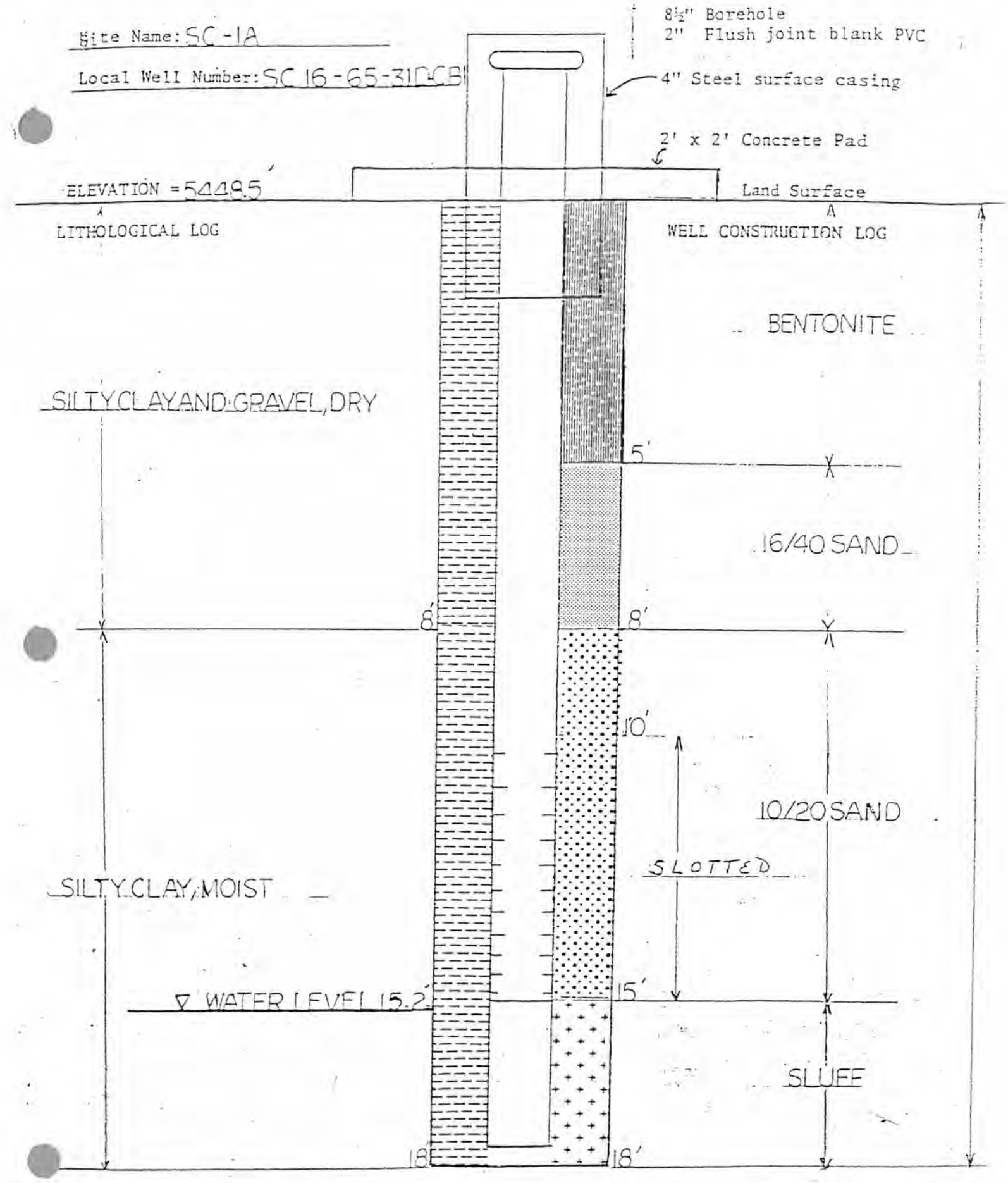

Site Name: SC-1A
Local Well Number: SC 16-65-31DCB1
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5449.5'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
BENTONITE
SILTY CLAY AND GRAVEL, DRY
5'
16/40 SAND
8'
8'
10'
10/20 SAND
SLOTTED
SILTY CLAY, MOIST
WATER LEVEL 15.2'
15'
SLUFF
18'
18'

Figure 4.

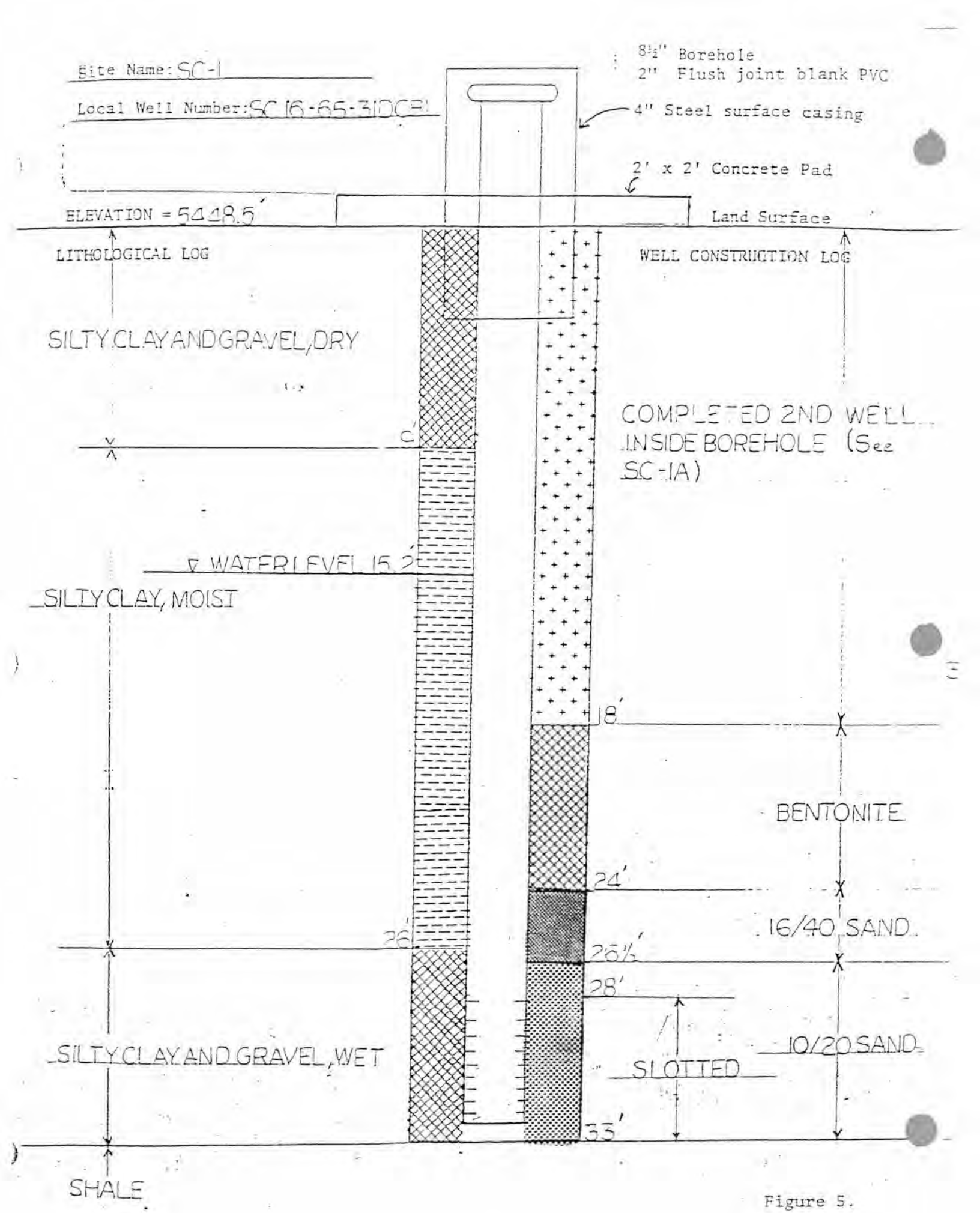

Site Name: SC-1
Local Well Number: SC 16-65-31DCB1
ELEVATION = 5448.5'
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
SILTY CLAY AND GRAVEL, DRY
COMPLETED 2ND WELL INSIDE BOREHOLE (See SC-1A)
6'
WATER LEVEL 15.2'
SILTY CLAY, MOIST
18'
BENTONITE
24'
16/40 SAND
26'
26½'
28'
SILTY CLAY AND GRAVEL, WET
10/20 SAND
SLOTTED
33'
SHALE

Figure 5.

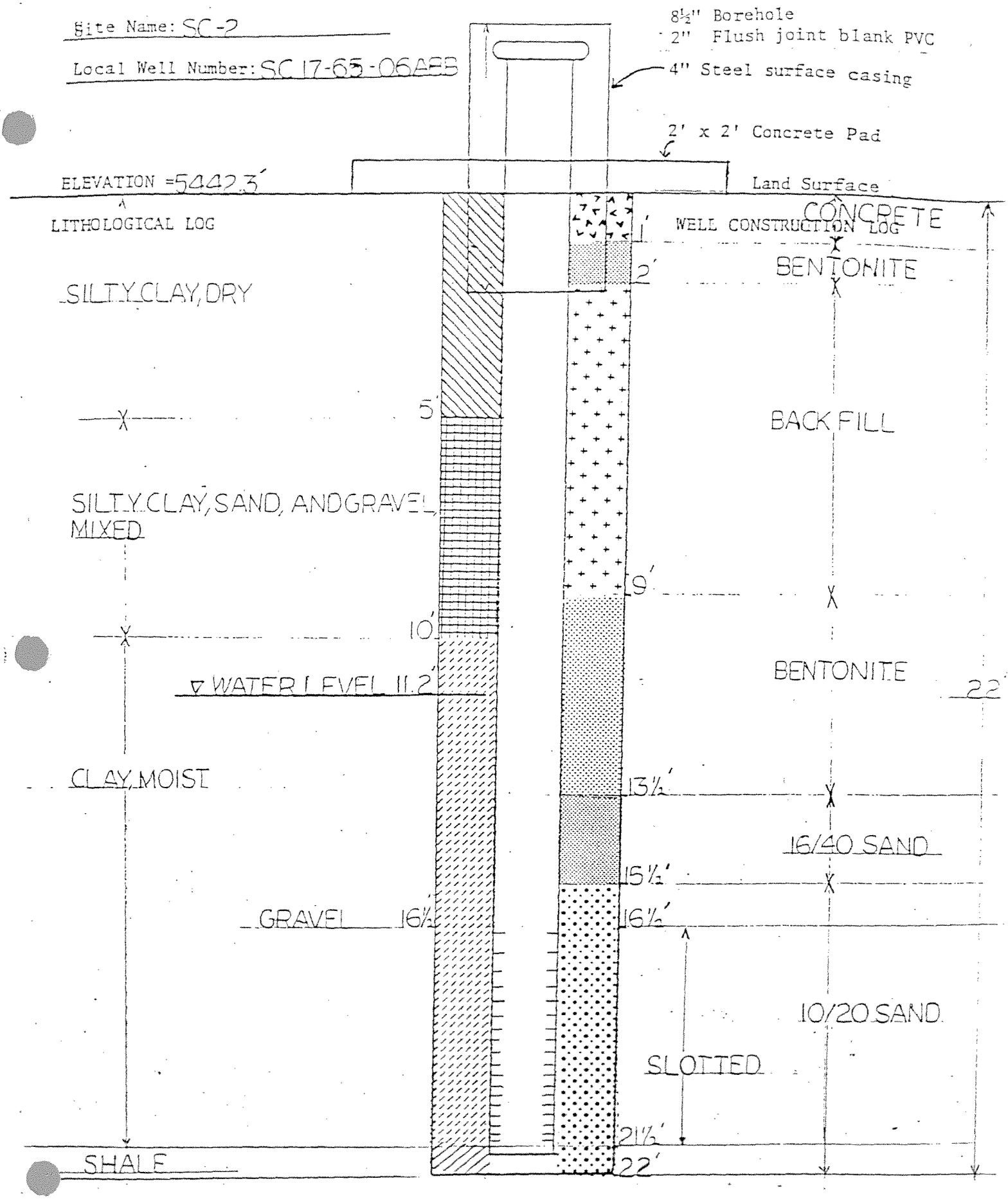

Site Name: SC-2
Local Well Number: SC 17-65-06AEB
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5442.3'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
SILTY CLAY, DRY
SILTY CLAY, SAND, AND GRAVEL, MIXED
CLAY, MOIST
GRAVEL
SHALE
CONCRETE
BENTONITE
BACK FILL
BENTONITE
16/40 SAND
10/20 SAND
SLOTTED
1'
2'
5'
9'
10'
WATER LEVEL 11.2'
13½'
15½'
16½'
16½'
21½'
22'
22'

Figure 6.

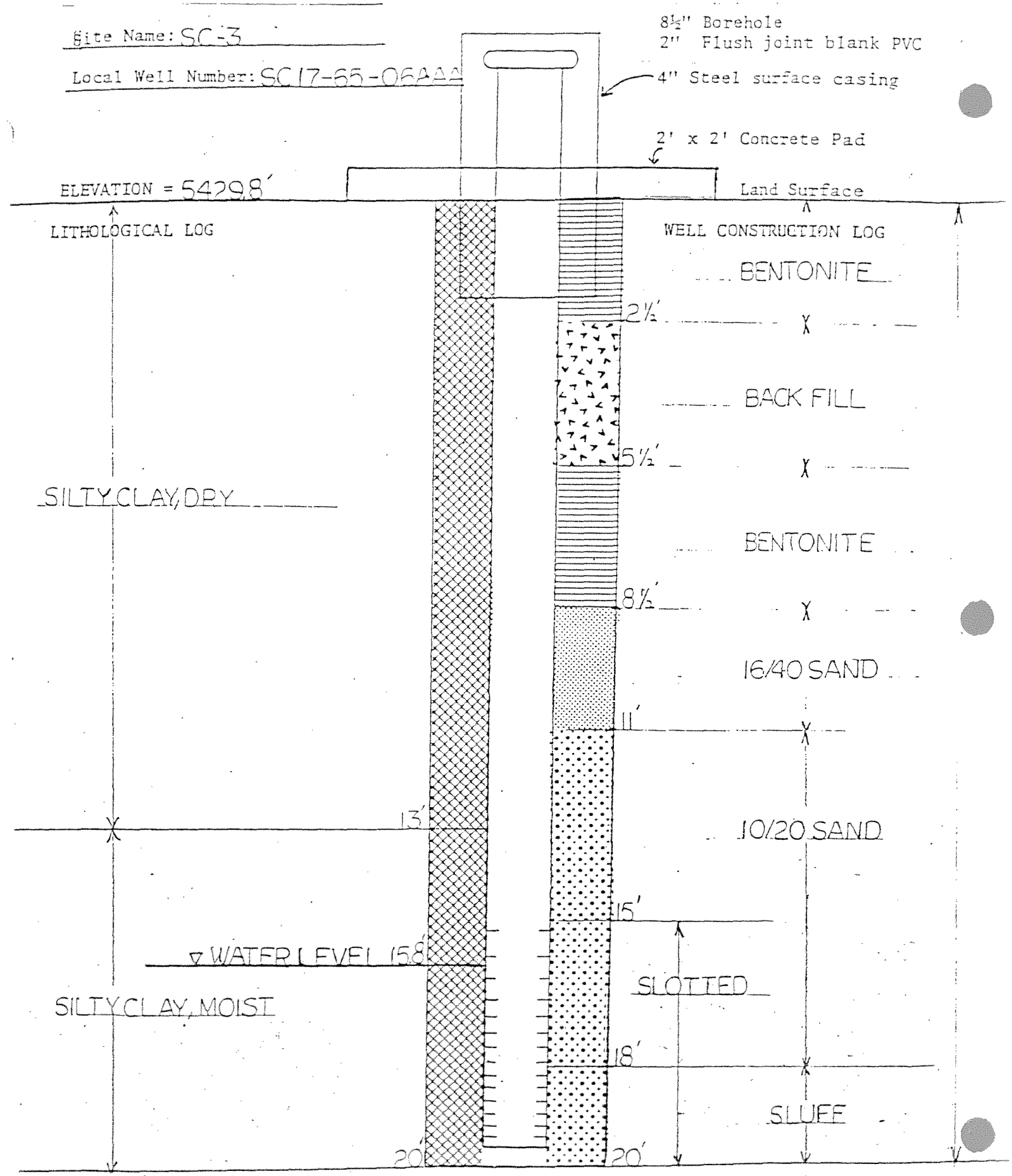

Site Name: SC-3
Local Well Number: SC 17-65-06AAA
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5429.8'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
BENTONITE
2½'
BACK FILL
5½'
SILTY CLAY, DRY
BENTONITE
8½'
16/40 SAND
11'
13'
10/20 SAND
15'
▽ WATER LEVEL 15.8'
SLOTTED
SILTY CLAY, MOIST
18'
SLUFF
20'
20'

Figure 7.

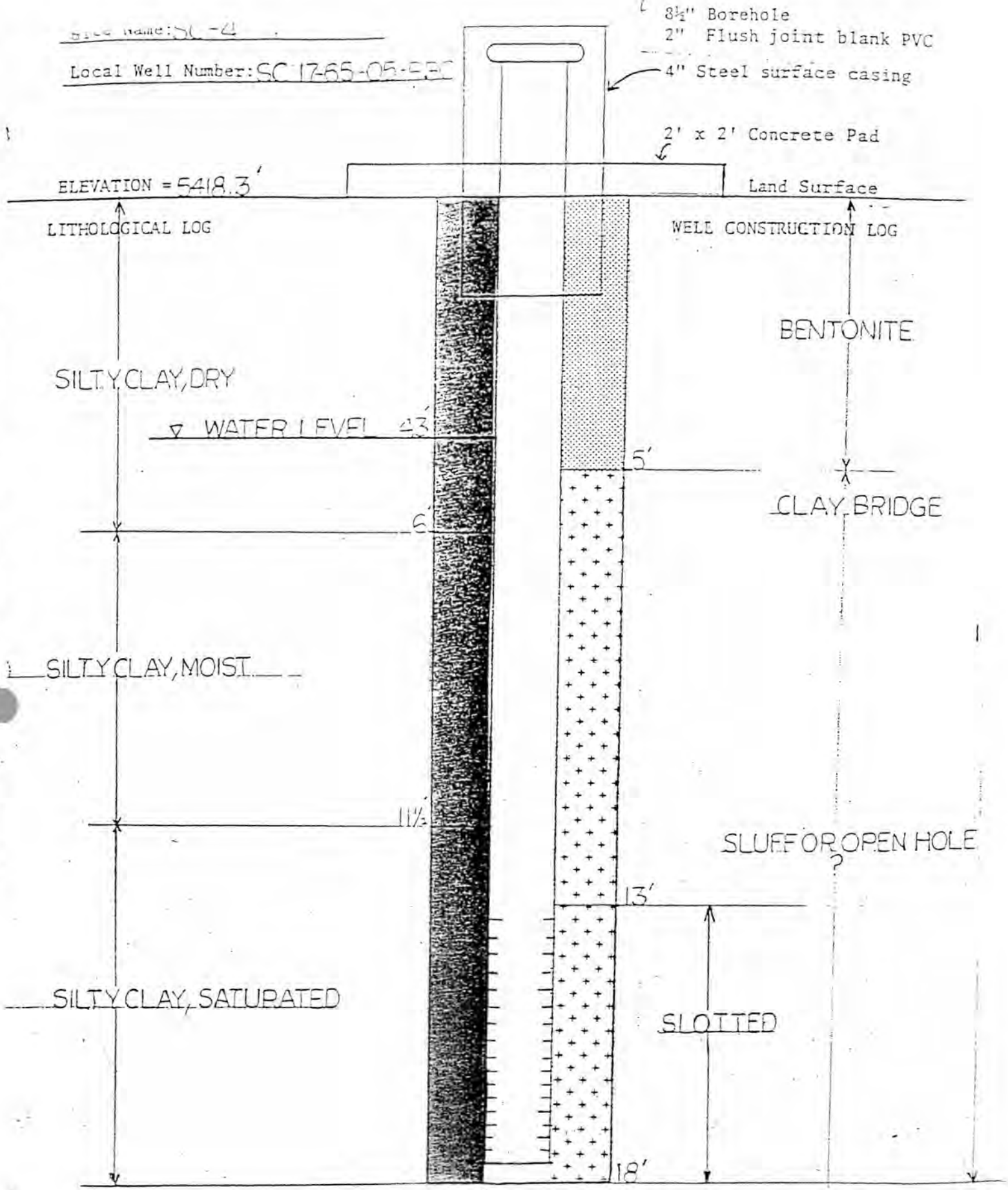

Site Name: SC-4
Local Well Number: SC 17-65-05-533C
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5418.3'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
BENTONITE
SILTY CLAY, DRY
WATER LEVEL 4.3'
5'
CLAY BRIDGE
6'
SILTY CLAY, MOIST
11½'
SLUFF OR OPEN HOLE
?
13'
SILTY CLAY, SATURATED
SLOTTED
18'

Figure 8.

PROJECT #: 09959105

PROJECT NAME: Clear Spring Ranch

ADDRESS:

CITY / STATE: Fountain, Colorado

RESOURCE GEOSCIENCE, INC.
3740 Wabash Street
Colorado Springs, Colorado

WELL # SC-5

SUBSURFACE PROFILE			SAMPLE					WELL DETAIL
Depth	Lithology	Description	Number	Type	PID Reading	Blow Counts	Lab Number	
0		GROUND SURFACE						
		SANDY CLAY low density, low moisture, low cohesion, low to moderate plasticity, dark brown						
5								
		CLAY low density, moderate to high moisture, moderate cohesion, moderate to high plasticity, dark brown						
10								
		CLAY low density, high moisture to saturated, moderate to high cohesion, moderate to high plasticity, dark brown						
15								
		CLAY low density, saturated, high cohesion, high plasticity, tan to grey						
20								
25								
		CLAY moderate density, saturated, high cohesion, high plasticity, tan to grey.						
30								
		END OF BORING						
35								

Stratification lines represent approximate boundary lines between soil and rock types. In-situ, the transition may be gradual.

DRILL DATE: 9/5/07
ENGINEER: Darrell Robbins
DRILLER: RGI
DRILL METHOD: HSA = Hollow Stem Auger
HOLE SIZE: 8"

COLLAR ELEVATION:
GROUND ELEVATION:
DEPTH TO GROUND WATER: 10' at 0 Hrs
GROUND WATER ELEVATION:
TOTAL DEPTH OF BORING: 30'

PROJECT NO.	LOG OF TEST BORING SC-6	SHEET
17229		1 OF 2

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT. 140 LBS. DROP 30 INCHES	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER		N/A	35'

DATE			
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM	GROUNDWATER DEPTH 19'	DATE AT DRILLING
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE	20'	5/31/02
BACKFILLED:	SURFACE CONDITIONS GRASS/WEEDS/BRUSH	20.5'	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	WELL	NOTES
0		ASH, SLIGHTLY MOIST TO MOIST, GRAY TO BLACK.						FLUSH WELL COVER
1								CONCRETE
2								
3								
4								
5								
6								
7								
8								
9								
10			47					BENTONITE
11								RISER
12		CLAY (CL to CH), MEDIUM STIFF TO STIFF, VERY MOIST TO WET, OLIVE-BROWN WITH GRAY FRAGMENTS.						
13			15					
14								
15			12					
16								
17								
18								
19		AT DRILLING						
20		5/31/02	12					SAND
21		6/6/02						
22								
23								
24								
25			5					0.020" SLOTTED SCREEN
26								
27								
28		CLAYSTONE, HIGHLY WEATHERED, VERY STIFF, VERY MOIST, BLOCKY, OLIVE-BROWN.						
29								
30			15					

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-15

PROJECT NO. 17229

LOG OF TEST BORING SC-6

DRILLING EQUIPMENT: CME 55 (w/ AUTOHAMMER)

PROJECT NAME: NIXON ASH PIT

LOCATION: SEE TEST BORING LOCATION PLAN

TYPE OF BIT: 4" AUGER

HAMMER DATA: WT. 140 LBS. DROP 30 INCHES

SURFACE ELEVATION: N/A

TOTAL DEPTH OF HOLE: 35'

DATE
- STARTED: 5/30/02
- COMPLETED: 5/30/02
- BACKFILLED:

DRILLING AGENCY: SPECTRUM

LOGGED BY: W. BARREIRE

SURFACE CONDITIONS: GRASS/WEEDS/BRUSH

GROUNDWATER DEPTH	19'	DATE AT DRILLIN
	20'	5/31/02
CAVED	20.5'	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
30		CLAYSTONE, HIGHLY WEATHERED, VERY STIFF, VERY MOIST, BLOCKY, OLIVE-BROWN.	15				
31							
32		BEDROCK					
33		CLAYSTONE, MODERATELY WEATHERED, HARD, MOIST, OLIVE-BROWN.					
34			50/10				
35		TOTAL DEPTH: 35'					
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							

FN: LOGS

KLEINFELDER
4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-16

LEGEND OF SYMBOLS USED ON BORING LOGS

LOG SYMBOLS

- BULK / GRAB SAMPLE
- MODIFIED CALIFORNIA SAMPLER (2.5 inch inside diameter)
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2.0-inch O.D. X 1.4-inch I.D.)
- SHELBY TUBE (3 inch outside diameter)
- BDBGM SIZE CORE BARREL (1.65-inch I.D.)
- NX SIZE CORE BARREL (1.875-inch I.D.)
- HQ-3 SIZE CORE BARREL (2.4-inch I.D.)
- WATER LEVEL (level where first encountered)
- WATER LEVEL (level after completion)

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were based on visual classification in the field and were modified where appropriate by visual classifications in the office, and/or laboratory gradation and index property testing.
5. NV = No Value; NA = Not Analyzed; NP = No Plasticity
6. Exp = percent expansion under defined surcharge pressure.
7. Com = Percent compression under defined surcharge pressure.
8. 50/X indicates number of blows required to drive the identified sampler X inches with a 140 lb hammer falling 30 inches.

USCS SYMBOL	SOIL DESCRIPTIONS
GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
--	CLAYSTONE
--	SHALE
--	SANDSTONE
--	LIMESTONE
--	FILL

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

KLEINFELDER
Bright People. Right Solutions.

Drafted By: B. Mustain
Date: December, 2008
Project Number: 100208

BORING LOG LEGEND

CSU - Clear Spring Ranch Ash Landfill
Southwest of Interstate 25 and Ray Nixon Road
Colorado Springs, Colorado

100208_CSU-ASH LANDFILL.GPJ 12/17/2008

Location:	See Boring Location Plan	Date Started:	12/8/2008
Groundwater (ft):	Initial (▼): 22.0 feet while drilling.	Date Completed:	12/8/2008
Drilling Company:	Custom Auger	Equipment: CME-55	Logged By: B. Mustain
Auger Diameter (in):	4"	Drilling Method: Solid Stem Auger	
Hammer Type:	Cathead		

Elevation (feet)	Depth (feet)	Graphical Log	DESCRIPTION	FIELD: Sample Interval	FIELD: Blow Counts per 6" Interval	FIELD: Sample Type	LABORATORY: USCS SYMBOL	LABORATORY: Dry Density (pcf)	LABORATORY: Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	Well/Piezometer Construction	Notes
			Surface Condition: Grass & Weeds												
	1		Sandy CLAY (CL), medium to dark brown, slightly moist to moist, fine-grained, firm.		1 5 7 11	SPT									Bentonite
	2				6 8 11 12	SPT									
	3														
	4				2 4 5 7	SPT									
	5														
	6				6 6 6 5	SPT									
	7														
	8				1 2 3 4	SPT									
	9														
	10				3 3 5 4	SPT									
	11														
	12				6 8 8 10	SPT									
	13														
	14				5 6 7 9	SPT									
	15														
	16				10 9 10 10	SPT									
	17														
	18				5 6 10 13	SPT									10/20 Sand
	19														
	20				20 16 24	SPT									0.01" Screen
	21														
	22		▼												
	23		Gravelly, Slightly Silty SAND (SM), medium brown, wet, medium dense.		12 18 8 8	SPT									
	24		Sandy CLAY (CL) with occasional gravel, medium brown, very moist, firm.		9 10 13 10	SPT									
	25														
	26		Gravelly, Slightly Silty SAND (SM), medium brown/olive-brown, wet, medium dense.		12 26 37	SPT									
	27		Claystone, olive-brown, moist, hard to very hard.												
	28				34 50/5"	SPT									
	29				50/6" 50/1"	SPT									
	30		SHALE Bedrock (Pierre Shale Formation), dark gray, moist, very hard.												
	31		Monitoring Well Installed												
	32														
	33														
	34														
	35														

Boring terminated at approximately 30 feet below ground surface.
Groundwater was encountered at 22 feet below ground surface during drilling.

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BORING LOG

CSU - Clear Spring Ranch Ash Landfill
Southwest of Interstate 25 and Ray Nixon Road
Colorado Springs, Colorado

BORING
SC-7
Page 1 of 1

Drafted By: B. Mustain	Project Number:
Date: December, 2008	100208

100208_CSU-ASH LANDFILL.GPJ 12/16/2008

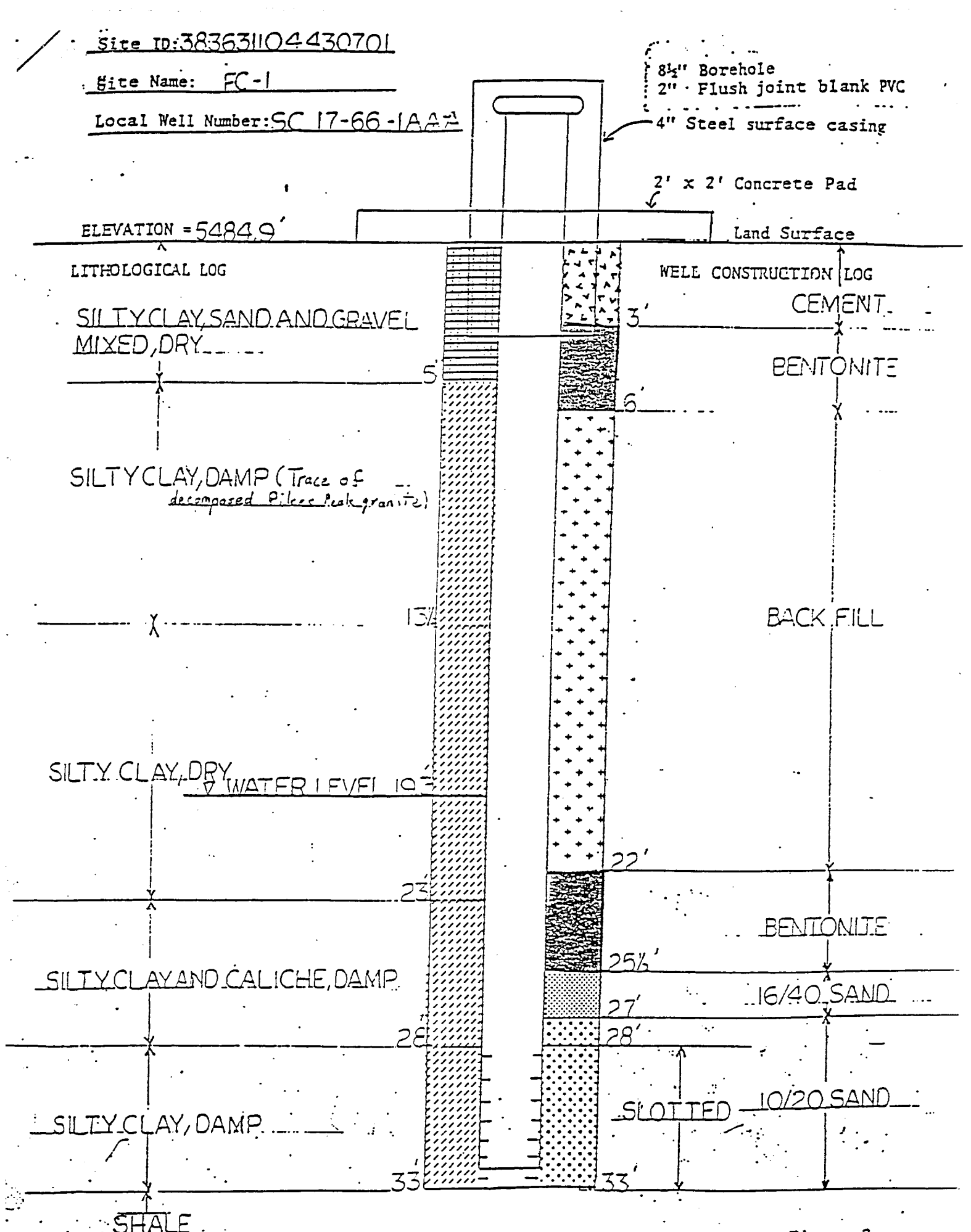

Site ID: 383631104430701
Site Name: FC-1
Local Well Number: SC 17-66-1AAA1
8½" Borehole
2" Flush joint blank PVC
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5484.9'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
SILTY CLAY, SAND AND GRAVEL MIXED, DRY
5'
SILTY CLAY, DAMP (Trace of decomposed Pikes Peak granite)
13½'
SILTY CLAY, DRY
WATER LEVEL 19'
23'
SILTY CLAY AND CALICHE, DAMP
28'
SILTY CLAY, DAMP
33'
SHALE
CEMENT
3'
BENTONITE
6'
BACK FILL
22'
BENTONITE
25½'
16/40 SAND
27'
28'
SLOTTED
10/20 SAND
33'

Figure 2.

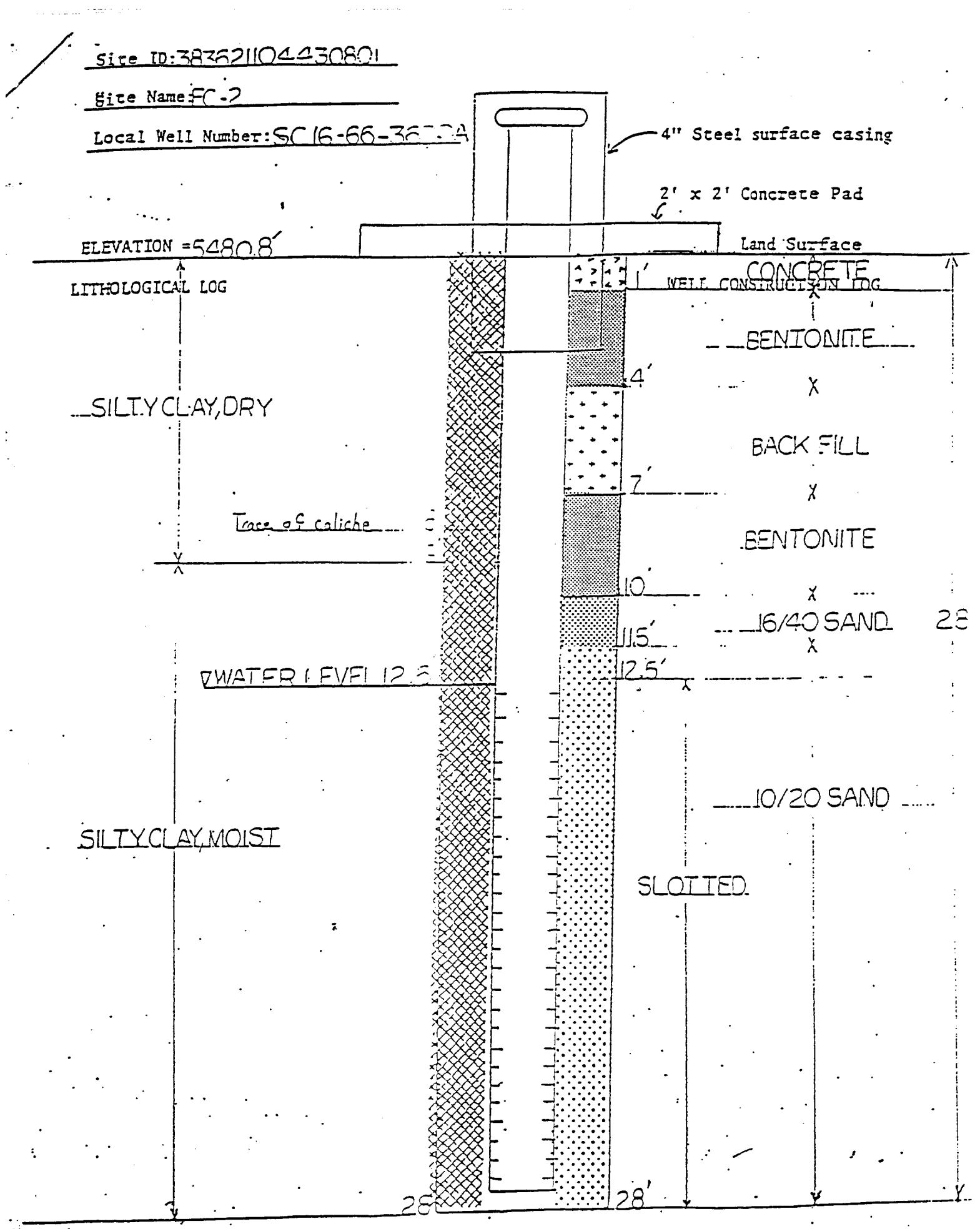

Site ID: 383621104430801
Site Name: FC-2
Local Well Number: SC 16-66-36 CA
4" Steel surface casing
2' x 2' Concrete Pad
ELEVATION = 5480.8'
Land Surface
LITHOLOGICAL LOG
WELL CONSTRUCTION LOG
CONCRETE
1'
BENTONITE
4'
SILTY CLAY, DRY
BACK FILL
7'
Trace of caliche
BENTONITE
10'
16/40 SAND
11.5'
WATER LEVEL 12.3
12.5'
10/20 SAND
SILTY CLAY, MOIST
SLOTTED
28'
28'

Figure 3.

PROJECT # 09959105

PROJECT NAME: Clear Spring Ranch

ADDRESS:

CITY / STATE: Fountain, Colorado

RESOURCE GEOSCIENCE, INC.
3740 Wabash Street
Colorado Springs, Colorado

MONITORING WELL # FC-1A

Depth	Lithology	Description	Number	Type	PID Reading	Blow Counts	Lab Number	WELL DETAIL
		SUBSURFACE PROFILE	*SAMPLE*					
0		GROUND SURFACE						
		CLAY low density, low moisture, low cohesion, low plasticity, gray.						
5								
10		**CLAY** low to moderate density, moderate moisture, moderate cohesion, low to moderate plasticity, dark gray.						
		SHALE high density, low moisture, low cohesion, low plasticity, gray						
15								
20								
25								
30		**SHALE** moderate to high density, low to moderate moisture, low to moderate cohesion, low plasticity, gray						
		SHALE high density, low moisture, low cohesion, low plasticity, gray						
35		**END OF BORING**						

Stratification lines represent approximate boundary lines between soil and rock types. In-situ, the transition may be gradual.

DRILL DATE: 10/05/07
ENGINEER: Jonathan Whitacre
DRILLER: RGI
DRILL METHOD: Hollow Stem Auger
HOLE SIZE: 8"

COLLAR ELEVATION:
GROUND ELEVATION:
DEPTH TO GROUND WATER: None at 0 hrs
GROUND WATER ELEVATION:
TOTAL DEPTH OF BORING: 35' bgs, 2.7' ags

PROJECT # 09959105

PROJECT NAME: Clear Spring Ranch

ADDRESS:

CITY / STATE: Fountain, Colorado

RESOURCE GEOSCIENCE, INC.
3740 Wabash Street
Colorado Springs, Colorado

MONITORING WELL # FC-2A

SUBSURFACE PROFILE			SAMPLE					WELL DETAIL
Depth	Lithology	Description	Number	Type	PID Reading	Blow Counts	Lab Number	
0		GROUND SURFACE						
		CLAY low density, low moisture, low cohesion, low plasticity, gray.						
5		**CLAY** low density, moderate moisture, moderate cohesion, moderate plasticity, grayish-brown.						
10								
		CLAY low to moderate density, low to moderate moisture, low to moderate cohesion, low plasticity, grayish-brown						
15								
		WEATHERED SHALE moderate density, low moisture, low cohesion, low plasticity, grayish-brown						
20								
		SHALE high density, low moisture, low cohesion, low plasticity, gray						
25								
		END OF BORING						
30								
35								

Stratification lines represent approximate boundary lines between soil and rock types. In-situ, the transition may be gradual.

DRILL DATE: 10/05/07
ENGINEER: Jonathan Whitacre
DRILLER: RGI
DRILL METHOD: Hollow Stem Auger
HOLE SIZE: 8"

COLLAR ELEVATION:
GROUND ELEVATION:
DEPTH TO GROUND WATER: None at 0 hrs
GROUND WATER ELEVATION:
TOTAL DEPTH OF BORING: 29' bgs, 2.76' ags

Boring and Well Construction Log

Boring #:FC-3A
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282807.37** Easting: **3223409.73**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5481.95**
Start Date & Time: **6/6/2016 10:40 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **34.75**
Finish Date & Time: **6/6/2016 15:25 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	92	NM	0		CL	very stiff, 3.5 unconfined compressive strength (qu) tons per square foot (tsf), dark gray (10YR 4/1), LEAN CLAY, moist; non-plastic, noncohesive, with organic rootlets, no odor or staining	Cement
				NM				3.0 - AS ABOVE; no rootlets	
	CB	NR	85	NM	5			5.0 - AS ABOVE; hard > 4.0 qu (tsf), brown (10YR 4/3) with little calcite deposits	Medium Bentonite Chips
				NM					
	CB	NR	92	NM	10			10.0 - AS ABOVE; very stiff 3.0 qu (tsf), medium plasticity, cohesive	
				NM			CH	13.0 - very stiff 2.0 qu (tsf), dark grayish brown (10YR 4/2), FAT CLAY, moist; medium/high plasticity; cohesive, no odor or staining	2" PVC, Schedule 40, Riser Pipe
	CB	NR	100	NM	15			15.0 - AS ABOVE; dark grayish brown (10YR 5/2), massive, trace calcite deposits	
				NM					

Remarks and Datum Used: Monitoring well was completed with above-grade well protection, SS = 2" Split Spoon

Soil samples were not collected from soil boring FC-3A

NR = Not Recorded, CB = 5' Long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
19.12 TOIC 6/6/2016 15:07 PM

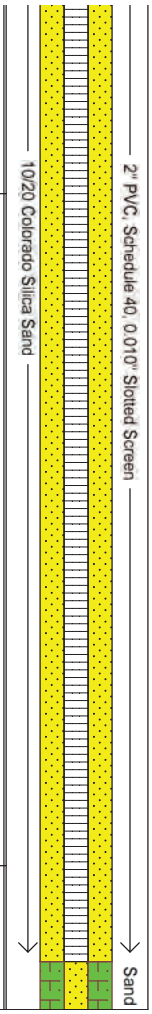
AECOM
6200 South Quebec Street
Greenwood Village, CO 80111
Direct: (303) 740-3916
Office: (303) 740-2600

Boring and Well Construction Log

Boring #:FC-3A
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282807.37** Easting: **3223409.73**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5481.95**
Start Date & Time: **6/6/2016 10:40 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **34.75**
Finish Date & Time: **6/6/2016 15:25 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
					20			20.0 - AS ABOVE; soft 0.5 qu (tsf), wet, slow dilatency	
	CB	NR	72	NM			CL	22.0 - stiff 2.0 qu (tsf), yellowish brown, SANDY LEAN CLAY, moist/wet, slow dilatency, non-plastic, noncohesive, very fine to fine sand, alluvial	
				NM					
					25			25.0 - AS ABOVE; little fine sand	
	CB	NR	90	NM					
				NM				28.2 - AS ABOVE; gray (10YR 5/1), with gravel, slight mottled gray (10YR 5/1) and brownish yellow (10YR 6/8)	
					30			30.0 - AS ABOVE; very stiff, some calcite deposits	
	CB	NR	80	NM			CLAY-STONE	32.5 - very stiff, dark gray (10YR 5/1) CLAYSTONE, moist, non-plastic, noncohesive, blocky, mottled brownish yellow and dark gray	
	SS	50	9"	NM				34.0 - Core Barrel Refusal	



Remarks and Datum Used:	Monitoring well was completed with above-grade well protection, SS = 2" Split Spoon	
AECOM 6200 South Quebec Street Greenwood Village, CO 80111 Direct: (303) 740-3916 Office: (303) 740-2600	Soil samples were not collected from soil boring FC-3A NR = Not Recorded, CB = 5' Long, 4" Diameter Core Barrel NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	Depth to Water Table (ft): 19.12 TOIC 6/6/2016 15:07 PM

Boring and Well Construction Log

Boring #:FC-3B
Sheet 1 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282806.09** Easting: **3223416.43**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5481.54**
Start Date & Time: **6/10/2016 06:45 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **55.1**
Finish Date & Time: **6/10/2016 09:50 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	
	CB	NR	92	NM	0		CL	very stiff 3.5 unconfined compressive strength (qu) tons per square foot (tsf), dark gray (10YR 4/1), LEAN CLAY, moist; non-plastic, noncohesive, with organic rootlets, no odor or staining	Cement
				NM					
								3.0 - AS ABOVE; no rootlets	
					5			5.0 - AS ABOVE; hard > 4.0 qu (tsf), brown (10YR 4/3) with little calcite deposits	
	CB	NR	85	NM					
				NM					
					10			10.0 - AS ABOVE; very stiff 3.0 qu (tsf), medium plasticity, cohesive	Medium Bentonite Chips
	CB	NR	92	NM					
				NM			CH	13.0 - very stiff 2.0 qu (tsf), dark grayish brown (10YR 4/2), FAT CLAY, moist; medium/high plasticity; cohesive, no odor or staining	
					15			15.0 - AS ABOVE; dark grayish brown (10YR 5/2), massive, trace calcite deposits	
	CB	NR	100	NM					
				NM					

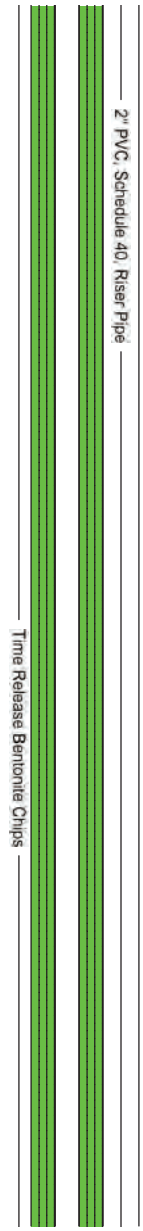
Remarks and Datum Used:	**All information presented for 0 to 34.75 feet bgs was obtained from soil boring FC-3A.**	
AECOM **6200 South Quebec Street** **Greenwood Village, CO 80111** **Direct: (303) 740-3916** **Office: (303) 740-2600**	**Soil samples were not collected from soil boring FC-3B**	**Depth to Water Table (ft):**
	NR = Not Recorded, CB = 5' Long, 4" Diameter Core Barrel	**39.32 TOIC 6/10/16 11:39 AM**
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

Boring and Well Construction Log

Boring #:FC-3B
Sheet 2 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282806.09** Easting: **3223416.43**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5481.54**
Start Date & Time: **6/10/2016 06:45 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **55.1**
Finish Date & Time: **6/10/2016 09:50 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
					20			20.0 - AS ABOVE; soft 0.5 qu (tsf), wet, slow dilatency	
	CB	NR	72	NM			CL	22.0 - stiff 2.0 qu (tsf), yellowish brown, SANDY LEAN CLAY, moist/wet, slow dilatency, non-plastic, noncohesive, very fine to fine sand, alluvial	
				NM	25			25.0 - AS ABOVE; little fine sand	
	CB	NR	90	NM				28.2 - AS ABOVE; gray (10YR 5/1), with gravel, slight mottled gray (10YR 5/1) and brownish yellow (10YR 6/8)	
				NM	30			30.0 - AS ABOVE; very stiff, some calcite deposits	
	CB	NR	80	NM			CLAY-STONE	(34.0-34.75') very stiff, dark gray (10YR 5/1) CLAYSTONE, moist, non-plastic, noncohesive, blocky, mottled brownish yellow and dark gray	
	SS	50	9"	NM				34.0 - Core Barrel Refusal	
					35			(34.75-40.0') "blind"drilled, no sampling	



Remarks and Datum Used: All information presented for 0 to 34.75 feet bgs was obtained from soil boring FC-3A.

Soil samples were not collected from soil boring FC-3B

NR = Not Recorded, CB = 5' Long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
39.32 TOIC 6/10/16 11:39 AM

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Boring and Well Construction Log

Boring #:FC-3B
Sheet 3 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282806.09** Easting: **3223416.43**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5481.54**
Start Date & Time: **6/10/2016 06:45 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **55.1**
Finish Date & Time: **6/10/2016 09:50 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data					Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)					
	SS	50	3"	NM	40		SHALE	40.0 - hard, bluish gray (GLEY2 5/10B), SHALE, dry, non-plastic, platy, bedded to thinly bedded.	
								(40.26-45.0') "blind" drilled, no sampling	
	SS	50	2"	NM	45		SHALE	45.0 - hard, bluish gray (GLEY2 5/10B), WEATHERED SHALE, dry, non-plastc, platy, thinly bedded, with moist, dark gray, clay	
								(45.2-50.0') "blind" drilled, no sampling	
	SS	50	0.5"	NM	50		SHALE	50.0 - hard, bluish gray (GLEY2 5/10B), WEATHERED SHALE, dry, non-plastc, platy, thinly bedded, with moist, dark gray, clay	
								(50.4-55.0') "blind" drilled, no sampling	
	SS	50	1.5"	NM	55		SHALE	55.0 - hard, bluish gray (GLEY2 5/10B), WEATHERED SHALE, dry, non-plastc, platy, thinly bedded, with moist, dark gray, clay	

10/20 Colorado Silica Sand

2" PVC, Sch. 40, 0.010" Slotted Screen

Remarks and Datum Used:	**All information presented for 0 to 34.75 feet bgs was obtained from soil boring FC-3A.**
Soil samples were not collected from soil boring FC-3B	**Depth to Water Table (ft):**
NR = Not Recorded, CB = 5' Long, 4" Diameter Core Barrel	**39.32 TOIC 6/10/16 11:39 AM**
NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

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Boring and Well Construction Log

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Boring #:SC-8
Sheet 1 of 1

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283779.00** Easting: **3224478.98**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5461.41**
Start Date & Time: **6/9/2016 09:03 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **20.92**
Finish Date & Time: **6/9/2016 11:45 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	
	CB	NR	92	NM	0		CL	soft 0.5 unconfined compressive strength (qu) tons per square foot (tsf), brown (10YR 5/3), moist, SANDY LEAN CLAY WITH GRAVEL, moist, with organic rootlets, non-plastic, noncohesive, no odor or staining	Cement Med. Bentonite Chips
				NM				1.5 - AS ABOVE; very stiff 2.5 qu (tsf), medium plasticity, cohesive, trace subangular gravel	
SC-8 (5'4"-6'0"), 6/9/2016 17:30 PM, SEE COC	SS	3 3	4" 4"	NM	5		CH	5.0 - soft 0.5 qu (tsf), dark grayish brown (10YR 4/2), FAT CLAY, moist, high plasticity, cohesive, massive, no odor or staining	
	CB	NR	80	NM					
				NM	10			11.0 - AS ABOVE; medium 1.0 qu (tsf)	
	CB	NR	100	NM			CL	12.0 - stiff 2.0 qu (tsf), dark grayish brown (10YR 4/2), LEAN CLAY, moist, low plasticity, cohesive, mottled dark grayish brown (10YR 4/2) and brownish yellow (10YR 6/8), no odor or staining	10/20 Colorado Silica Sand
				NM	15			14.5 - AS ABOVE; hard 4.0 qu (tsf), non-plastic, noncohesive	
	CB	NR	90	NM				16.0 - AS ABOVE; trace calcite deposit	
								16.7 - AS ABOVE; white (10YR 8/1) calcite deposits	
	SS	50	11"	NM	20		CLAY-STONE	18.3 - hard >4.0 qu (tsf), dark gray (10YR 4/1), CLAYSTONE, dry, massive, blocky, mottled dark gray (10YR 4/1) and brownish yellow (10YR 6/8)	2" PVC, Schedule 40, Riser Pipe 2" PVC, Sch. 40, 0.010" Slotted Screen Sand
								20.0 - Core Barrel Refusal	

Remarks and Datum Used: Monitoring well SC-8 was constructed with above-grade well protection; SS= Split-Spoon sampler

California sampler was collected from SC-8 from 5'4" to 6'0"

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
6.75 TOIC 6/9/2016 12:00 PM

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Boring and Well Construction Log

Boring #:SC-9
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283750.09** Easting: **3225388.22**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5457.83**
Start Date & Time: **6/8/2016 12:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **27.42**
Finish Date & Time: **6/9/2016 08:00 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	90	NM	0		CL	very stiff 2.5 unconfined compressive strength (qu) tons per square foot (tsf), grayish brown, LEAN CLAY, moist, non-plastic, noncohesive, massive, with organic rootlets from 0-0.5' bgs, no odor or staining	Cement
							SP CL	1.7 - medium, dark grayish brown (10YR 4/2), POORLY GRADED SAND WITH GRAVEL, moist, fine to coarse sand, subangular gravel, no odor or staining	
				NM				1.9 - hard >4.0 qu (tsf), yellowish brown (10YR 5/4), LEAN CLAY, moist, non-plastic, noncohesive, massive, trace calcite deposits, alluvial	Medium Bentonite Chips
	CB	NR	85	NM	5			5.0 - AS ABOVE; brown (10YR 5/3)	2" PVC, Schedule 40, Riser Pipe
				NM					
	CB	NR	87	NM	10			10.0 - AS ABOVE; very stiff 2.75 qu (tsf), gray (10YR 5/1), low plasticity, cohesive, blocky, no odor or staining	
				NM			CH	12.7 - very soft, < 0.25 qu (tsf), grayish brown (10YR 5/2), FAT CLAY, wet, slow dilatency, high plasticity, cohesive, trace subangular gravel, no odor or staining	
							SP		

Remarks and Datum Used: Monitoring well SC-9 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected from soil boring SC-9

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
15.23 TOIC 6/9/2016 08:40 AM

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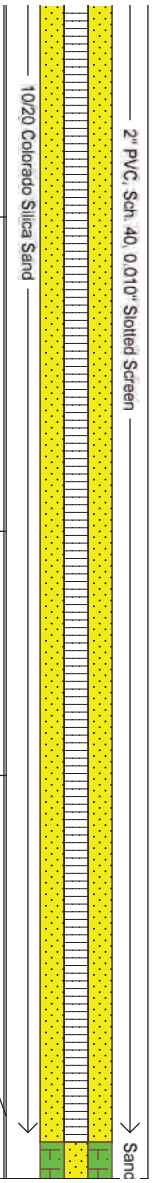
Boring and Well Construction Log

Boring #:SC-9
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283750.09** Easting: **3225388.22**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5457.83**
Start Date & Time: **6/8/2016 12:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **27.42**
Finish Date & Time: **6/9/2016 08:00 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
					15			13.8 - loose, brown (10YR 5/3), POORLY GRADED GRAVEL WITH SAND AND CLAY, wet, subangular gravel, medium to coarse sand, no odor or staining, alluvial	
				NM			CH	16.4 - medium, grayish brown (10YR 5/2), FAT CLAY, wet, slow dilatency, high plasticity, cohesive, trace subangular gravel, no odor or staining	
CB	NR	52		NM					
					20		GP	20.0 - very loose, gray (10YR 5/1), POORLY GRADED GRAVEL WITH SAND AND CLAY, wet, angular gravel, fine to coarse sand, no odor or staining	
				NM					
CB	NR	100					CH	22.8 - soft, gray(10YR 5/1), FAT CLAY, wet, slow dilatency, high plasticity, cohesive, little angular gravel, no odor or staining 23.5 - AS ABOVE; no gravel	
				NM					
					25				
CB	NR	35		NM					
SS	50	5"		NM			CLAY-STONE	26.7 - hard, gray, CLAYSTONE, dry, blocky, massive, oxidized, no odor or staining - Core Barrel Refusal at 27 feet bgs.	



Remarks and Datum Used:	**Monitoring well SC-9 was constructed with above-grade well protection; SS= Split-Spoon sampler**
	Soil samples were not collected from soil boring SC-9
	NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

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Depth to Water Table (ft):
15.23 TOIC 6/9/2016 08:40 AM

Boring and Well Construction Log

Boring #:SC-10
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283428.94** Easting: **3226344.60**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5445.18**
Start Date & Time: **6/9/2016 12:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **35.25**
Finish Date & Time: **6/9/2016 17:00 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									Soil and Rock Description	Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol			
	CB	NR	85	NM	0		CL		very soft,brown (10YR 4/3), LEAN CLAY WITH GRAVEL, moist, non-plastic, noncohesive, organic rootlets	Cement
				NM					0.3 - AS ABOVE; very stiff >4.0 unconfined compressive strength (qu) tons per square foot (tsf), dark grayish brown (10YR 4/3)	
									2.5 - AS ABOVE; no rootlets	
	CB	NR	100	NM	5				5.0 - AS ABOVE; stiff 1.0 qu (tsf), medium/high plasticity, cohesive, massive	Medium Bentonite Chips
				NM						
	CB	NR	87	NM	10				10.0 - AS ABOVE; very stiff 3.0 qu (tsf)	2" PVC, Schedule 40, Riser Pipe
				NM			CH		13.0 - soft, dark grayish brown, FAT CLAY, wet, slow dilatency, medium/high plasticity, coshesive, no odor or staining	
	CB	NR	100	NM	15				15.0 - AS ABOVE; stiff 2.0 unconfined compressive strength (qu) tons per square foot (tsf), very dark gray (10YR 3/1)	
									17.5 - AS ABOVE; very stiff 2.5 qu (tsf), dark grayish brown (10YR 4/2), moist, medium plasticity, cohesive,	

Remarks and Datum Used: Monitoring well SC-10 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected from soil boring SC-10

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
9.73 TOIC 6/10/2016 11:23 AM

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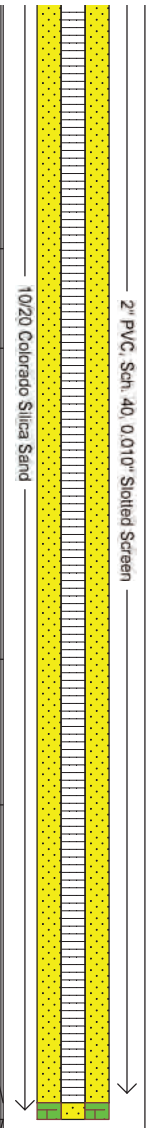
Boring and Well Construction Log

Boring #:SC-10
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283428.94** Easting: **3226344.60**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5445.18**
Start Date & Time: **6/9/2016 12:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **35.25**
Finish Date & Time: **6/9/2016 17:00 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
				NM				~15% calcite deposit	
					20				
				NM				19.75 - AS ABOVE; very soft 0.25 quf (tsf), high plasticity	
	CB	NR	98				CL	22.1 - very soft, dark grayish brown (10YR 4/2), LEAN CLAY WITH SAND AND GRAVEL, wet, non-plastic, noncohesive, subangular gravel, fine to coarse sand, no odor or staining	
				NM			GP	23.6 - loose, dark grayish brown (10YR 4/2), POORLY GRADED GRAVEL, wet, fine to coarse sand, subangular gravel, no odor or staining	
					25			25.0 - AS ABOVE; with sand and clay	
	CB	NR	90	NM					
				NM			CLAY-STONE	28.3 - loose, dark grayish brown (10YR 4/2), WEATHERED CLAYSTONE, moist, blocky, with moist non-plastic clay and gravel,	
	SS	50	6"	NM	30			30.0 - Core Barrel Refusal	
								(30.5-35.0') "blind" drilled, no sampling	
	SS	50	3"	NM	35		SHALE	35.0 - hard >4.0 qu (tsf), gray, WEATHERED SHALE, dry, thinly bedded, massive	
								35.25 Feet BGS - End of Boring	



Remarks and Datum Used: Monitoring well SC-10 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected from soil boring SC-10

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
9.73 TOIC 6/10/2016 11:23 AM

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Boring and Well Construction Log

Boring #:SC-11
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283151.69** Easting: **3226374.64**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5441.94**
Start Date & Time: **6/6/2016 16:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **30.66**
Finish Date & Time: **6/7/2016 10:30 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	71	NM	0		CL	hard >4.0 unconfined compressive strength (qu) tons per square foot (tsf), brown (10YR 4/3), LEAN CLAY, moist, non-plastic, noncohesive, massive, little sand with organic rootlets, no odor or staining	Cement
				NM				1.0 - AS ABOVE; no rootlets	
								2.0 - AS ABOVE; white calcite deposit	
				NM				4.5 - AS ABOVE; stiff 1.5 qu (tsf), medium plasticity, cohesive	Medium Bentonite Chips
SC-11 (5'4"-6'0") 6/6/2016 16:30 PM, SEE COC	SS	3 5	6" 6"	NM	5		CH	5.0 - stiff 1.5 qu (tsf), brown (10YR 4/3), FAT CLAY, moist, high plasticity, cohesive, massive, trace calcite, no mottling, odor, or staining.	
	CB	NR	100	NM					
				NM					
					10			10.0 - AS ABOVE; dark grayish brown (10YR 4/2), no calcite deposits	
	CB	NR	100	NM					
				NM					
					15			15.0 - AS ABOVE; very soft <0.25 qu (tsf), brown (10YR 4/3), wet, slow dilatency, medium/high plasticity	2" PVC, Schedule 40, Riser Pipe

Remarks and Datum Used: Monitoring well SC-11 was constructed with above-grade well protection; SS= Split-Spoon sampler

California sampler was collected from SC-11 from 5'4" to 6'0"

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
7.63 TOIC 6/7/16 12:52 PM

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Boring and Well Construction Log

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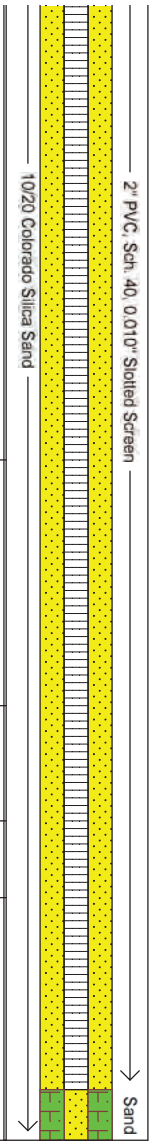
Boring #:SC-11
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1283151.69** Easting: **3226374.64**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5441.94**
Start Date & Time: **6/6/2016 16:00 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **30.66**
Finish Date & Time: **6/7/2016 10:30 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	100	NM				15.25 - medium 1.0 qu (tsf), brown (10YR 4/3), moist	
				NM					
					20			19.0 - AS ABOVE; very stiff 2.75 qu (tsf), mottled brown (10YR 4/3) and yellowish brown (10YR 5/8)	
	CB	NR	68	NM			SP	21.8 - very loose, brown (10YR 4/3), POORLY GRADED SAND WITH CLAY AND GRAVEL, wet, fine to coarse sand	
				NM					
					25		CL	25.0 - stiff 1.5 qu (tsf), brown (10YR 4/3), SANDY LEAN CLAY WITH GRAVEL, wet, non-plastic, noncohesive, angular gravel	
	CB	NR	80	NM			CH	26.5 - soft, brown (10YR 4/3), FAT CLAY, wet, high plasticity, cohesive, non mottling or staining	
				NM			CLAY-STONE	27.5 - stiff, dark gray (10YR 4/1), WEATHERED CLAYSTONE, moist, massive, blocky	
	SS	50	8"	NM	30			30.0 - Core Barrel Refusal	



Remarks and Datum Used:	Monitoring well SC-11 was constructed with above-grade well protection; SS= Split-Spoon sampler	
	California sampler was collected from SC-11 from 5'4" to 6'0"	Depth to Water Table (ft):
	NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel	7.63 TOIC 6/7/16 12:52 PM
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

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Boring and Well Construction Log

Boring #:SC-12
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282807.25** Easting: **3226399.78**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5442.07**
Start Date & Time: **6/7/2016 11:00 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **25.83**
Finish Date & Time: **6/7/2016 15:10 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data					Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)					
	CB	NR	73	NM	0		CL	very stiff, brown (10YR 4/3), LEAN CLAY, moist, non-plastic, noncohesive, massive, with rootlets	Cement
				NM				2.5 - AS ABOVE; no rootlets, little calcite deposits	Medium Bentonite Chips
	CB	NR	72	NM	5		CH	5.0 - very soft <0.25 unconfined compressive strength (qu) tons per square foot (tsf), dark yellowish brown (10YR 4/4), FAT CLAY, moist, high plasticity, cohesive, massive, with fine sand	2" PVC, Schedule 40, Riser Pipe
				NM				7.5 - AS ABOVE; wet (7.5' to 7.7' bgs)	
	CB	NR	53	NM	10			10.0 - AS ABOVE; no mottling or calcite deposits	2" PVC
				NM					

Remarks and Datum Used: Monitoring well SC-12 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected at soil boring SC-12

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
7.55 TOIC 6/7/16 15:17 PM

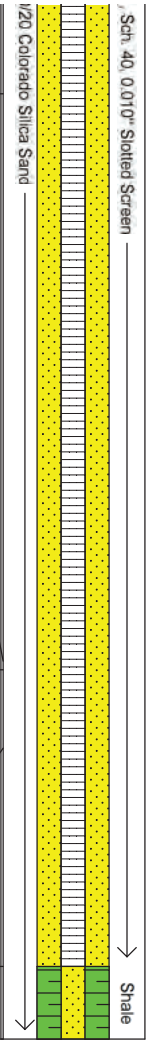
AECOM
6200 South Quebec Street
Greenwood Village, CO 80111
Direct: (303) 740-3916
Office: (303) 740-2600

Boring and Well Construction Log

Boring #:SC-12
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282807.25** Easting: **3226399.78**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5442.07**
Start Date & Time: **6/7/2016 11:00 AM**	Method: **Hollow Stem Auger**	Total Depth (ft): **25.83**
Finish Date & Time: **6/7/2016 15:10 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
					15		CL	15.0 - very soft <0.25 qu (tsf), brown (10YR 5/3), LEAN CLAY, wet, slow dilatency, medium plasticity, cohesive, massive	
	CB	NR	90	NM					
				NM				17.8 - AS ABOVE; sandy lean clay, non-plastic, noncohesive, mottled brown and brownish yellow (10YR 6/8)	
								18.2 - AS ABOVE; no sand	
					20			20.0 - AS ABOVE; with calcite deposit, massive, mottled brown (10YR 5/3) and gray (10YR 5/1)	
				NM			SP CL	21.5 - medium dense, brown, POORLY GRADED SAND WITH CLAY AND GRAVEL, wet, coarse gravel	
	CB	NR	83					21.6 - hard >4.0 qu (tsf), brown (10YR 4/3), LEAN CLAY WITH GRAVEL, moist, non-plastic, noncohesive, massive, mottled	
				NM			CLAY-STONE	22.5 - hard, dark gray, CLAYSTONE, moist, non-plastic, blocky, with trace sand	
					25				
	SS	50	10"	NM			SHALE	25.0 - hard, blue, SHALE, dry, platy, non-plastic, Core Barrel Refusal at 25 feet bgs	



Remarks and Datum Used: Monitoring well SC-12 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected at soil boring SC-12

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
7.55 TOIC 6/7/16 15:17 PM

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Boring and Well Construction Log

Boring #:SC-13
Sheet 1 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282422.79** Easting: **3226375.83**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5443.74**
Start Date & Time: **6/7/2016 15:45 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **23.16**
Finish Date & Time: **6/8/2016 11:00 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	83	NM	0		CL	hard >4.0 unconfined compressive strength (qu) tons per square foot (tsf), brown (10YR 4/3), LEAN CLAY, moist, non-plastic, noncohesive, with organic rootlets	Cement
				NM				1.5 - AS ABOVE; no organic rootlets	Medium Bentonite Chips
	CB	NR	75	NM	5		CH	5.0 - very soft 1.0 qu (tsf), brown (10YR 4/3), FAT CLAY, moist, high plasticity, cohesive, massive, trace calcite deposits	2" PVC, Schedule 40, Riser Pipe
				NM				7.5 - AS ABOVE; very soft < 0.25 qu (tsf)	
				NM	10		CL	10.7 - stiff 1.0 qu (tsf), brown (10YR 4/3), LEAN CLAY, wet, medium plasticity, cohesive, massive, mottled gray and brown, trace sand, alluvial deposition	

Remarks and Datum Used: Monitoring well SC-13 was constructed with above-grade well protection; SS= Split-Spoon sampler

Soil samples were not collected at soil boring SC-13

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
8.57 TOIC 6/8/16 11:25 AM

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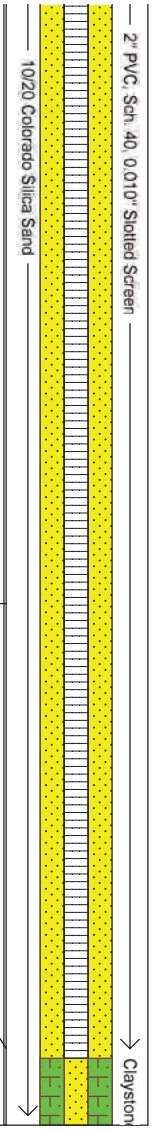
Boring and Well Construction Log

Boring #:SC-13
Sheet 2 of 2

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282422.79** Easting: **3226375.83**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5443.74**
Start Date & Time: **6/7/2016 15:45 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **23.16**
Finish Date & Time: **6/8/2016 11:00 AM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
	CB	NR	100	NM				14.0 - AS ABOVE; soft 0.50 qu (tsf), non-plastic, noncohesive	
					15				
	CB	NR	95	NM				15.5 - AS ABOVE; medium 1.0 qu (tsf)	
				NM				17.0 - AS ABOVE; SANDY LEAN CLAY WITH GRAVEL,	
								17.8 - stiff, wet, slow dilatency, mottled brown (10YR 5/3) and yellowish brown (10YR 5/8), trace angular gravel	
							GP	18.0 - loose, brown POORLY GRADED GRAVEL WITH CLAY, wet, angular gravel, little fine to coarse sand	
					20				
	CB	NR	50	NM					
	SS	50	8"	NM			CLAY-STONE	22.4 - hard >4.0 qu (tsf), brown and gray, WEATHERED CLAYSTONE, moist, bedded, blocky, no odor or staining Core Barrel Refusal at 22.5 feet bgs.	



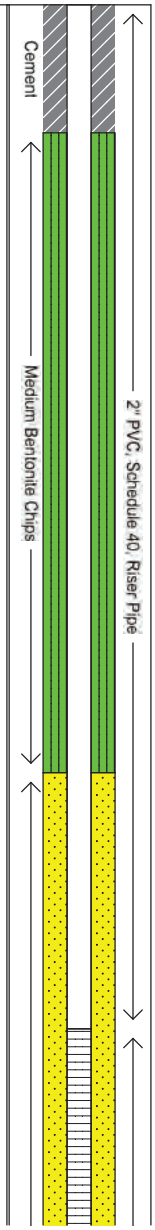
Remarks and Datum Used:	**Monitoring well SC-13 was constructed with above-grade well protection; SS= Split-Spoon sampler**	
AECOM **6200 South Quebec Street** **Greenwood Village, CO 80111** **Direct: (303) 740-3916** **Office: (303) 740-2600**	**Soil samples were not collected at soil boring SC-13**	**Depth to Water Table (ft):**
	NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel	**8.57 TOIC 6/8/16 11:25 AM**
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

Boring and Well Construction Log

Boring #:SC-14
Sheet 1 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282348.07** Easting: **3225699.13**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5448.20**
Start Date & Time: **6/10/2016 12:30 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **28.08**
Finish Date & Time: **6/10/2016 16:00 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data								Soil and Rock Description	Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol		
	CB	NR	82	NM	0		CL	hard >4.0 unconfined compressive strength (qu) tons per square foot (tsf), brown (10YR 4/2), LEAN CLAY, moist, non-plastic, noncohesive, with organic rootlets, no odor or staining	
				NM				2.75 - AS ABOVE; very stiff 2.75 qu (tsf), with calcite deposits	
								4.0 - AS ABOVE; decreasing calcite deposits	
SC-14 (5'4"-6'0") 6/10/2016 12:40 PM, SEE COC	SS	4	4" 4"	NM	5				
	CB	5	53	NM				6.0 - AS ABOVE; medium stiff, brown (10YR 4/3), low plasticity, cohesive, no calcite deposits	
				NM				7.5 - AS ABOVE; with ~10% calcite deposits	



Remarks and Datum Used:	Monitoring well SC-14 was constructed with above-grade well protection; SS= Split-Spoon sampler	
	California sampler was collected from SC-14 from 5'4" to 6'0"	Depth to Water Table (ft):
	NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel	9.16 TOIC 6/10/16 15:55 PM
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

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Boring and Well Construction Log

Boring #:SC-14
Sheet 2 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282348.07** Easting: **3225699.13**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5448.20**
Start Date & Time: **6/10/2016 12:30 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **28.08**
Finish Date & Time: **6/10/2016 16:00 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									Well Diagram
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	
	CB	NR	100	NM	10		CH	10.0 - soft, 0.5 qu (tsf), brown (10YR 4/3), FAT CLAY, moist, high plasticity, cohesive, massive, with 5% calcite deposits,	
				NM				12.2 - AS ABOVE; mottled brown (10YR 4/3) and gray (2.5Y 4/1), no calcite deposts	
	CB	NR	93	NM	15			14.9 - AS ABOVE; wet (visible water on soil) 15.1 - AS ABOVE; SANDY FAT CLAY, dark grayish brown (10YR 4/2)	
				NM			CL	18.0 - soft, dark grayish brown (10YR 4/2), SANDY LEAN CLAY, wet, non-plastic, nonocohesive, no odor or staining	10/20 Colorado Silica Sand 2" PVC, Sch. 40, 0.010" Slotted Screen

Remarks and Datum Used: Monitoring well SC-14 was constructed with above-grade well protection; SS= Split-Spoon sampler

California sampler was collected from SC-14 from 5'4" to 6'0"

NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel

NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing

Depth to Water Table (ft):
9.16 TOIC 6/10/16 15:55 PM

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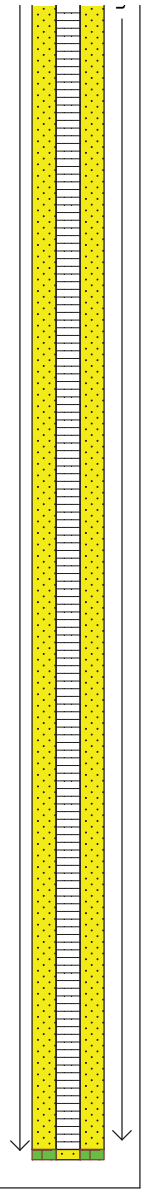
Boring and Well Construction Log

Boring #:SC-14
Sheet 3 of 3

Project: **CSU Well Installation**	Contractor: **GDI Drilling Inc.**	Location: **Clear Springs Ranch, Fountain, CO**
Project #: **60506434.3**	Operator: **Dean & Eric Stedman**	Northing: **1282348.07** Easting: **3225699.13**
Client: **Colorado Springs Utilities**	Drill Rig Type: **Diedrich D-90 Truck Mount**	Surface Elevation (ft AMSL): **5448.20**
Start Date & Time: **6/10/2016 12:30 PM**	Method: **Hollow Stem Auger**	Total Depth (ft): **28.08**
Finish Date & Time: **6/10/2016 16:00 PM**	Boring ID: **8.5 inches**	Logged By: **Chris Ahrendt**

Sampling and Field Data									
Analytical Samples	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)	Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
					20		SP	20.0 - very loose, dark yellowish brown (10YR 4/6), POORLY GRADED SAND, wet, fine to coarse sand, with trace fines and gravel	
				NM			CH	21.0 - soft 0.5 qu (tsf), FAT CLAY WITH SAND, wet, slow dilatency, high plasticity, cohesive	
							CL	21.5 - stiff, dark yellowish brown (10YR 4/6), LEAN CLAY, moist, low plasticity, with some gravel and weathered claystone, claystone is blocky	
CB	NR	47					SP	22.2 - loose, reddish brown (5YR 5/4), POORLY GRADED SAND WITH CLAY, wet, medium plasticity, cohesive, fine to coarse sand, trace gravel, no odor or staining	
				NM					
					25				
				NM			CH	25.5 - very soft 0.25 qu (tsf), dark grayish brown (10YR 4/2), FAT CLAY WITH SAND, wet, high plasticity, cohesive	
CB	NR	57							
				NM			CLAY-STONE	27.0 - hard, dark gray, WEATHERED CLAYSTONE, moist, with some soft clay and gravel, Core Barrel Refusal at 28.0 feet bgs	
							SHALE	28.0 - hard, SHALE, dry, non-plastic, noncohesive, laminated	
SS	50	1"		NM					



Remarks and Datum Used:	**Monitoring well SC-14 was constructed with above-grade well protection; SS= Split-Spoon sampler**	
AECOM **6200 South Quebec Street** **Greenwood Village, CO 80111** **Direct: (303) 740-3916** **Office: (303) 740-2600**	**California sampler was collected from SC-14 from 5'4" to 6'0"**	**Depth to Water Table (ft):**
	NR = Not Recorded, CB = 5' long, 4" Diameter Core Barrel	**9.16 TOIC 6/10/16 15:55 PM**
	NM = Not Measured, ft. TOIC = Feet from Top of Inner PVC Casing	

NE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

B NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/24/77

)LE NO. 77-11 ENGINEER CRN DATE COMPLETED 6/24/77

.EVATION 5433.4 COORDINATES 282,000 N 2,228,000 E

IILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

'PE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH rom	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, slightly moist, dark brown, roots.
2"	5'	CL	Clay, sandy, stiff, silty, moist, gray and yellow brown, washed in bedrock.
5'	13'	SM	Sand, silty, medium dense, fine sized, yellow brown and gray, washed in sandstone Trace of gravel at 13 feet.
13	16'	GC	Gravel, clayey, dense, claystone matrix, slightly moist, brown and gray, sandstone gravel sized pieces.
16'	19.3'		Bedrock, Claystone-Shale, very hard, sandy, slightly moist, gray and brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

PTH op)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (200)	Sandstone	Siltstone	Claystone		
4'	17/12	Cal	CL-SM		X			X	X			60				Gray & Yellow Brown	Washed in Bedrock
9'	29/12	Cal	SM		X			X	X			30				Yellow Brown & Gray	
14	50/11	Cal	GC		X					X	X	40				Brown	
19	50/4	Cal	Bedrock													Gray & Brown	

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION None

PTH TO BEDROCK 16 Feet DEPTH TO WATER TABLE 14 DAYS AFTER COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/24/77
HOLE NO. 77-12 ENGINEER CRN DATE COMPLETED 6/24/77
ELEVATION 5433.8 COORDINATES 283,000 N 2,228,000 E
DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey
TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, brown, roots
			No topsoil at actual hole location.
2"	14'	CL	Clay, sandy, silty, stiff, slightly moist to moist, brown
			Fine silty sand at 14 feet.
14'	20'	SM-SC	Sand, clayey and silty, medium dense, fine sized, moist, gray and brown.
	22'	GP-GC	Gravel, clean to clayey, dense, moist, brown.
22'	23'		Weathered Claystone-Shale, stiff, moist, gray.
23'	24.2'		Bedrock, Claystone-Shale, very hard, gray, sandy, layered horizontal.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
4'	50/11	Cal	CL		X			X	X			80				Brown	
9'	28/12	Cal	CL		X			X	X			80				Brown	
14'	23/12	Cal	SM		X			X				40				Brown & Gray	
19'	33/12	Cal	SM		X			X				40				Brown & Gray	
	50/3	Cal	Claystone														

AL – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION None

[illegible] 23 Feet

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-13 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5447.8 COORDINATES 284,000 N 2,228,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, silty, sandy, tan, roots.
2"	3'	CL	Clay, sandy, silty, stiff to very stiff, dry to slightly moist, brown.
3'	6'	SM	Sand, clean to silty, dense, gravelly, slightly moist, brown.
6'	18'	CL	Clay, silty, sandy, stiff, gravelly, slightly moist, brown, some thin sand, gravelly layers 1 to 6 inches thick From 15 feet thin bedded clay, very silty with fine sand.
18'	38'	SC	Sand and Gravel, clayey, medium dense to dense, slightly moist, brown and red brown.
38'	39.3'		Bedrock, Shale, very hard, fractured, blocky, slightly moist, gray, brown, iron stains on fractures.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
2'	15/12	Cal	SM	X	Sl.			X	X	X	Sl.	20				Brown	
9'	14/12	Cal	CL	X	X			X	X	X		70				Brown	
1'	17/12	Cal	CL	X	X			X				60				Brown	
3'	28/12	Cal	SC	X	X			X	X	X	S	30				Brown	
8'	18/12	Cal	SC-CL	X	X			X	X			50-70				Brown	
3'	44/12	Cal	CL	X	X			X	X	X	S	60				Brown	
8'	50/7	Cal	SC-CL	X	X			X	X	X		50-70				Brown	
9'	50/4	Cal	Claystone														

Cal – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO BEDROCK 38 Feet

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77
HOLE NO. 77-14 ENGINEER CRN DATE COMPLETED 6/22/77
ELEVATION 5475.4 COORDINATES 285,000 N 2,228,000 E
DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey
TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, dry, tan, roots.
2"	3.5'	CL	Clay, sandy, silty, stiff, gravelly, slightly moist, brown.
3.5'	6.5'	SM	Sand, silty, clayey, dense, gravelly, slightly moist, brown, gravel to 3-inch size.
6.5'	16'	CL	Clay, very sandy, stiff, gravelly, moist, brown, layers of sand and gravel from 1 to 6 inches thick.
16	19.5'		Bedrock, Shale, hard, fractured, blocky, gray, brown, slightly moist.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (ft)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
1'	33/12	Cal	SM														
3'	14/12	Cal	CL	X	X			X	X	X		60				Brown	
4'	33/12	Cal	CL-SC	X	X			X	X	X	X	40				Brown	
21'	50/5	Cal	Claystone														

. – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

TH TO BEDROCK 16 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 17

THE FISHERMAN COMPANY

BORING LOG

10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-15 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5452.8 COORDINATES 284,000 N 2,227,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, stiff, dry, brown to tan, roots.
2"	3'	CL	Clay, sandy, silty, medium stiff to 2.5 feet to very stiff on down, dry, tan, gravelly at 3 feet.
3'	5'	SC	Sand and Gravel, clayey, dense, slightly moist, brown and red brown.
5'	7'	CL	Clay, sandy, very stiff, slightly moist, brown.
7'	9.5'		Bedrock, Shale, hard, sandy, blocky, fractured.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (ft)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (#200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
5'	39/12	Cal	SC	X				X	X	X	X	40				Brown	
7'	50/6	Cal	Claystone														

– 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 7 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 17

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-16 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5442.8 COORDINATES 283,000 N 2,227,000 E

DRILLING COMPANY Custom Auger Drilling Company RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, silty, fine sandy, stiff, dry, tan.
2"	16'	CL	Clay, sandy, silty, stiff, dry, brown
			Gypsum salts in clay
			Moist from 10 feet down.
16'	19.3'		Bedrock, Claystone, Shale, hard, brown and gray.
			Water at 25 feet in piezometer 100 feet south and 40 feet west of Hole 77-16.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (ft)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
4'	27/12	Cal	CL	X				X	X			80				Brown	
9'	13/12	Cal	CL	X				X	X			80				Brown	
14'	25/12	Cal	CL		X			X	X			80				Brown	
21'	50/4	Cal															

– 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 16 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/24/77

HOLE NO. 77-17 ENGINEER CRN DATE COMPLETED 6/24/77

ELEVATION 5442.8 COORDINATES 282,433 N 2,227,381 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, brown, roots.
2"	9'	CL	Clay, sandy, silty, stiff, slightly moist to moist, brown.
9'	18'	SM	Sand, silty, medium dense, moist, fine sized, gray-brown.
18'	21'	GC	Claystone with gravel, dense, moist, gray.
21'	23'		Weathered Bedrock, Sandstone, silty, clayey, wet, brown and gray.
23'	24.3'		Bedrock, Sandstone and Claystone layered, very hard, gray and brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	12/12	Cal	CL		X			X	X			80				Brown	
9'	11/12	Cal	SM		X			X				40				Gray-Brown	
14'	36/12	Cal	SM		X			X				40				Gray-Brown	
19'	30/12	Cal	SM with Gravel									40				Gray-Brown	
	50/4	Cal															

CL – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 23 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION 19.5'

BORING LOG

FISHERMAN COMPANY

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-18 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5438.0 COORDINATES 282,324 N 2,227,381 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, very silty, slightly moist, tan, roots.
2"	3'	SM-ML	Sand, very silty and clayey, medium dense, fine sized, brown to tan.
3'	15'	CL	Clay, sandy, silty, gravelly, stiff, moist, brown. Fine to coarse sand and gravel sizes in 14-foot sample.
15'	18'	SM-SC	Sand, silty, clayey, gravelly, medium dense, moist to wet, brown.
18'	19.8'		Bedrock, Shale-Claystone, very hard, fractured, blocky, thin sand layers, dark gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	11/12	Cal	SM	X				X	X			40				Brown	
9'	22/12	Cal	CL		X					X		70				Brown	
14'	11/12	Cal	CL-SC			X			X	X	X	50-50				Brown	
18'	50/8	Cal	Bedrock													Dark Gray	

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION 17.5'

18 Feet

THE FISHERMAN COMPANY

BORING LOG

CONSULTING ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-19 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5441.5 COORDINATES 282,235 N 2,227,382 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, brown, roots, slightly moist.
2"	14'	CL	Clay, sandy, gravelly, silty, very stiff, moist, brown.
14'	19'	SM	Sand, clean to silty and gravelly, medium dense, moist, some thin clay layers, brown.
19'	24.1'		Bedrock, Shale-Claystone, very hard, fractured, blocky, moist, brown and gray, very sandy, fine sand layers.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	50/11	Cal	CL													Brown	
9'	24/12	Cal	CL-SM	Clay one end, SM other												Brown	
14'	21/12	Cal	SM		X			X	X	X	X	20				Brown	
19'	50/6	Cal	Bedrock														
24'	50/2	Cal	Bedrock														

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO BEDROCK 19 Feet

DEPTH TO WATER TABLE 13 ... 19.9'

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/24/77

HOLE NO. 77-20 ENGINEER CRN DATE COMPLETED 6/24/77

ELEVATION 5448.9 COORDINATES 282,000 N 2,227,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil. Clay, sandy, silty, slightly moist, brown, roots.
2"	18'	CL	Clay, very sandy, very silty, medium stiff to stiff, slightly moist to moist, brown, porous in top 5 feet.
18'	21'	SM	Sand, silty, medium dense, moist, fine sized, yellow brown and gray, some coarse sand and gravel sizes scattered in layer.
21'	22'	GC	Gravel, clayey, dense, moist, brown.
22	24'		Weathered Claystone-Sandstone, hard, moist, yellow brown and gray.
24'	29.1'		Bedrock, Shale, very hard, slightly moist, dark gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (200)	Sandstone	Siltstone	Claystone		
4'	12/12	Cal	CL		X			X				80				Brown	Very Silty
9'	21/12	Cal	CL		X			X				80				Brown	
4'	30/12	Cal	CL		X			X				80				Brown	
9'	15/12	Cal	SM		X			X				55				Yellow	
																Brown & Gray	
4	50/5	Cal	Bedrock														
9'	50/2	Cal	Bedrock														

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 24 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

THE FISHERMAN COMPANY — BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-21 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5464.1 COORDINATES 281,000 N 2,225,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, slightly moist, brown, roots.
2"	3'	CL	Clay, sandy, silty, stiff, slightly moist, brown.
3'	5'		Weathered Bedrock, Shale, sandy, blocky, fractured, slightly moist, gray and brown.
5'	9.5'		Bedrock, Claystone-Shale, very hard, blocky, fractured, slightly moist, gray brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
4'	48/12	Cal	Bedrock, fractured, blocky, sandy													Brown	
9'	50/5	Cal	Bedrock													Gray	

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 5 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 13

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-22 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5455.8 COORDINATES 282,000 N 2,226,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, slightly moist, brown, roots.
2"	14'	CL	Clay, sandy, silty, medium stiff to stiff, slightly moist to moist, water laid - layers - calcareous spots (Gypsum).
14'	19'	SM	Sand, silty, medium dense, moist, yellow brown to gray.
19'	21'	SC-GC	Sand and Gravel, clayey, dense, moist, brown.
21'	23'		Weathered Shale, fractured, hard, blocky, moist, gray brown.
23	24.5'		Bedrock, Shale-Claystone, very hard, thin, sand layers, dark gray to brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

EPTH Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (200)	Sandstone	Siltstone	Claystone		
4'	11/12	Cal	CL	X				X				80				Brown	
9'	33/12	Cal	CL		X			X	X			80				Brown	Calcareous
4'	24/12	Cal	SM		X			X				40				Yellow Brown & gray	
	50/11	Cal	SC-GC		X			X	X	X	X	25				Brown	
	50/6	Cal	Bedrock		X			X				60				Brown-Gray	

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO WATER TABLE AT BORING COMPLETION None

PTH TO BEDROCK 23 Feet

HE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

'B NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

)LE NO. 77-23 ENGINEER CRN DATE COMPLETED 6/22/77

.EVATION 5455.4 COORDINATES 283,000 N 2,226,000 E

'ILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

'PE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, dark brown to tan, roots.
2"	2'	CL	Clay, silty, sandy, stiff, dry, tan to brown.
2'	9.5'		Bedrock, Claystone, Shale, fractured, blocky, gray, olive, brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

PTH ool	BLOW COUNT	TYPE	SYMBOL	MOISTURE (Dry / Moist / V. Moist / Wet)	SAND GRADING (Fine / Medium / Coarse / Gravel / % Fines (-200))	BEDROCK (Sandstone / Siltstone / Claystone)	COLOR	COMMENTS
4'	50/10	Cal	Claystone	X		X X	Brown & Gray	
9'	50/5	Cal	Claystone	X		X X	Brown & Gray	

– 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

'TH TO BEDROCK 2 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 16 DAYS AFTER COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-24 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5457.2 COORDINATES 284,000 N 2,226,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, clay, sandy, silty, roots.
2"	14'	CL	Clay, sandy, silty, very stiff, gravelly layers, dry to slightly moist, brown and gray brown.
14'	15'	GC	Gravel, clayey, dense, slightly moist, brown.
15'	17'		Weathered Shale, medium hard, slightly moist, brown.
17'	19.1'		Bedrock, Shale, some sandstone layers, gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	30/12	Cal	CL	X				X	X			80				Brown	
9'	22/12	Cal	CL	X				X	X			70				Gray-Brown	
14'	50/3	Cal	CL	X				X	X		Sl.	60				Gray-Brown	
19'	50/2	Cal	Claystone-Sandstone														

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 17 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 16 DAYS AFTER COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-25 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5473.9 COORDINATES 285,000 N 2,226,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, dry, grass roots.
2"	18.5'	CL	Clay, sandy, silty, very stiff, scattered gravel, slightly moist, brown, some calcareous streaks. Gravelly 13' - 14'
18.5'	24'	SC	Clay and Sand layered, stiff, gray and brown.
24'	25.5'		Weathered Bedrock, Claystone, Shale, hard, gravel mixed.
25.5'	29.2'		Bedrock, Claystone, hard, brown, orange, iron stains.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	44/12	Cal	CL	X				X	X			80				Brown	
9'	50/11	Cal	CL	X				X	X			80				Brown	
14'	36/12	Cal	CL	X				X	X	X	X	70				Brown	
19'	33/12	Cal	CL		Sl.			X	X			80				Tan & brown	
	50/7	Cal			X						X	60					Gravel & Clay-stone mixed
	50/3	Cal			X												

CAL – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 25.5 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 16 DAYS AFTER COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/22/77

HOLE NO. 77-26 ENGINEER CRN DATE COMPLETED 6/22/77

ELEVATION 5466.2 COORDINATES 284,000 N 2,225,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil, Clay, sandy, silty, dark brown, roots.
2"	9'	CL	Clay, sandy to very sandy, very stiff, gravelly layers, silty, slightly moist, brown and gray. Porous in upper 5 feet.
9'	14.3'		Bedrock, Shale, hard, fractured, blocky, gray brown, sandy.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
1'	24/12	Cal	CL	X				X	X							Brown	
3'	50/9	Cal	Claystone	X										X	X	Gray Brown	
4'	50/4	Cal	Claystone														

. – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

TH TO BEDROCK 9 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 16

THE FISHERMAN COMPANY

BORING LOG

CONSULTING ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-27 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5467.2 COORDINATES 282,499 N 2,224,955 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
			2" Topsoil typical, none at hole location.
0	18'	CL	Clay, sandy, silty, medium stiff to stiff, slightly moist to moist, brown.
			Sandier belo 14 feet.
18'	23'	SM	Sand, silty, clayey, medium dense, gravelly, moist, brown
			20' - 22' gravelly
			Free water in sample at 19 feet.
23'	24.5'		Bedrock, Claystone-Shale, very sandy, very hard, moist, brown and gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
4'	31/12	Cal	CL	X				X				80				Brown	Calcareous
9'	50/11	Cal	CL	X				X				80				Brown	Porous
14'	25/12	Cal	CL		X			X				70				Brown	
19'	24/12	Cal	SM		X			X	X	X	X	40				Brown	
24'	50/5	Cal	Bedrock		X			X				60				Brown & Gray	

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 23 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 13 DAYS AFTER DRILLING None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/25/77

HOLE NO. 77-28 ENGINEER CRN DATE COMPLETED 6/25/77

ELEVATION 5467.4 COORDINATES 282,000 N 2,225,000 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	2"		Topsoil in area, not at hole.
2"	23'	CL	Clay, sandy, silty, stiff to very stiff, slightly moist to moist, brown, calcareous
			Dark gray below 14 feet
			Original ground surface at one time at 14 feet
			Porous in 19-foot drive.
23'	26'	GM-GC	Gravel, sandy, silty to clayey, dense, moist, brown.
26	28'		Weathered Bedrock, Claystone, sandy, medium hard, slightly moist, gray brown.
28'	29.2'		Bedrock, Claystone-Shale, sandy, blocky, fractured, gray-brown.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (-200)	Sandstone	Siltstone	Claystone		
4'	27/12	Cal	CL	X				X				80				Brown	Calcareous
9'	22/12	Cal	CL	X				X				80				Brown	Calcareous, Gypsum
14'	50/11	Cal	CL	X				X				80				Dark Gray	
19'	25/12	Cal	CL		X			X				30				Brown	Porous
24	45/12	Cal	GM		X			X	X	X	X	20				Brown	
26	50/3	Cal	Bedrock														

CL – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 26 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION None

DEPTH TO WATER TABLE 13 DAYS AFTER COMPLETION None

THE FISHERMAN COMPANY

BORING LOG

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 6/29/77
HOLE NO. 77-36 ENGINEER CRN DATE COMPLETED 6/29/77
ELEVATION 5412.9 COORDINATES 279,000 N 2,230,000 E
DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey
TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE				SAND GRADING					BEDROCK			COLOR	COMMENTS
				Dry	Moist	V. Moist	Wet	Fine	Medium	Coarse	Gravel	% Fines (200)	Sandstone	Siltstone	Claystone		
44'	35/12	Cal	SM			X		X	X	X	X	20				Brown	
51'	50/4	Cal	Bedrock														

L – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 51 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION 46'

DEPTH TO WATER TABLE 10 DAYS AFTER COMPLETION 46.5'

THE FISHERMAN COMPANY

BORING LOG

HOLDING POND AT PLANT

CONSULTING SOILS ENGINEERS
10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 7/8/77

HOLE NO. 77-37 ENGINEER CRN DATE COMPLETED 7/8/77

ELEVATION 5469.1 COORDINATES 290,736 N 2,226,312 E

DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey

TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	3"		Topsoil, Clay, sandy, silty, slightly moist, dark brown, roots.
3"	4'	CL	Clay, sandy, silty, stiff, slightly moist, brown.
4'	16'	SP-SM	Sand, clean to silty, medium dense, slightly moist, tan and brown, fine sand with coarse and pea gravel sizes
			Horizontally layered with thin layers of clay, more clay from 10' - 16'
Le	30'	GP-GC	Gravel, sandy, clean to clayey, medium dense, slighrly moist, brown.
			Very clean from 17' - 30'
			Water at 21 feet in 24-foot drive.
30'	34.5'		Bedrock, Shale, very hard, sandy, moist, blue gray or dark gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (-200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
'	10/12	Cal	SP-SM	X	S			X	X	X	S	10					
'	13/12	Cal	SM		S			X				40				Brown	
'	16/12	Cal	CL-SM		S			X				50-50				Brown	
'	27/12	Cal	SP		S			X	X	X	X	5				Brown	
'	46/12	Cal	GP				X	X	X	X	X	5				Brown	
'	50/5	Cal	Bedrock													Blue-Gray	

– – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 30 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION 21'

DEPTH TO WATER TABLE 1 DAYS AFTER 22.9'

THE FISHERMAN COMPANY

BORING LOG
HOLDING POND AT PLANT

10600 W. Alameda Ave., Suite L-7
Lakewood, Colorado 80226

JOB NO. 155 NAME Ash Pond, R. D. Nixon Power Plant DATE STARTED 7/8/77
HOLE NO. 77-38 ENGINEER CRN DATE COMPLETED 7/8/77
ELEVATION 5467.2 COORDINATES 290,336 N 2,226,312 E
DRILLING COMPANY Custom Auger Drilling Service RIG CME-55 DRILLER Max Muckey
TYPE OF BORING 4-inch continuous flight auger.

CLASSIFICATION OF LAYERS (UNIFIED SOIL CLASSIFICATION SYSTEM)

DEPTH From	DEPTH To	SOIL SYMBOL	SOIL DESCRIPTION
0	3"		Topsoil, Clay, sandy, silty, slightly moist, brown, roots.
3"	4.5'	CL	Clay, sandy, silty, medium stiff, slightly moist, brown and tan.
4.5'	9'	SP-SM	Sand, clean to silty, medium dense, slightly moist, brown.
9'	19.5'	CL	Clay, sandy, stiff, thin sand layers, horizontal layers, slightly moist, dark brown and brown.
19.5'	23'	GP-GC	Gravel, sandy, clean to clayey, medium dense, moist, brown, some thin clay layers. Water at 21 feet in 24-foot drive.
23'	25'	SM-CL	Sand, fine, silty, clayey to clay sandy, dark gray (mud), very soft, wet.
25'	29.5'	SP	Sand, clean, gravelly, medium dense, wet, brown.
29.5'	30'		Bedrock, Shale, sandy, hard, dark gray to blue gray.

CLASSIFICATION OF INDIVIDUAL SAMPLES

DEPTH (Top)	BLOW COUNT	TYPE	SYMBOL	MOISTURE: Dry	Moist	V. Moist	Wet	SAND GRADING: Fine	Medium	Coarse	Gravel	% Fines (#200)	BEDROCK: Sandstone	Siltstone	Claystone	COLOR	COMMENTS
4'	13/12	Cal	SP	X				X	X			5				Brown	
9'	21/12	Cal	CL		S			X				90				Brown	
14'	19/12	Cal	CL		X			X				90				Brown	
19'	15/12	Cal	SP		X			X	X	X	X	5				Brown	
24	12/12	Cal	SP				X	X	X	X	X	5				Brown	
	25/9,25/3	Cal	SP one end, bedrock other														

CL – 2" I.D., 2.5" O.D. Drive Sampler SS. – Standard Split Screen ST. – Shelby Tube

DEPTH TO BEDROCK 29.5 Feet

DEPTH TO WATER TABLE AT BORING COMPLETION 21'
DEPTH TO WATER TABLE 1 DAYS AFTER COMPLETION 21.5'

from points higher on the slope, with the main mechanisms of transport being (1) transport by stormwater sheetflow, (2) fall via erosional undermining, and (3) slow downslope creep under the influence of gravity.

Soil types on the site fall into three general groups, described on a preliminary basis as follows:

I. Clayey sands and gravels, consisting mainly of Verdos Alluvium and colluvium derived from it;

II. Lean, silty clays, including residual soils developed on Pierre Shale, clayey colluvium, and Piney Creek Alluvium;

III. Weathered Pierre Shale; and

IV. Relatively unweathered Pierre Shale.

These materials have been briefly described, and their properties will be subsequently discussed as they affect the proposed disposal site. The occurrence of these soil types in the boreholes is summarized in Table III.

TABLE III

These are depth intervals, not thicknesses (based on comparison to actual logs for 77-14 and 77-25

Thicknesses of Soil Types in Boreholes

Boring No.	Surface Elev.	Type I	Type II	Type III	Type IV
LD-1	5541	--	--	0-6'	6'
LD-2	5569	0-3'	3-7.5'	7.5-16.5'	16.5'
LD-3	5560	--	0-1'	1-6.5'	6.5'
LD-4	5519	Thin	0-1'	1-6.5'	6.5'
LD-5	5504	--	0-17'	17-22'	22'
LD-6	5509	--	0-1.5'	1.5-6'	6'
LD-7	5519	--	0-12'	12'	Unknown
LD-8	5511	Thin	0-3'	3'	Unknown
Drilled by CH_2M Hill					
B-10	5523	--	0-2'	2-9'	9'
B-11	5526	--	0-14'	14'	Unknown
B-12	5534	--	0-4'	4-6.5'	6.5'
B-13	5525	--	0-15'	15-19.5'	19.5'
B-14	5487	17-19.5'	0-17'	19.5'	Unknown
B-15	5514	--	0-15'	15'	Unknown
Drilled by The Fisherman Co.					
77-14	5475	3.5-6.5'	0-3.5', 6.5-16'	16'	Unknown
77-25	5474	--	0-24'	24-25.5'	25.5'

In holes drilled by firms other than Lincoln-DeVore, soil type classifications and depths are based descriptions furnished by those firms, and Lincoln-DeVore cannot warranty their accuracy.

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-16

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 1
Location: See Plan
Elevation: See Plan
Date Start: 3/24/94
Date Finish: 3/24/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/24/94	WD	NE	N/A	14.3'	Size ID	4-1/4 in.		1 3/8 in.
					Hammer Wt	------		140 lb.
					Hammer Fall	------		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
5					
10					LEAN CLAY (CL) Brown, dry, mostly clay. - FINE ALLUVIUM -
					14.0
15		50/4"	S1	14/14.3	SHALE Very hard, brown, dry, mostly shale, little gypsum. Bottom of Exploration at 14.3 ft.

BLOWS/FT.	DENSITY	BLOWS/FT.	CONSISTENCY	SAMPLE IDENTIFICATION	GROUNDWATER ABBREVIATIONS
0 - 4	VERY LOOSE	0 - 2	VERY SOFT	C - CALIFORNIA BARREL	WD - WHILE DRILLING
4 - 10	LOOSE	2 - 4	SOFT	S - SPLIT SPOON	NE - NOT ENCOUNTERED
10 - 30	MEDIUM DENSE	4 - 8	MEDIUM STIFF	T - TUBE	NR - NOT READ
30 - 50	DENSE	8 - 15	STIFF	U - UNDISTURBED PISTON	N/A- NOT APPLICABLE
51 +	VERY DENSE	15 - 30	VERY STIFF	G - GRAB SAMPLE	
		31 +	HARD	X - OTHER	BORING NO. B-16

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-17

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 2
Location: See Plan
Elevation: See Plan
Date Start: 3/24/94
Date Finish: 3/24/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/24/94	WD	17.0'	N/A	24.4'	Size ID	4-1/4 in.		1 3/8 in.
3/25/94	8:00 AM	13.9'			Hammer Wt	------		140 lb.
3/29/94	7:00 AM	14.0'			Hammer Fall	------		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
5					LEAN CLAY (CL) Brown, dry, mostly clay. - FINE ALLUVIUM -
10					
15		4 4 4	S1	14.0 15.5	LEAN CLAY (CL) Medium stiff to stiff, brown, moist, mostly clay, trace fine sand. - FINE ALLUVIUM -
		7 12	S2	19.0 20.5	19.0

BLOWS/FT.	DENSITY	BLOWS/FT.	CONSISTENCY	SAMPLE IDENTIFICATION	GROUNDWATER ABBREVIATIONS
0 - 4	VERY LOOSE	0 - 2	VERY SOFT	C - CALIFORNIA BARREL	WD - WHILE DRILLING
4 - 10	LOOSE	2 - 4	SOFT	S - SPLIT SPOON	NE - NOT ENCOUNTERED
10 - 30	MEDIUM DENSE	4 - 8	MEDIUM STIFF	T - TUBE	NR - NOT READ
30 - 50	DENSE	8 - 15	STIFF	U - UNDISTURBED PISTON	N/A- NOT APPLICABLE
51 +	VERY DENSE	15 - 30	VERY STIFF	G - GRAB SAMPLE	
		31 +	HARD	X - OTHER	BORING NO. B-17

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-17
		Page 2 of 2

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
		16			CLAYEY SAND WITH GRAVEL (SC)
					Medium dense, brown, wet, mostly sand, some gravel, little clay.
					- COARSE ALLUVIUM -
					24.0
		50/5"	S3	24/24.4	SHALE
25					Hard, gray, wet, slightly weathered shale.
					Bottom of Exploration at 24.4 ft.
30					
35					
40					

BLOWS/FT.	DENSITY
0 - 4	VERY LOOSE
4 - 10	LOOSE
10 - 30	MEDIUM DENSE
30 - 50	DENSE
51 +	VERY DENSE

BLOWS/FT.	CONSISTENCY
0 - 2	VERY SOFT
2 - 4	SOFT
4 - 8	MEDIUM STIFF
8 - 15	STIFF
15 - 30	VERY STIFF
31 +	HARD

SAMPLE IDENTIFICATION
C - CALIFORNIA BARREL
S - SPLIT SPOON
T - TUBE
U - UNDISTURBED PISTON
G - GRAB SAMPLE
X - OTHER

GROUNDWATER ABBREVIATIONS
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
NR - NOT READ
N/A- NOT APPLICABLE

BORING NO. B-17

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-18

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 2
Location: See Plan
Elevation: See Plan
Date Start: 3/24/94
Date Finish: 3/24/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/24/94	WD	19.0'	34.3'	34.3'	Size ID	4-1/4 in.		1 3/8 in.
3/25/94	8:00 AM	18.4'			Hammer Wt	------		140 lb.
3/29/94	7:00 AM	17.0'			Hammer Fall	------		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
5					
10					
15		4 3 4	S1	14.0 15.5	LEAN CLAY (CL) Medium stiff, brown, moist, mostly clay, trace fine gravel. - FINE ALLUVIUM -
		7 12	S2	19.0 20.5	Same as above except very stiff and no gravel.

BLOWS/FT.	DENSITY	BLOWS/FT.	CONSISTENCY	SAMPLE IDENTIFICATION	GROUNDWATER ABBREVIATIONS
0 - 4	VERY LOOSE	0 - 2	VERY SOFT	C - CALIFORNIA BARREL	WD - WHILE DRILLING
4 - 10	LOOSE	2 - 4	SOFT	S - SPLIT SPOON	NE - NOT ENCOUNTERED
10 - 30	MEDIUM DENSE	4 - 8	MEDIUM STIFF	T - TUBE	NR - NOT READ
30 - 50	DENSE	8 - 15	STIFF	U - UNDISTURBED PISTON	N/A- NOT APPLICABLE
51 +	VERY DENSE	15 - 30	VERY STIFF	G - GRAB SAMPLE	
		31 +	HARD	X - OTHER	BORING NO. B-18

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-18
		Page 2 of 2

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
		14			
		6	S3	24.0	Same as above except stiff.
25		6			
		8		25.5	
					29.0
		8	S4	29.0	CLAYEY SAND WITH GRAVEL (SC)
		10			
30		14		30.5	Medium dense, brown, wet, mostly sand, some gravel, little clay.
					- COARSE ALLUVIUM -
					32.0
					SHALE
		50/3"	S5	34/34.3	Very hard, gray, wet, slightly weathered shale.
35					Bottom of Exploration at 34.3 ft.
40					

BLOWS/FT.	DENSITY
0 - 4	VERY LOOSE
4 - 10	LOOSE
10 - 30	MEDIUM DENSE
30 - 50	DENSE
51 +	VERY DENSE

BLOWS/FT.	CONSISTENCY
0 - 2	VERY SOFT
2 - 4	SOFT
4 - 8	MEDIUM STIFF
8 - 15	STIFF
15 - 30	VERY STIFF
31 +	HARD

SAMPLE IDENTIFICATION
C - CALIFORNIA BARREL
S - SPLIT SPOON
T - TUBE
U - UNDISTURBED PISTON
G - GRAB SAMPLE
X - OTHER

GROUNDWATER ABBREVIATIONS
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
NR - NOT READ
N/A- NOT APPLICABLE

BORING NO. B-18

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-19

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 2
Location: See Plan
Elevation: See Plan
Date Start: 3/25/94
Date Finish: 3/25/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/25/94	WD	NE	N/A	35.5	Size ID	4-1/4 in.		1 3/8 in.
					Hammer Wt	------		140 lb.
					Hammer Fall	------		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
5					
10					
15		7 10 11	S1	14.0 15.5	LEAN CLAY (CL) Very stiff, brown, dry, mostly clay, trace fine gravel. - FINE ALLUVIUM -
		12 21	S2	19.0 20.5	Same as above except hard.

BLOWS/FT.	DENSITY	BLOWS/FT.	CONSISTENCY	SAMPLE IDENTIFICATION	GROUNDWATER ABBREVIATIONS
0 - 4	VERY LOOSE	0 - 2	VERY SOFT	C - CALIFORNIA BARREL	WD - WHILE DRILLING
4 - 10	LOOSE	2 - 4	SOFT	S - SPLIT SPOON	NE - NOT ENCOUNTERED
10 - 30	MEDIUM DENSE	4 - 8	MEDIUM STIFF	T - TUBE	NR - NOT READ
30 - 50	DENSE	8 - 15	STIFF	U - UNDISTURBED PISTON	N/A- NOT APPLICABLE
51 +	VERY DENSE	15 - 30	VERY STIFF	G - GRAB SAMPLE	
		31 +	HARD	X - OTHER	BORING NO. B-19

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-19
		Page 2 of 2

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
		17/3"			
		10	S3	24.0 — 25.5	Same as above except very stiff, no gravel and trace sand.
25		10			
		12			
					29.0
		16	S4	29.0 — 30.5	CLAYEY SAND WITH GRAVEL (SC)
		12			Very medium dense, brown, dry, mostly fine sand, some gravel, little clay.
30		10			- COARSE ALLUVIUM -
					32.0
					SHALE
		16	S5	34.0 — 35.5	Hard, brown, dry, slightly weathered shale.
		34			
35					
					Bottom of Exploration at 35.5 ft.
40					

BLOWS/FT.	DENSITY
0 - 4	VERY LOOSE
4 - 10	LOOSE
10 - 30	MEDIUM DENSE
30 - 50	DENSE
51 +	VERY DENSE

BLOWS/FT.	CONSISTENCY
0 - 2	VERY SOFT
2 - 4	SOFT
4 - 8	MEDIUM STIFF
8 - 15	STIFF
15 - 30	VERY STIFF
31 +	HARD

SAMPLE IDENTIFICATION
C - CALIFORNIA BARREL
S - SPLIT SPOON
T - TUBE
U - UNDISTURBED PISTON
G - GRAB SAMPLE
X - OTHER

GROUNDWATER ABBREVIATIONS
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
NR - NOT READ
N/A- NOT APPLICABLE

BORING NO. B-19

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-20

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 1
Location: See Plan
Elevation: See Plan
Date Start: 3/25/94
Date Finish: 3/25/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/25/94	WD	NE	N/A	14.4'	Size ID	4-1/4 in.		1 3/8 in.
					Hammer Wt	------		140 lb.
					Hammer Fall	------		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
5					LEAN CLAY (CL) Very stiff, brown, dry, mostly clay, trace fine gravel. - FINE ALLUVIUM -
10					NOTE: Thumbsize gravel noted at 11.0 ft.
					13.0 SHALE
		50/5"	S1	14/14.4	Hard, brown/gray, dry, slightly weathered shale.
15					Bottom of Exploration at 14.4 ft.

BLOWS/FT.	DENSITY
0 - 4	VERY LOOSE
4 - 10	LOOSE
10 - 30	MEDIUM DENSE
30 - 50	DENSE
51 +	VERY DENSE

BLOWS/FT.	CONSISTENCY
0 - 2	VERY SOFT
2 - 4	SOFT
4 - 8	MEDIUM STIFF
8 - 15	STIFF
15 - 30	VERY STIFF
31 +	HARD

SAMPLE IDENTIFICATION
C - CALIFORNIA BARREL
S - SPLIT SPOON
T - TUBE
U - UNDISTURBED PISTON
G - GRAB SAMPLE
X - OTHER

GROUNDWATER ABBREVIATIONS
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
NR - NOT READ
N/A- NOT APPLICABLE

HALEY & ALDRICH, INC.	TEST BORING REPORT	Boring No. B-21

PROJECT: Hanna Ranch Dam Seepage Analysis
CLIENT: City of Colorado Springs
CONTRACTOR: GDI Drilling
EQUIPMENT USED: Diedrich D-50

Job No. 20194-000
Page No. 1 of 1
Location: See Plan
Elevation: See Plan
Date Start: 3/25/94
Date Finish: 3/25/94
Driller: J. Shaw
Prepared By: M. Ganse

GROUNDWATER		DEPTH TO:			Auger Type		Sampler Type	
Date	Hrs After Comp	Water	Bottom of Casing	Bottom of Hole	Type	HSA		S
3/25/94	WD	NE	N/A	6.5'	Size ID	4-1/4 in.		1 3/8 in.
					Hammer Wt	-----		140 lb.
					Hammer Fall	-----		30 in.

Depth in Feet	Casing Blows Per Foot	Sampler Blows Per 6 Inch	Sample Number	Sample Depth Range	FIELD CLASSIFICATION AND REMARKS
					LEAN CLAY (CL)
					Brown, dry, mostly clay.
					- FINE ALLUVIUM -
					NOTE: Gravel in cuttings at 4.5 ft.
					5.0
5		18			SHALE
		24	S1	5.0 / 6.5	
		24			Hard, brown, dry, slightly weathered shale.
					Bottom of Exploration at 6.5 ft.
10					
15					

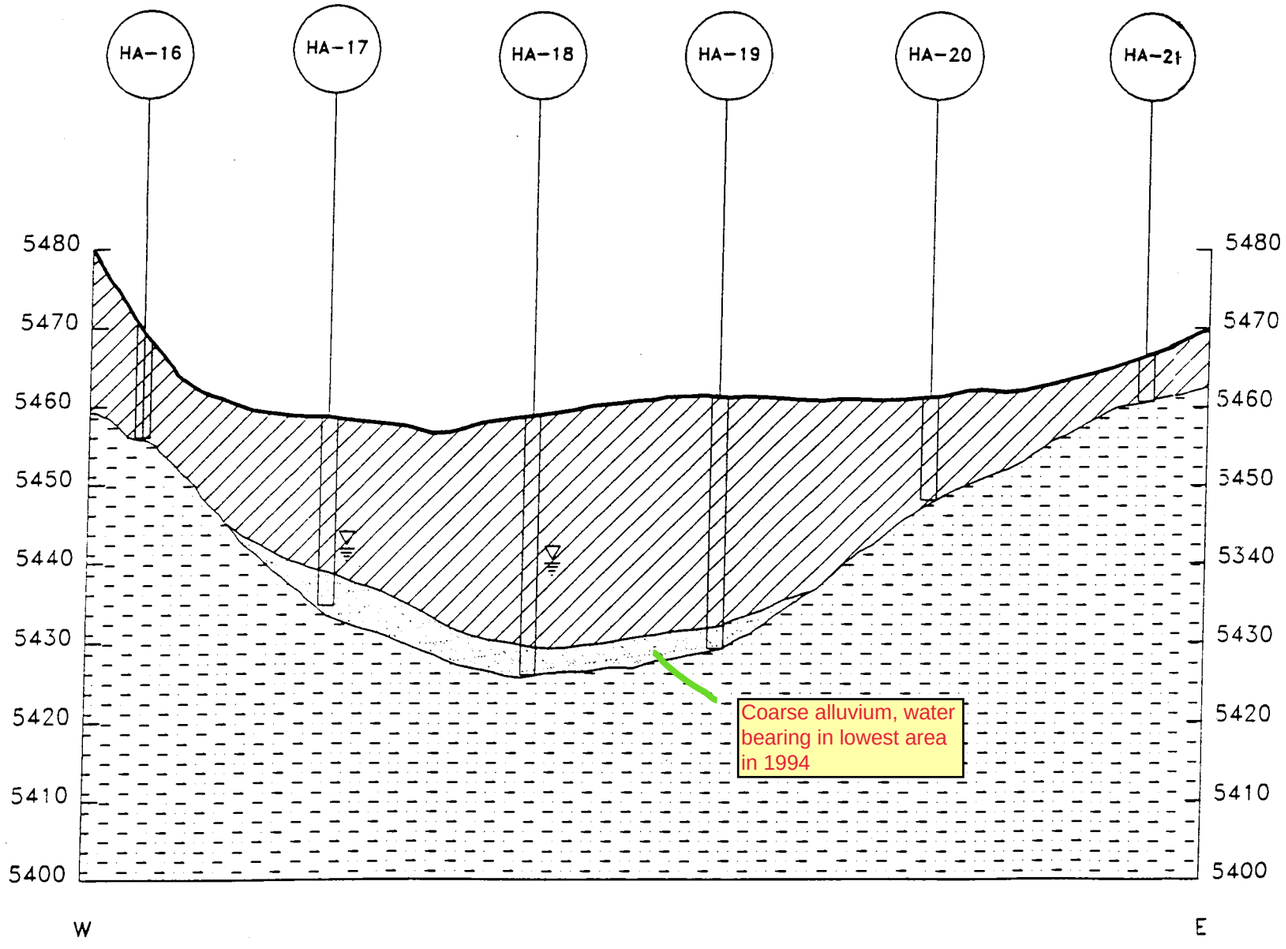
BLOWS/FT.	DENSITY
0 - 4	VERY LOOSE
4 - 10	LOOSE
10 - 30	MEDIUM DENSE
30 - 50	DENSE
51 +	VERY DENSE

BLOWS/FT.	CONSISTENCY
0 - 2	VERY SOFT
2 - 4	SOFT
4 - 8	MEDIUM STIFF
8 - 15	STIFF
15 - 30	VERY STIFF
31 +	HARD

SAMPLE IDENTIFICATION
C - CALIFORNIA BARREL
S - SPLIT SPOON
T - TUBE
U - UNDISTURBED PISTON
G - GRAB SAMPLE
X - OTHER

GROUNDWATER ABBREVIATIONS
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
NR - NOT READ
N/A- NOT APPLICABLE

BORING NO. B-21



SCALE:
1"=200' HORIZONTAL
1"=20' VERTICAL

LEGEND

GROUND SURFACE
INFERRED STRATIGRAPHIC BOUNDARIES

BORING LOCATIONS

HA-16 BORINGS, DRILLED BY H&A

WATER LEVEL

FINE-GRAINED ALLUVIUM-
LEAN CLAY WITH SAND (CL)
MEDIUM TO VERY STIFF,
BROWN, MOSTLY CLAY,
SOME AREAS SILTY,
SOME AREAS WITH SAND

COARSE-GRAINED ALLUVIUM-
CLAYEY SAND (SC)
DENSE PRIMARILY
COARSE SAND,
SOME AREAS CLEAN WITH
GRAVEL, MOST AREAS
WITH SOME CLAY OR SILT

SHALE BEDROCK-
VERY HARD TO HARD,
SLIGHTLY TO MODERATELY
WEATHERED SHALE

HALEY & ALDRICH INC.
Geotechnical Engineers & Environmental Consultants

FIGURE 4
GEOLOGIC PROFILE

CLIENT: CITY OF COLORADO SPRINGS	JOB NO: 20194-004
PROJECT: H. R. SUPERNATANT DAM	DATE: FEBRUARY 1995

TABLE I
HANNA RANCH EXPANSION
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample No. and Depth (Feet)	Soil Description (Classification)	Natural Water Content (%)	Dry Unit Weight (PCF)	Water Soluble Sulfates (%)	Silt/Clay <#200	Atterberg Limits		Unconfined Compression		Swell- Consolidation	
							Liquid Limit	Plasticity Index	Stress (PSF)	Strain (%)	Swell (%)	Press (PSF)
HA-201	C1 (0.0-1.5)	Lean Clay with Sand (CL)	15.3	109.0	0.83	83.1	47	22			0.3	
HA-201	C6 (25.0-26.5)	Lean Clay (CL)	10.3	118.3		87.0	42	20			4.9	
HA-201	C8 (35.0-35.5)	Claystone	11.5									
HA-201	C9 (40.0-40.5)	Claystone	13.0									
HA-201	C10 (45.0-45.2)	Claystone	11.3	120.1					5153			
HA-202	C2 (5.0-6.5)	Weathered Claystone	12.5			96.3	50	29				
HA-202	C3 (10.0-10.8)	Weathered Claystone	25.8									
HA-202	C4 (15.0-15.3)	Claystone	11.9		1.95							
HA-202	C5 (20.0-20.3)				1.59							
HA-202	C6 (35.0-35.1)	Claystone	13.3	110.9					4670			
HA-202	C10 (45.0-45.1)	Claystone	7.5	105.1	0.16	99.1					1.9	

TABLE I
HANNA RANCH EXPANSION
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample No. and Depth (Feet)	Soil Description (Classification)	Natural Water Content (%)	Dry Unit Weight (PCF)	Water Soluble Sulfates (%)	Silt/Clay <#200	Atterberg Limits		Unconfined Compression		Swell- Consolidation	
							Liquid Limit	Plasticity Index	Stress (PSF)	Strain (%)	Swell (%)	Press (PSF)
HA-203	C2 (5.0-6.5)	Lean Clay with Sand(CL)	15.3	96.8	0.09	80.1	44	21			consol upon wetting	
HA-203	C3 (10.0-10.5)	Claystone	9.8									
HA-203	C4 (15.0-15.3)	Claystone	12.2									
HA-203	C6 (25.0-25.3)	Claystone	11.9			97.4						
HA-203	C7 (30.0-30.3)	Claystone	12.8	107.9							6.1	
HA-204	C1 (0.0-1.5)	Weathered Claystone	23.5			90.9	52	28				
HA-204	C2 (5.0-6.5)	Weathered Claystone	26.9									
HA-204	C3 (10.0-11.5)	Weathered Claystone	20.8									
HA-204	C4 (15.0-16.5)	Weathered Claystone	15.0			98.4	41	19				
HA-204	C5 (20.0-21.0)	Claystone	14.3									
HA-204	C6 (25.0-26.0)	Claystone	14.9			97.8	51	29				

TABLE I
HANNA RANCH EXPANSION
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample No. and Depth (Feet)	Soil Description (Classification)	Natural Water Content (%)	Dry Unit Weight (PCF)	Water Soluble Sulfates (%)	Silt/Clay <#200	Atterberg Limits		Unconfined Compression		Swell- Consolidation	
							Liquid Limit	Plasticity Index	Stress (PSF)	Strain (%)	Swell (%)	Press (PSF)
HA-205	C2 (5.0-6.5)	Weathered Claystone	17.4									
HA-205	C3 (10.0-11.5)	Weathered Claystone	18.9			87.8	45	20				
HA-205	C4 (15.0-15.7)	Claystone	16.3									
HA-205	C5 (20.0-20.7)	Claystone	14.3									
HA-205	C6 (25.0-25.4)	Claystone	15.0									
HA-205	C7 (30.0-30.4)	Claystone	13.5			97.5						
HA-205	C8 (35.0-35.1)	Claystone	12.4									
HA-205	C9 (40.0-40.2)	Claystone	10.5			95.3	61	38				
HA-207	C2 (5.0-6.5)	Lean Clay (CL)	18.4	109.1		88.7	38	20	1731			
HA-208	C2 (5.0-6.5)	Weathered Claystone	22.5									
HA-208	C3 (10.0-11.5)	Weathered Claystone	14.8									

TABLE I
HANNA RANCH EXPANSION
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample No. and Depth (Feet)	Soil Description (Classification)	Natural Water Content (%)	Dry Unit Weight (PCF)	Water Soluble Sulfates (%)	Silt/Clay <#200	Atterberg Limits		Unconfined Compression		Swell- Consolidation	
							Liquid Limit	Plasticity Index	Stress (PSF)	Strain (%)	Swell (%)	Press (PSF)
HA-208	C4 (15.0-15.3)	Claystone	11.9			98.6	45	23				
HA-209	C2 (5.0-6.5)	Lean Clay (CL)	19.0	109.2		95.6	39	21	5277			
HA-210	C1 (0.0-1.5)	Lean Clay (CL)	26.7			85.7	41	21				
HA-210	C2 (5.0-6.5)	Weathered Claystone	10.6									
HA-210	C3 (10.0-10.8)	Claystone	9.7			94.2	35	17				
HA-202 HA-203	bulk (0-3, 0-7.5)	Lean Clay with Sand(CL)*				83.0	45	28				
HA-201 HA-202 HA-203	bulk (3.0-10.0)	Weathered Claystone**				95.3	49	30				
HA-201 HA-202 HA-203	bulk (10.0-30.0)	Claystone				96.3	51	32				

* See Appendix C, Figure C-2 for Proctor results

** See Appendix C, Figure C-1 for Proctor results

PROJECT NO. 17229	LOG OF TEST BORING LEGEND	SHEET 1 OF 1
DRILLING EQUIPMENT	PROJECT NAME NIXON ASH PIT	LOCATION
TYPE OF BIT	HAMMER DATA: WT. LBS. DROP INCHES	SURFACE ELEVATION / TOP OF CASING ELEVATION
DATE: STARTED: / COMPLETED: / BACKFILLED:	DRILLING AGENCY / LOGGED BY / SURFACE CONDITIONS	GROUNDWATER DEPTH / DATE

DEPTH (FEET)	GEOLOGIC LOG	SOIL DESCRIPTION	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		FILL	50 ↑ Indicates number of blows required to drive the identified sampler 12 inches with a 140 lb. hammer falling 30 inches.			CONTINUOUS SAMPLER	
1		GW WELL GRADED GRAVEL					
2		GP POORLY GRADED GRAVEL				GRAB SAMPLE	
3		GM SILTY GRAVEL					
4		GC CLAYEY GRAVEL				CALIFORNIA SAMPLER (OD-2.5")	
5		SW WELL GRADED SAND					
6		SP POORLY GRADED SAND				MODIFIED CALIF. SAMPLER (OD-3")	
7		SM SILTY SAND					
8		SC CLAYEY SAND				NO RECOVERY	
9		ML SILT					
10		CL LEAN CLAY				PITCHER SAMPLER	
11		OL ORGANIC CLAY or SILT, LOW PLASTICITY					
12		MH ELASTIC SILT				SHELBY TUBE SAMPLER	
13		CH FAT CLAY					
14		GW-GM WELL GRADED GRAVEL w/ SILT				STANDARD PENETRATION SAMPLER (OD-2")	
15		GW-GC WELL GRADED GRAVEL w/ CLAY					
16		GP-GM POORLY GRADED GRAVEL w/ SILT	50/6 ↑ Indicates number of blows required to drive the identified sampler 6 inches with a 140 lb. hammer falling 30 inches.			LL=Liquid Limit %	
17		GP-GC POORLY GRADED GRAVEL w/ CLAY				PI=Plastic Index %	
18		GC-GM SILTY, CLAYEY GRAVEL				-#200=percent passing No. 200 sieve	
19		SW-SM WELL GRADED SAND w/ SILT					
20		SW-SC WELL GRADED SAND w/ CLAY				Ex=percent expansion under defined load	
21		SP-SM POORLY GRADED SAND w/ SILT					
22		SP-SC POORLY GRADED SAND w/ CLAY				Exp=expansive pressure	
23		CL-ML SILTY CLAY					
24		SC-SM SILTY, CLAYEY SAND				Col=percent collapse at defined load	
25		SANDSTONE					
26		CLAYSTONE					
27		▼ WATER LEVEL AT TIME OF DRILLING					
28		▽ MEASURED WATER LEVEL ON DATE INDICATED					
29							
30							

FN LOCKEY

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO. B-1

PROJECT NO.	LOG OF TEST BORING K-1	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	WT. 140 LBS. DROP 30 INCHES	N/A	9.5'

DATE				GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY	SPECTRUM	NONE	AT DRILLING
COMPLETED:	5/30/02	LOGGED BY	W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS	SPORADIC WEEDS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		CLAY (CL), STIFF, SLIGHTLY MOIST, SOME SULFATE STRINGERS, LIGHT BROWN.	14				
7		BEDROCK CLAYSTONE, SLIGHTLY SANDY, HARD TO VERY HARD, SLIGHTLY MOIST, IRON STAINING, BROWN TO OLIVE-BROWN.	50/6				
10		TOTAL DEPTH: 9.5'					

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-2

PROJECT NO.	LOG OF TEST BORING K-2	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	WT. 140 LBS. DROP 30 INCHES	N/A	10'

DATE			
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM	GROUNDWATER DEPTH	NONE / NONE / NONE
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE	DATE	AT DRILLING / 5/31/02 / 6/6/02
BACKFILLED:	SURFACE CONDITIONS EXPOSED SOIL		

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		CLAY (CL), STIFF TO VERY STIFF, MOIST, BROWN.	13				
8		BEDROCK CLAYSTONE, SLIGHTLY SANDY, HARD, SLIGHTLY MOIST, IRON STAINING, OLIVE-BROWN.	50/8				
10		TOTAL DEPTH: 10'					

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-3

PROJECT NO.	LOG OF TEST BORING K-3	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	WT. 140 LBS. DROP 30 INCHES	N/A	20'

DATE			GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY SPECTRUM	NONE	AT DRILLING
COMPLETED:	5/30/02	LOGGED BY W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS GRASS/WEEDS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		SILTY SAND AND GRAVEL (ROAD BASE), DRY, REDDISH-BROWN.					
1-16		CLAY (CL), SOME SLIGHTLY SANDY ZONES, MEDIUM STIFF TO STIFF, SLIGHTLY MOIST TO MOIST, SOME SULFATE STRINGERS, LIGHT BROWN.	20				
			7				
17-19		BEDROCK CLAYSTONE, HARD, SLIGHTLY MOIST, BROWN TO OLIVE-BROWN.	50/9				
20		TOTAL DEPTH: 20'					
21-30							

KLEINFELDER
4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-4

PROJECT NO. 17229	LOG OF TEST BORING K-4	SHEET 1 OF 1
DRILLING EQUIPMENT CME 55 (w/ AUTOHAMMER)	PROJECT NAME NIXON ASH PIT	LOCATION SEE TEST BORING LOCATION PLAN
TYPE OF BIT 4" AUGER	HAMMER DATA: WT. 140 LBS. DROP 30 INCHES	SURFACE ELEVATION N/A
		TOTAL DEPTH OF HOLE 14.5'

DATE			
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM	GROUNDWATER DEPTH	NONE / DATE AT DRILLING
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE		NONE / 5/31/02
BACKFILLED:	SURFACE CONDITIONS WEEDS		NONE / 6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0–8		CLAY (CL), MEDIUM STIFF TO STIFF, MOIST TO VERY MOIST, SOME SULFATE STRINGERS, LIGHT BROWN TO BROWN.	10				
8–14		BEDROCK CLAYSTONE, SLIGHTLY SANDY, MEDIUM HARD TO HARD, SLIGHTLY MOIST TO MOIST, SOME IRON STAINING, OLIVE-BROWN.	42				
14–30		TOTAL DEPTH: 14.5'					

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4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-5

PROJECT NO	LOG OF TEST BORING K-5	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	14.5'

DATE			GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY: SPECTRUM	NONE	AT DRILLIN
COMPLETED:	5/30/02	LOGGED BY: W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS: NATIVE GRASS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		4" TOPSOIL AND GRASS.					
1-8		CLAY (CL), MEDIUM STIFF TO VERY STIFF, SLIGHTLY MOIST, LIGHT BROWN.	11				
8-14		BEDROCK CLAYSTONE, HARD, SLIGHTLY MOIST, BROWN TO OLIVE-BROWN.	50 50/7				
14		TOTAL DEPTH: 14.5'					
15-30							

PROJECT NO.	LOG OF TEST BORING K-6	SHEET 1 OF 2
17229		

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT. 140 LBS. DROP 30 INCHES	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER		N/A	45'

DATE					
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM	GROUNDWATER DEPTH	NONE	DATE	AT DRILLING
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE		NONE		5/31/02
BACKFILLED:	SURFACE CONDITIONS ASH w/ SPORADIC WEEDS		NONE		6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		ASH, MOIST, GRAY TO BLACK.					
10			6				
20			7				
25			18				
30							

KLEINFELDER
4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-7

PROJECT NO.	LOG OF TEST BORING K-6	SHEET
17229		2 OF 2

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	45'

DATE			GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY SPECTRUM	NONE	AT DRILLIN
COMPLETED:	5/30/02	LOGGED BY W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS ASH w/ SPORADIC WEEDS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
30–39		ASH, MOIST, GRAY TO BLACK.	16 39				
40–43		CLAY (CL), STIFF TO VERY STIFF, VERY MOIST, BROWN.	14				
43–45		BEDROCK CLAYSTONE, SLIGHTLY SANDY, HARD, MOIST, OLIVE-BROWN.	50				
45		TOTAL DEPTH: 45'					

FN: LOGS

KLEINFELDER
4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-8

PROJECT NO.	LOG OF TEST BORING K-7	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	24.5'

DATE				GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY	SPECTRUM	NONE	AT DRILLING
COMPLETED:	5/30/02	LOGGED BY	W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS	SPARSE GRASS/WEEDS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		ASH, SLIGHTLY MOIST TO MOIST, GRAY TO BLACK.					
1		SAND, GRAVELLY (ROAD BASE), SLIGHTLY MOIST, REDDISH-BROWN.					
2		ASH, WET, GRAY TO BLACK.					
7		CLAY (CL), MEDIUM STIFF TO STIFF, VERY MOIST TO SLIGHTLY MOIST, OLIVE-BROWN.	6				
17		BEDROCK CLAYSTONE, SLIGHTLY SANDY LENSES, MEDIUM HARD TO HARD, SLIGHTLY MOIST, OLIVE-BROWN.	50/11				
24			50/7				
25		TOTAL DEPTH: 24.5'					
30							

EN LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-9

PROJECT NO. 17229	LOG OF TEST BORING K-8	SHEET 1 OF 2
DRILLING EQUIPMENT CME 55 (w/ AUTOHAMMER)	PROJECT NAME NIXON ASH PIT	LOCATION SEE TEST BORING LOCATION PLAN
TYPE OF BIT 4" AUGER	HAMMER DATA: WT. 140 LBS. DROP 30 INCHES	SURFACE ELEVATION N/A
		TOTAL DEPTH OF HOLE 56'

DATE				
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM	GROUNDWATER DEPTH	NONE	DATE AT DRILLING
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE		NONE	5/31/02
BACKFILLED:	SURFACE CONDITIONS ASH w/ SPORADIC WEEDS		NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		ASH, SLIGHTLY MOIST TO MOIST, GRAY TO BLACK.					
9			36				
19			50/7				
30							

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-10

PROJECT NO.	LOG OF TEST BORING K-8	SHEET
17229		2 OF 2

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	56'

DATE			GROUNDWATER DEPTH	DATE
STARTED: 5/30/02	DRILLING AGENCY: SPECTRUM		NONE	AT DRILLING
COMPLETED: 5/30/02	LOGGED BY: W. BARREIRE		NONE	5/31/02
BACKFILLED:	SURFACE CONDITIONS: ASH w/ SPORADIC WEEDS		NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
30		ASH, SLIGHTLY MOIST TO MOIST, GRAY TO BLACK.	50/7				
36			36				
39		VERY MOIST TO WET ZONES FROM 38'-42'.					
41			24				
45							
46		CLAY (CL), STIFF, VERY MOIST TO WET, LIGHT BROWN.	14				
50			10				
56			13				
57		TOTAL DEPTH: 56'					
60							

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-11

PROJECT NO.	LOG OF TEST BORING K-9	SHEET 1 OF 1
17229		

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	5'

DATE					
STARTED	5/30/02	DRILLING AGENCY	SPECTRUM	GROUNDWATER DEPTH	NONE AT DRILLING
COMPLETED	5/30/02	LOGGED BY	W. BARREIRE		NONE 5/31/02
BACKFILLED:		SURFACE CONDITIONS	GRASS/WEEDS/CACTI		NONE 6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		4" TOPSOIL AND GRASS.					
1		CLAY (CL), SANDY, STIFF, SLIGHTLY MOIST, LIGHT BROWN.	12				
2		BEDROCK					
3		CLAYSTONE, SANDY, MEDIUM HARD TO HARD, SLIGHTLY MOIST TO DRY, LIGHT BROWN.					
4			50/11				
5		TOTAL DEPTH: 5'					
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Not in area of interest

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-12

PROJECT NO.	LOG OF TEST BORING K-10	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	29.5'

DATE			GROUNDWATER DEPTH	DATE
STARTED: 5/30/02	DRILLING AGENCY SPECTRUM		NONE	AT DRILLING
COMPLETED: 5/30/02	LOGGED BY W. BARREIRE		NONE	5/31/02
BACKFILLED:	SURFACE CONDITIONS SPORADIC WEEDS/BRUSH		NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		CLAY (CL), SOME SLIGHTLY SANDY TO SANDY LENSES, MEDIUM STIFF TO VERY STIFF, SLIGHTLY MOIST, SOME SULFATE STRINGERS, SLIGHTLY POROUS, LIGHT BROWN.					
5			12				
		Not in area of interest					
10			17				
15			20				
25		BEDROCK CLAYSTONE, SLIGHTLY SANDY, HARD, SLIGHTLY MOIST, LIGHT BROWN TO BROWN.					
29			50/6.5				
30		TOTAL DEPTH: 29.5'					

FN: LOGS

KLEINFELDER

4815 LIST DRIVE, UNIT 115
COLORADO SPRINGS, CO 80919

FIGURE NO.: B-13

PROJECT NO.	LOG OF TEST BORING K-11	SHEET
17229		1 OF 1

DRILLING EQUIPMENT	PROJECT NAME	LOCATION
CME 55 (w/ AUTOHAMMER)	NIXON ASH PIT	SEE TEST BORING LOCATION PLAN

TYPE OF BIT	HAMMER DATA: WT.	DROP	SURFACE ELEVATION	TOTAL DEPTH OF HOLE
4" AUGER	140 LBS.	30 INCHES	N/A	9.5'

DATE			GROUNDWATER DEPTH	DATE
STARTED:	5/30/02	DRILLING AGENCY: SPECTRUM	NONE	AT DRILLING
COMPLETED:	5/30/02	LOGGED BY: W. BARREIRE	NONE	5/31/02
BACKFILLED:		SURFACE CONDITIONS: GRASS/WEEDS	NONE	6/6/02

DEPTH (FEET)	SYMBOL	LOG OF MATERIAL	BLOW COUNTS	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	NOTES
0		CLAY (CL), SLIGHTLY SANDY, STIFF, SLIGHTLY MOIST, LIGHT BROWN TO BROWN.					
3		BEDROCK CLAYSTONE, HARD TO VERY HARD, SLIGHTLY MOIST, OLIVE-BROWN.	50/11				
9			50/8				
10		TOTAL DEPTH: 9.5'					

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-201

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5472 ELEVATION DATUM USC & GS

SHEET 1 OF 2

PROJECT NO. K77-101-1

DATE 11-11-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Stiff, light tan brown, desiccated, Silty CLAY with caliche	CL	Boring advanced with 4" dia. C.F.A.
	S	12/12	5 7			
5						WC < PL
	S	12/12	5 10			
10						
	S	12/12	10 12			
15				Becoming brown		
	S	12/12	4 5			
20						
	S	12/12	12 18	Very stiff, brown, Silty CLAY with gravel	w/ GP	
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-53

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-201

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5472 ELEVATION DATUM USC & GS

SHEET 2 OF 2

PROJECT NO. K77-101-1

DATE 11-11-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Very stiff, brown, Silty CLAY with gravel	CL	
				SHALE: Hard, olive brown, weathered, blocky	SH	
	S	12/12	18 31			
30						WC < PL
	S	5/5	50/5"			
35						Bottom of Boring 34.4'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-54

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-202

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5470 ELEVATION DATUM USC & GS

SHEET 1 OF 2

PROJECT NO K77-101-1

DATE 11-12-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, light brown, desiccated, SILT with trace of clay	ML	Boring advanced with 4" dia. C.F.A.
				Hard, light brown, desiccated, low plastic Silty CLAY with caliche	CL	
5	S	12/12	10 18			
	S	12/12	15 22			
10				Stiff, light brown, Silty CLAY with trace of very fine sand and caliche		
15	S	12/12	6 7			Drilling resistance increasing
	S	12/12	17 18			Drilling resistance increasing
20						
25	S	11/11	20 30	With trace of gravel		

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-55

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-202

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5470 ELEVATION DATUM USC & GS

SHEET 2 OF 2

PROJECT NO. K77-101-1

DATE 11-12-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				Stiff, light brown, Silty CLAY with gravel and trace of sand	CL	
				SHALE: Hard, olive brown with gray, weathered, desiccated, blocky, Clayey	SH	
	S	6/8	22 28/2"			WC < PL
30						
	S	6/6	50			
35						Bottom of Boring 34.5'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-56

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-203

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5465 ELEVATION DATUM USC & GS

SHEET 1 OF 2

PROJECT NO K77-101-1

DATE 11-12-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, light brown, poorly graded SILT	ML	Boring advanced with 4" dia. C.F.A.
	S	12/12	10			
5			20	Hard, brown, desiccated, low plastic, Silty CLAY	CL	
				Becoming stiff		
	S	12/12	8			
10			7			
	S	12/12	15	Becoming hard with caliche		
5			20			
				Becoming very stiff with trace of very fine grained sand and trace of gravel		
	S	12/12	6			
0			9			
				Dense, light brown, poorly graded, Silty, fine grained, angular SAND with trace of gravel	SM	
	S	12/12	15			
5			16			

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-57

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-203

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5465 ELEVATION DATUM USC & GS

SHEET 2 OF 2

PROJECT NO. K77-101-1

DATE 11-12-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				Dense, light brown, poorly graded, Silty, fine grained, angular SAND with trace of gravel	SM	
				SHALE: Hard, brown with gray, weathered, fissile bedded, Clayey	SH	WC < PL
	S	6/6	50			
30						
	S	3/3	50/3"			
35						Bottom of Boring 34.25'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-58

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-204

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5466 ELEVATION DATUM USC & GS

SHEET 1 OF 2

PROJECT NO. K77-101-1

DATE 11-18-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Hard, light brown, desiccated, low plastic, Silty CLAY with caliche	CL	Boring advanced with 4" dia. C.F.A.
						WC < PL
	S	12/12	17 20			
5				Becoming stiff		Drilling resistance decreased
	S	10/12	6 6			
10				Becoming very stiff		Drilling resistance increased
	S	10/12	17 15			
15				Dense, light brown, poorly graded, very fine grained, Silty SAND with some very thin, interbedded Sandy SILT	SM & ML	
	S	12/12	14 16			
20				Dense, light brown, poorly graded, fine grained SAND in a Silty CLAY matrix with some gravel	SC	
				SHALE: Hard, olive brown, weathered, Sandy, Clayey	SH	
	S	8/5	50/8"			
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-59

BORING LOG

PROJECT NAME ASH STORAGE SYSTEM

WC77-204

PROJECT LOCATION Fountain, Colorado

GEOLOGIST J. Hash DRILLER Jerry/CADS

SURFACE ELEVATION 5466 ELEVATION DATUM USC & GS

SHEET 2 OF 2

PROJECT NO K77-101-1

DATE 11-18-77

RIG CME-55

WATER ENTERS None detected ATD

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: SHALE: Hard, olive brown, weathered, Sandy, Clayey	SH	WC < PL
	S	6/6	50			
30						Bottom of Boring 29.5'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. C-60

WDR-26-77

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Permit Pending, Verbal approval by Reiner G. Haubold, Chief of Ground Water Operation

WELL OWNER City of Colorado Springs

ADDRESS 30 S. Nevada, Suite 201, Colo Springs

DATE COMPLETED December 5 , 1985

_____ ¼ of the _____ ¼ of Sec. 30, 31 &

T. 16 S , R. 65 W , 6th

HOLE DIAMETER

6 3/4 in. from 0 to 53 ft.

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

DRILLING METHOD Rotary w/air

CASING RECORD: Plain Casing

Size 4" & kind PVC from + 8" to 13

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

Perforated Casing

Size 4" & kind PVC from 13' to 53

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

GROUTING RECORD

Material Neat Cement

Intervals 0 - 10'

Placement Method Poured

GRAVEL PACK: Size 1/4" gravel

Interval 10' to 53'

TEST DATA

Date Tested Dry 11/13/85 .

Static Water Level Prior to Test _____

Type of Test Pump _____

Length of Test _____

Sustained Yield (Metered) _____

Final Pumping Water Level _____

WELL LOG # 2A

From	To	Type and Color of Material	Water Loc.
0	10	Decomposed buff soft colored shale (dry)	
10	53	Grey to black hard shale, dry	
		Hole was dry the entire depth	
		Set Aluminum water meter shell & cover	
		Poured 6' square 6" to 4" concrete slab 12/3/85 with 2" X 4' pipe set in each corner.	

TOTAL DEPTH 53'

Use additional pages necessary to complete log.

WGR-26 77

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Permit Pending, Verbal approval by Reiner G. Haubold, Chief of Ground Water Operation

WELL OWNER City of Colorado Springs

ADDRESS 30 S. Nevada, Colorado Springs, Co.

DATE COMPLETED December 6, 1985 , 19 85

_____ ¼ of the _____ ¼ of Sec. 30, 31 &

T. 16 S., R. 65 W., 6th

HOLE DIAMETER

6 3/4 in. from 0 to 53 ft.

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

DRILLING METHOD Rotary w/air

CASING RECORD: Plain Casing

Size 4" & kind PVC from + 8" to 13

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

Perforated Casing

Size 4" & kind XX PVC from 13 to 53

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

GROUTING RECORD

Material Neat cement

Intervals 0 - 10'

Placement Method Poured

GRAVEL PACK: Size 1/4" gravel

Interval 10' - 53'

TEST DATA

Date Tested November 13, 1985 , 1

Static Water Level Prior to Test 23'

Type of Test Pump Air bail

Length of Test 1 hr.

Sustained Yield (Metered) 1/2 gpm

Final Pumping Water Level 23'

WELL LOG # 3 A

From	To	Type and Color of Material	Water Loc.
0	23	Damp oxidized buff colored shale, water at 23'	1 gpm
23		Black shale	
23	53	Hard black shale	
		Poured 6' square concrete slab 6" - 4", 12/3/85 with 2" X 4' long pipe set in corner	
		Set Aluminum water meter shell and cover 12/4/85	

TOTAL DEPTH 53'

Use additional pages necessary to complete log.

WJR-26-77

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Permit Pending, Verbal approval by Reiner G. Haubold, Chief of Ground Water Operation

WELL OWNER City of Colorado Springs

ADDRESS 30 S. Nevada, Suite 201, Colo Springs

DATE COMPLETED December 5 (15), 19 85

____ % of the ____ % of Sec. 30, 31

T. 16 S, R. 65 W, 6th

HOLE DIAMETER

6 3/4 in. from 0 to 53' ft.

____ in. from ____ to ____ ft.

____ in. from ____ to ____ ft.

DRILLING METHOD Rotary w/air

CASING RECORD: Plain Casing

Size 4" & kind PVC from + 8" to 13

Size ____ & kind ____ from ____ to ____

Size ____ & kind ____ from ____ to ____

Perforated Casing

Size 4" & kind PVC from 13' to 53

Size ____ & kind ____ from ____ to ____

Size ____ & kind ____ from ____ to ____

GROUTING RECORD

Material Neat cement

Intervals 0 - 10'

Placement Method poured

GRAVEL PACK: Size 1/4" gravel

Interval 10' - 53'

TEST DATA

Date Tested November 15

Static Water Level Prior to Test 23'

Type of Test Pump Air bail

Length of Test 1 hr.

Sustained Yield (Metered) 8 gpm

Final Pumping Water Level 23'

WELL LOG #5A

From	To	Type and Color of Material	Water Loc.
0	23	Damp buff oxidized shale, and damp from 12/ to 23',	23'
23	53	Black - Green hard shale, dry from 27' to 53' by examing large cuttings	
		Set Aluminum meter shell and cover.	
		Poured 6' square, 6" - 4" concrete slab with 2" X 4' long pipe set in each corner 12/5/85	

TOTAL DEPTH 53'

Use additional pages necessary to complete log.

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Permit Pending. Verbal approval by Reiner G. Haubold, Chief of Ground Water Operation

WELL OWNER City of Colorado Springs

ADDRESS 30 So. Nevada, Suite 201, Colo Springs

DATE COMPLETED December 6, 1985

_____ ¼ of the _____ ¼ of Sec. 30, 31 &

T. 16 S, R. 65 W, 6th

HOLE DIAMETER

6 3/4 in. from 0 to 53' ft.

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

DRILLING METHOD Rotary w/air

CASING RECORD: Plain Casing

Size 4" & kind PVC from + 8 to 13'

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

Perforated Casing

Size 4" & kind PVC from 13 to 53'

Size _____ & kind _____ from _____ to _____

Size _____ & kind _____ from _____ to _____

GROUTING RECORD

Material Neat cement

Intervals 0 - 10'

Placement Method Poured

GRAVEL PACK: Size 1/4" gravel

Interval 10' - 53'

TEST DATA

Date Tested November 15, , 1

Static Water Level Prior to Test 22'

Type of Test Pump Air bail

Length of Test 1 hr

Sustained Yield (Metered) 1 gpm

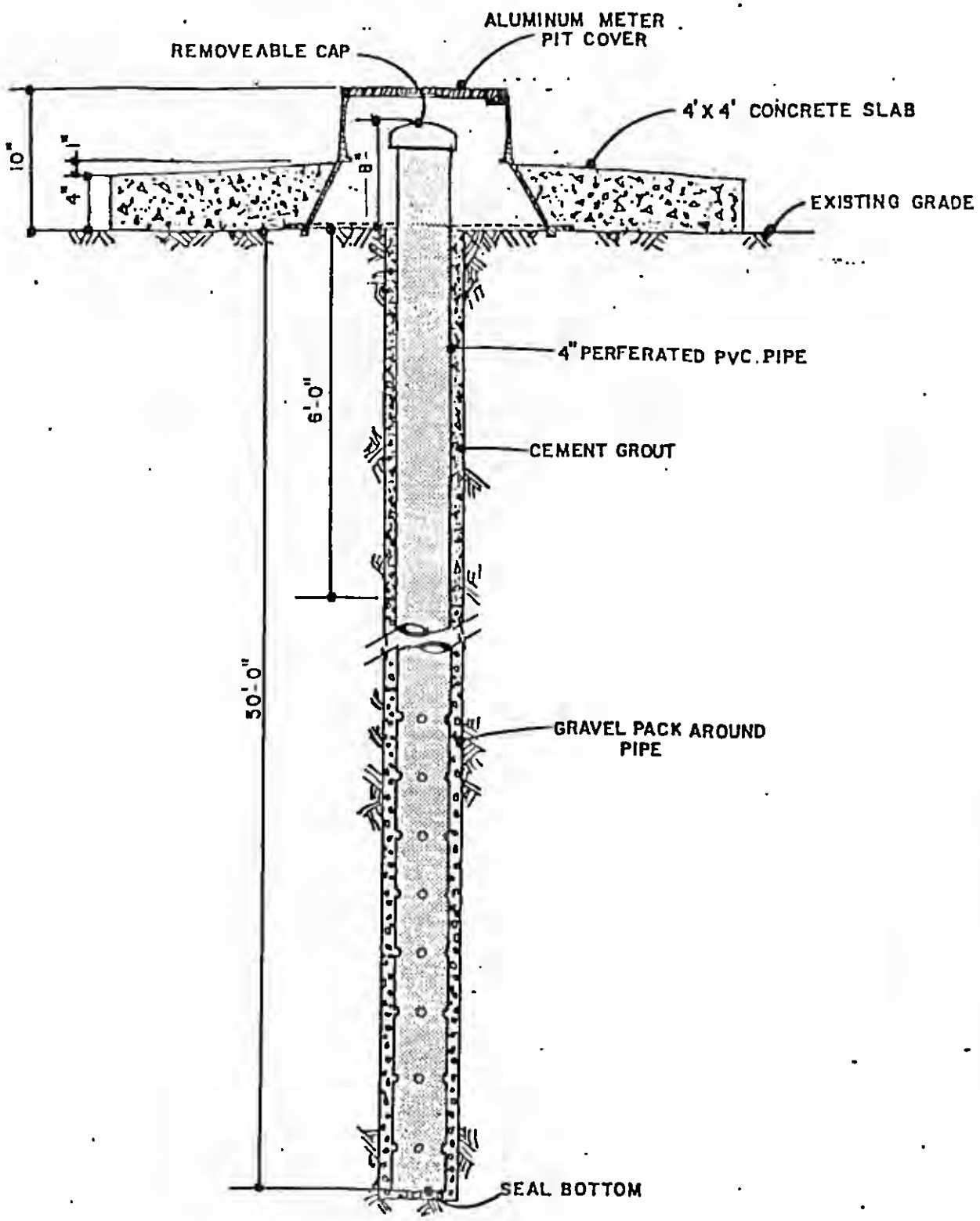
Final Pumping Water Level 22'

WELL LOG # 6 A

From	To	Type and Color of Material	Water Loc.
0	8	Dry oxidized buff colored shale	
8	22	Damp oxidized grey shale 1 gpm	22'
22	53	Hard Black Green shale, dry from 25' to 53'	
		Set Aluminum water meter shell and cover	
		Poured 6' square 6' - 4' concrete slab with 2' x 4' long steel pipe in each corner	

TOTAL DEPTH 53'

Use additional pages necessary to complete log.



TYPICAL SAMPLE WELL

CITY OF COLORADO SPRINGS WASTEWATER DIVISION	SAMPLE WELLS SOLIDS HANDLING FACILITIES	DATE DESIGN BY P.R.S. DRAWN BY P.R.S. SCALE

PROJECT #: # 09959105

PROJECT NAME: Clear Spring Ranch

ADDRESS:

CITY / STATE: Fountain, CO

RESOURCE GEOSCIENCE, INC.
3740 Wabash Street
Colorado Springs, Colorado

WELL # WW-7A

SUBSURFACE PROFILE			SAMPLE					WELL DETAIL
Depth	Lithology	Description	Number	Type	PID Reading	Blow Counts	Lab Number	
0		GROUND SURFACE						
		CLAY moderate density, low moisture, low cohesion, moderate plasticity, tan						
5		**CLAY** moderate to high density, low to moderate moisture, moderate cohesion, moderate to high plasticity, brown						
10								
15								
		SHALE high density, low moisture, moderate cohesion, moderate to high plasticity, greyish-brown						
		END OF BORING						
20								

Stratification lines represent approximate boundary lines between soil and rock types. In-situ, the transition may be gradual.

DRILL DATE: 9/5/07
ENGINEER: Darrell Robbins
DRILLER: RGI
DRILL METHOD: HSA = Hollow Stem Auger
HOLE SIZE: 8"

COLLAR ELEVATION:
GROUND ELEVATION:
DEPTH TO GROUND WATER: None Encountered at 0 Hrs
GROUND WATER ELEVATION:
TOTAL DEPTH OF BORING: 18'

Appendix B Laboratory Results – February 2022 Groundwater Sampling Event

Colorado Springs Utilities

It's how we're all connected

Laboratory Report For:

CCR Landfill Alternative Contaminant Source Demonstration

Colorado Springs Utilities Environmental Services

Report Authorized by: Wendy M Asay

Title: Environmental Specialist

Report Date: March 8, 2022

Report generated by: Wendy M. Asay

Colorado Springs Utilities Laboratory Services Section certifies that the test results meet all approved method and Laboratory Quality Assurance Plan requirements unless otherwise noted

Samples

467358	8-Feb-2022 10:25	Fort Carson Well #2A
467359	8-Feb-2022 11:45	Fort Carson Well #1A
467360	8-Feb-2022 13:40	Clear Spring Ranch Wastewater Well #5A
467361	8-Feb-2022 14:37	Clear Spring Ranch Wastewater Well #6A
467362	8-Feb-2022 11:24	Crooked Canyon Well #1
467363	8-Feb-2022 13:10	Fort Carson Well #3B
467364	8-Feb-2022 13:46	Fort Carson Well #3A
467365	8-Feb-2022 14:50	Sand Canyon Well #8
467366	8-Feb-2022 15:36	Sand Canyon Well #10
467367	8-Feb-2022 15:32	Equipment Blank
467368	8-Feb-2022 00:00	Field Duplicate sample
467395	9-Feb-2022 09:55	Sand Canyon Well #7
467396	9-Feb-2022 10:58	Sand Canyon Well #12
467397	9-Feb-2022 11:54	Sand Canyon Well #13
467398	9-Feb-2022 12:28	Sand Canyon Well #14
467399	9-Feb-2022 13:10	Sand Canyon Well #2
467400	9-Feb-2022 14:10	Sand Canyon Well #3
467401	9-Feb-2022 14:52	Sand Canyon Well #11
467402	9-Feb-2022 10:30	Fort Carson Well #1
467403	9-Feb-2022 11:22	Fort Carson Well #2
467404	9-Feb-2022 13:59	Clear Spring Ranch Wastewater Well #3A
467405	9-Feb-2022 15:48	Sand Canyon Well #9
467406	9-Feb-2022 00:00	Field Duplicate sample
467407	9-Feb-2022 16:03	Equipment Blank

LIMS #: 467358

Sample Date: 2/8/2022 10:25:28 AM

Sample Point: FC_2A

Sample Point Description: Fort Carson Well #2A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	11.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	10200	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	138	mV	0.000			1
	NA	Depth to Water	15.20	ft.	0.0000			1
	SM_2320_B	Alkalinity (Bicarbonate)	367	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	367	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.23	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	50	mg/L	30			1
	EPA_300_0	Chloride	168	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	0.12	mg/L	0.10		02/10/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10		02/10/2022	1
		Sulfate	7610	mg/L	0.50	D	02/09/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	0.34	mg/L	0.10	EB	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	174	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	4.1	ug/L	1.0	D	02/14/2022	1
	SM_2540_C	Total Dissolved Solids	12900	mg/L	10			1
	EPA_200_7	Boron (Total Recoverable)	746	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	425000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	1210	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	636000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	15100	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	2370000	ug/L	200	T1/D/B1	02/11/2022	1

LIMS #: 467359

Sample Date: 2/8/2022 11:45:28 AM

Sample Point: FC_1A

Sample Point Description: Fort Carson Well #1A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.0	degrees C	0.000			1
+	SM_2510_B	Conductivity	22800	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	164	mV	0.000			1
	NA	Depth to Water	17.58	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	29000	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	803	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	803	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.64	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	200	mg/L	30			1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	31	mg/L	0.10	D	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	743	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	20.1	ug/L	1.0	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	1090	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	421000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	208	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	1440000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	24500	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	5890000	ug/L	200	T1/D/B1	02/11/2022	1
	EPA_300_0	Chloride	1390	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	24.2	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	0.26	mg/L	0.10		02/10/2022	1
		Sulfate	16900	mg/L	0.50	D	02/25/2022	1

LIMS #: 467360

Sample Date: 2/8/2022 1:40:28 PM

Sample Point: WW_5A

Sample Point Description: Clear Spring Ranch Wastewater Well #5A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.0	degrees C	0.000			1
+	SM_2510_B	Conductivity	8220	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	163	mV	0.000			1
	NA	Depth to Water	23.76	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	8820	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	584	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	584	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.65	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	175	mg/L	30			1
	EPA_300_0	Chloride	374	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	116	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	0.23	mg/L	0.10	D	02/10/2022	1
		Sulfate	5040	mg/L	0.50	D	02/10/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	160	mg/L	0.10	D	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	401	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	205	ug/L	1.0	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	832	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	477000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	62.4	ug/L	10.0	EB	02/11/2022	1
		Magnesium (Total Recoverable)	468000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	6960	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	1580000	ug/L	200	T1/D/B1	02/11/2022	1

LIMS #: 467361

Sample Date: 2/8/2022 2:37:28 PM

Sample Point: WW_6A

Sample Point Description: Clear Spring Ranch Wastewater Well #6A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.4	degrees C	0.000			1
+	SM_2510_B	Conductivity	38600	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	207	mV	0.000			1
	NA	Depth to Water	12.56	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	52200	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	1570	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	1570	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	3.32	mg/L	0.10			1
	EPA_300_0	Chloride	750	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	567	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/P4	02/10/2022	1
		Sulfate	31500	mg/L	0.50	D	02/25/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	3.3	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	750	mg/L	0.10	D	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	1040	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	412	ug/L	1.0	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	1920	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	425000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	1130	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	1410000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	72800	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	13700000	ug/L	200	T1/D/B1	02/11/2022	1
	EPA_410_4	Chemical Oxygen Demand	165	mg/L	30			1

LIMS #: 467362

Sample Date: 2/8/2022 11:24:28 AM

Sample Point: CC_1

Sample Point Description: Crooked Canyon Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	6.7	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.5	degrees C	0.000			1
+	SM_2510_B	Conductivity	24500	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	178	mV	0.000			1
	NA	Depth to Water	17.60	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	34100	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	588	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	588	mg/L	5			1
	EPA_410_4	Chemical Oxygen Demand	210	mg/L	30			1
	EPA_300_0	Chloride	1690	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	20.6	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	0.59	mg/L	0.10	D/H	02/10/2022	1
		Sulfate	21200	mg/L	0.50	D	02/10/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	26	mg/L	0.10	D	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	470	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	184	ug/L	1.0	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	1000	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	422000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	36.2	ug/L	10.0	EB	02/11/2022	1
		Magnesium (Total Recoverable)	2320000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	32400	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	5900000	ug/L	200	T1/D/B1	02/11/2022	1
	SM_4500_FC	Fluoride (Total)	0.58	mg/L	0.10			1

LIMS #: 467363

Sample Date: 2/8/2022 1:10:28 PM

Sample Point: FC_3B

Sample Point Description: Fort Carson Well #3B

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.6	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	8270	umhos/cm	1			1
	NA	Depth to Water	29.58	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	7560	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.61	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	240	mg/L	30			1
	EPA_300_0	Chloride	222	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	<0.10	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D	02/10/2022	1
		Sulfate	4530	mg/L	0.50	D	02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	1.8	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	<0.10	mg/L	0.10		02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	325	ug/L	0.50	D	02/14/2022	1
		Selenium (Total Recoverable)	4.8	ug/L	1.0	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	1300	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	218000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	1990	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	140000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	11800	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	2050000	ug/L	200	T1/D/B1	02/11/2022	1
+	SM_2580_B	Oxidation-Reduction Potential	-222	mV	0			1
	SM_2320_B	Alkalinity (Bicarbonate)	750	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	750	mg/L	5			1

LIMS #: 467364

Sample Date: 2/8/2022 1:46:28 PM

Sample Point: FC_3A

Sample Point Description: Fort Carson Well #3A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_2580_B	Oxidation-Reduction Potential	-28	mV	0			1
+	SM_4500HB	pH	7.3	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	8150	umhos/cm	1			1
	NA	Depth to Water	22.57	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	9160	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	369	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	369	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.64	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	<30	mg/L	30	U		1
	EPA_300_0	Chloride	130	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	3.04	mg/L	0.10	H	02/10/2022	1
		Nitrite as Nitrogen	0.12	mg/L	0.10	H	02/10/2022	1
		Sulfate	5840	mg/L	0.50	D	02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	3.2	mg/L	0.10		02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	939	ug/L	0.50	D	02/25/2022	1
		Selenium (Total Recoverable)	38.5	ug/L	1.0	D	02/25/2022	1
	EPA_200_7	Boron (Total Recoverable)	1110	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	405000	ug/L	100	D/T1	02/11/2022	1
		Iron (Total Recoverable)	808	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	536000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	2740	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	1450000	ug/L	200	T1/D/B1	02/11/2022	1

LIMS #: 467365

Sample Date: 2/8/2022 2:50:28 PM

Sample Point: SC_8

Sample Point Description: Sand Canyon Well #8

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	6.8	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	11800	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	73	mV	0.000			1
	NA	Depth to Water	8.62	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	12100	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	762	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	762	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.68	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	234	mg/L	30			1
	EPA_300_0	Chloride	1340	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	777	mg/L	0.10	D/H	02/11/2022	1
		Nitrite as Nitrogen	0.47	mg/L	0.10	D/H	02/10/2022	1
		Sulfate	3260	mg/L	0.50		02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	1100	mg/L	0.10	D/T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	780	ug/L	0.50	D	02/25/2022	1
		Selenium (Total Recoverable)	63.3	ug/L	1.0	D	02/25/2022	1
	EPA_200_7	Boron (Total Recoverable)	1190	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	588000	ug/L	100	D/T1	02/11/2022	1
		Iron (Total Recoverable)	412	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	883000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	6540	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	1790000	ug/L	200	T1/D/B1	02/11/2022	1

LIMS #: 467366

Sample Date: 2/8/2022 3:36:28 PM

Sample Point: SC_10

Sample Point Description: Sand Canyon Well #10

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.7	degrees C	0.000			1
+	SM_2510_B	Conductivity	15700	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	61	mV	0.000			1
	NA	Depth to Water	15.02	ft.	0.0000			1
	SM_2320_B	Alkalinity (Bicarbonate)	584	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	584	mg/L	5			1
	EPA_350_1	Ammonia (Total) as Nitrogen	0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	240	mg/L	0.10	D/T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	364	ug/L	0.50	D	02/25/2022	1
		Selenium (Total Recoverable)	210	ug/L	1.0	D	02/25/2022	1
	EPA_200_7	Boron (Total Recoverable)	1250	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	440000	ug/L	100	D/T1	02/11/2022	1
		Iron (Total Recoverable)	2380	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	875000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	10300	ug/L	300	D	02/11/2022	1
		Sodium (Total Recoverable)	3750000	ug/L	200	T1/D/B1	02/11/2022	1
	EPA_410_4	Chemical Oxygen Demand	130	mg/L	30			1
	SM_2540_C	Total Dissolved Solids	17700	mg/L	10			1
	EPA_300_0	Chloride	997	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	188	mg/L	0.10	D/H	02/10/2022	1
		Nitrite as Nitrogen	0.47	mg/L	0.10	D/H	02/10/2022	1
		Sulfate	10300	mg/L	0.50	D	02/11/2022	1
	SM_4500_FC	Fluoride (Total)	0.87	mg/L	0.10			1

LIMS #: 467367

Sample Date: 2/8/2022 3:32:52 PM

Sample Point: EQUIP_BLK

Sample Point Description: Equipment Blank

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	<10	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	<5	mg/L	5	P3		1
		Alkalinity (Carbonate)	<1	mg/L	1	P3		1
		Alkalinity (Total)	<5	mg/L	5	U/P3		1
	SM_4500_FC	Fluoride (Total)	<0.10	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	<30	mg/L	30	U		1
	EPA_300_0	Chloride	<0.50	mg/L	0.50		02/09/2022	1
		Nitrate as Nitrogen	<0.10	mg/L	0.10		02/09/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10		02/09/2022	1
		Sulfate	<0.50	mg/L	0.50		02/09/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	0.21	mg/L	0.10		02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	<0.50	ug/L	0.50		02/14/2022	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	<20.0	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	<100	ug/L	100		02/11/2022	1
		Iron (Total Recoverable)	18.5	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	<10.0	ug/L	10.0		02/11/2022	1
		Potassium (Total Recoverable)	<300	ug/L	300		02/24/2022	1
		Sodium (Total Recoverable)	<200	ug/L	200	B1	02/11/2022	1

LIMS #: 467368

Sample Date: 2/8/2022 12:00:52 AM

Sample Point: FIELD_DUP

Sample Point Description: Field Duplicate sample

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	52300	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	1570	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	1570	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	3.33	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	132	mg/L	30			1
	EPA_300_0	Chloride	764	mg/L	0.50	D	02/10/2022	1
		Nitrate as Nitrogen	580	mg/L	0.10	D	02/10/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/P4	02/10/2022	1
		Sulfate	32000	mg/L	0.50	D	02/25/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	3.4	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	750	mg/L	0.10	D	02/14/2022	1
	EPA_200_7	Boron (Total Recoverable)	1670	ug/L	20.0		02/24/2022	1
		Calcium (Total Recoverable)	399000	ug/L	100	T1/D	02/11/2022	1
		Iron (Total Recoverable)	278	ug/L	10.0		02/11/2022	1
		Magnesium (Total Recoverable)	1430000	ug/L	10.0	T1/D	02/11/2022	1
		Potassium (Total Recoverable)	74800	ug/L	300		02/11/2022	1
		Sodium (Total Recoverable)	13900000	ug/L	200	T1/D/B1	02/11/2022	1
	EPA_200_8	Manganese (Total Recoverable)	1040	ug/L	0.50	D	02/25/2022	1
		Selenium (Total Recoverable)	393	ug/L	1.0	D	02/25/2022	1

LIMS #: 467395

Sample Date: 2/9/2022 9:55:42 AM

Sample Point: SC_7

Sample Point Description: Sand Canyon Well #7

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.4	degrees C	0.000			1
+	SM_2510_B	Conductivity	17100	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	90	mV	0			1
	NA	Depth to Water	9.84	ft.	0.0000			1
	SM_2320_B	Alkalinity (Bicarbonate)	836	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	836	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.71	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	97	mg/L	30			1
	EPA_300_0	Chloride	531	mg/L	0.50	D	02/26/2022	1
		Nitrate as Nitrogen	194	mg/L	0.10	D/H	02/26/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/P4	02/26/2022	1
		Sulfate	11400	mg/L	0.50	D	02/26/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	230	mg/L	0.10	D/T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	209	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	162	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	1190	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	383000	ug/L	100	D/T1	02/23/2022	1
		Iron (Total Recoverable)	234	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	1010000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	12500	ug/L	300	D/T1	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	4040000	ug/L	200	T1/D	02/23/2022	1
	SM_2540_C	Total Dissolved Solids	19100	mg/L	10			1

LIMS #: 467396

Sample Date: 2/9/2022 10:58:42 AM

Sample Point: SC_12

Sample Point Description: Sand Canyon Well #12

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.3	degrees C	0.000			1
+	SM_2510_B	Conductivity	13200	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	170	mV	0			1
	NA	Depth to Water	11.83	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	13900	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	388	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	388	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.38	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	62	mg/L	30			1
	EPA_300_0	Chloride	298	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	7.13	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	8560	mg/L	0.50	D/T2	02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	9.9	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	97.7	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	13.8	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	4480	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	381000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	32.9	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	751000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	3960	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	2710000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467397

Sample Date: 2/9/2022 11:54:42 AM

Sample Point: SC_13

Sample Point Description: Sand Canyon Well #13

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.6	degrees C	0.000			1
+	SM_2510_B	Conductivity	10200	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	51	mV	0			1
	NA	Depth to Water	11.97	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11000	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	405	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	405	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.16	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	39	mg/L	30			1
	EPA_300_0	Chloride	82.0	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	4.94	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	3870	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	2.8	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	24.0	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	25.1	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	1600	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	379000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	<10.0	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	733000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	2950	ug/L	300	D	02/23/2022	1
		Sodium (Total Recoverable)	1940000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467398

Sample Date: 2/9/2022 12:28:42 PM

Sample Point: SC_14

Sample Point Description: Sand Canyon Well #14

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	11.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	10100	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	55	mV	0			1
	NA	Depth to Water	12.19	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11400	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	407	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	407	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.10	mg/L	0.10			1
	EPA_300_0	Chloride	77.8	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	1.63	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	3960	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	1.6	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	304	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	5.2	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	1600	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	382000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	<10.0	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	742000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	3500	ug/L	300	D	02/23/2022	1
		Sodium (Total Recoverable)	1970000	ug/L	200	T1/D	02/23/2022	1
	EPA_410_4	Chemical Oxygen Demand	34	mg/L	30			1

LIMS #: 467399

Sample Date: 2/9/2022 1:10:42 PM

Sample Point: SC_2

Sample Point Description: Sand Canyon Well #2

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	11.6	degrees C	0.000			1
+	SM_2510_B	Conductivity	10200	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	48	mV	0			1
	NA	Depth to Water	13.71	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	11600	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	421	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	421	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.09	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	39	mg/L	30			1
	EPA_300_0	Chloride	160	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	1.81	mg/L	0.10	D/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/T2	02/11/2022	1
		Sulfate	3770	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	2.5	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	15.3	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	12.9	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	1680	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	375000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	75.9	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	741000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	2850	ug/L	300	D	02/23/2022	1
		Sodium (Total Recoverable)	2020000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467400

Sample Date: 2/9/2022 2:10:42 PM

Sample Point: SC_3

Sample Point Description: Sand Canyon Well #3

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.9	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.5	degrees C	0.000			1
+	SM_2510_B	Conductivity	18500	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	56	mV	0			1
	NA	Depth to Water	13.87	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	21800	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	292	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	292	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	1.39	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	108	mg/L	30			1
	EPA_300_0	Chloride	352	mg/L	0.50	D/T2	02/12/2022	1
		Nitrate as Nitrogen	3.97	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	7270	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	5.5	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	42.6	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	21.7	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	1130	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	377000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	164	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	1250000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	6750	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	4390000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467401

Sample Date: 2/9/2022 2:52:42 PM

Sample Point: SC_11

Sample Point Description: Sand Canyon Well #11

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.5	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	14800	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	49	mV	0			1
	NA	Depth to Water	12.53	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	14600	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	385	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	385	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.86	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	153	mg/L	30			1
	EPA_300_0	Chloride	554	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	73.5	mg/L	0.10	D/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/T2	02/11/2022	1
		Sulfate	4310	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	150	mg/L	0.10	D	02/15/2022	1
	EPA_200_8	Manganese (Total Recoverable)	55.4	ug/L	0.50	D	02/15/2022	1
		Selenium (Total Recoverable)	213	ug/L	1.0	D	02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	2530	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	437000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	137	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	702000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	12200	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	3040000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467402

Sample Date: 2/9/2022 10:30:42 AM

Sample Point: FC_1

Sample Point Description: Fort Carson Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	21100	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	194	mV	0			1
	NA	Depth to Water	18.20	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	21600	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	926	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	926	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.19	mg/L	0.10			1
	EPA_300_0	Chloride	389	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	11.2	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	7350	mg/L	0.50	D/T2	02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	18	mg/L	0.10	D	02/15/2022	1
	EPA_200_8	Manganese (Total Recoverable)	150	ug/L	0.50	D	02/28/2022	1
		Selenium (Total Recoverable)	9.8	ug/L	1.0	D	02/28/2022	1
	EPA_200_7	Boron (Total Recoverable)	1070	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	383000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	<10.0	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	692000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	31200	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	5330000	ug/L	200	T1/D	02/23/2022	1
	EPA_410_4	Chemical Oxygen Demand	118	mg/L	30			1

LIMS #: 467403

Sample Date: 2/9/2022 11:22:42 AM

Sample Point: FC_2

Sample Point Description: Fort Carson Well #2

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.3	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	12.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	9450	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	156	mV	0			1
	NA	Depth to Water	14.69	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	9780	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	350	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	350	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.73	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	33	mg/L	30			1
	EPA_300_0	Chloride	58.6	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	4.90	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	3400	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	4.5	mg/L	0.10	T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	42.6	ug/L	0.50	D	02/28/2022	1
		Selenium (Total Recoverable)	34.4	ug/L	1.0	D	02/28/2022	1
	EPA_200_7	Boron (Total Recoverable)	1030	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	395000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	101	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	613000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	2580	ug/L	300	D	02/23/2022	1
		Sodium (Total Recoverable)	1640000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467404

Sample Date: 2/9/2022 1:59:42 PM

Sample Point: WW_3A

Sample Point Description: Clear Spring Ranch Wastewater Well #3A

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.1	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.8	degrees C	0.000			1
+	SM_2510_B	Conductivity	16300	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	188	mV	0			1
	NA	Depth to Water	22.27	ft.	0.0000			1
	SM_2540_C	Total Dissolved Solids	16600	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	914	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	914	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.16	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	97	mg/L	30			1
	EPA_300_0	Chloride	163	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	38.4	mg/L	0.10	D/H/T2	02/11/2022	1
		Nitrite as Nitrogen	0.44	mg/L	0.10	D/H/T2	02/11/2022	1
		Sulfate	5690	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	82	mg/L	0.10	D	02/15/2022	1
	EPA_200_8	Manganese (Total Recoverable)	392	ug/L	0.50	D	02/28/2022	1
		Selenium (Total Recoverable)	4.1	ug/L	1.0	D	02/28/2022	1
	EPA_200_7	Boron (Total Recoverable)	1410	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	391000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	<10.0	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	796000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	32700	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	3560000	ug/L	200	T1/D	02/23/2022	1

LIMS #: 467405

Sample Date: 2/9/2022 3:48:42 PM

Sample Point: SC_9

Sample Point Description: Sand Canyon Well #9

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.2	degrees C	0.000			1
+	SM_2510_B	Conductivity	20100	umhos/cm	1			1
+	SM_2580_B	Oxidation-Reduction Potential	180	mV	0			1
	NA	Depth to Water	19.52	ft.	0.0000			1
	SM_2320_B	Alkalinity (Bicarbonate)	724	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	724	mg/L	5			1
	EPA_300_0	Chloride	1410	mg/L	0.50	D	02/26/2022	1
		Nitrate as Nitrogen	338	mg/L	0.10	D/H	02/26/2022	1
		Nitrite as Nitrogen	3.76	mg/L	0.10	D/H/P4	02/26/2022	1
		Sulfate	11400	mg/L	0.50	D	02/26/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	430	mg/L	0.10	D/T2	02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	55.5	ug/L	0.50	D	02/28/2022	1
		Selenium (Total Recoverable)	205	ug/L	1.0	D	02/28/2022	1
	EPA_200_7	Boron (Total Recoverable)	1350	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	434000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	10600	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	1240000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	19100	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	4170000	ug/L	200	T1/D	02/23/2022	1
	EPA_410_4	Chemical Oxygen Demand	172	mg/L	30			1
	SM_2540_C	Total Dissolved Solids	21600	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	1.03	mg/L	0.10			1

LIMS #: 467406

Sample Date: 2/9/2022 12:00:35 AM

Sample Point: FIELD_DUP

Sample Point Description: Field Duplicate sample

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	14700	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	386	mg/L	5			1
		Alkalinity (Carbonate)	<1	mg/L	1			1
		Alkalinity (Total)	386	mg/L	5			1
	SM_4500_FC	Fluoride (Total)	0.85	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	104	mg/L	30			1
	EPA_300_0	Chloride	557	mg/L	0.50	D/T2	02/11/2022	1
		Nitrate as Nitrogen	74.5	mg/L	0.10	D/T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	D/T2	02/11/2022	1
		Sulfate	4420	mg/L	0.50	D/T2	02/12/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	150	mg/L	0.10	D	02/15/2022	1
	EPA_200_8	Manganese (Total Recoverable)	58.8	ug/L	0.50	D	02/28/2022	1
		Selenium (Total Recoverable)	201	ug/L	1.0	D	02/28/2022	1
	EPA_200_7	Boron (Total Recoverable)	2580	ug/L	20.0		02/23/2022	1
		Calcium (Total Recoverable)	444000	ug/L	100	T1/D	02/23/2022	1
		Iron (Total Recoverable)	142	ug/L	10.0		02/23/2022	1
		Magnesium (Total Recoverable)	717000	ug/L	10.0	T1/D	02/23/2022	1
		Potassium (Total Recoverable)	12500	ug/L	300	D	02/23/2022	1
	EPA_200_7	Sodium (Total Recoverable)	3100000	ug/L	200	T1/D	03/23/2022	1

LIMS #: 467407

Sample Date: 2/9/2022 4:03:35 PM

Sample Point: EQUIP_BLK

Sample Point Description: Equipment Blank

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	SM_2540_C	Total Dissolved Solids	<10	mg/L	10			1
	SM_2320_B	Alkalinity (Bicarbonate)	<5	mg/L	5	P3		1
		Alkalinity (Carbonate)	<1	mg/L	1	P3		1
		Alkalinity (Total)	<5	mg/L	5	J/P3		1
	SM_4500_FC	Fluoride (Total)	<0.10	mg/L	0.10			1
	EPA_410_4	Chemical Oxygen Demand	<30	mg/L	30	U		1
	EPA_300_0	Chloride	<0.50	mg/L	0.50	T2	02/11/2022	1
		Nitrate as Nitrogen	<0.10	mg/L	0.10	T2	02/11/2022	1
		Nitrite as Nitrogen	<0.10	mg/L	0.10	T2	02/11/2022	1
		Sulfate	<0.50	mg/L	0.50	T2	02/11/2022	1
	EPA_350_1	Ammonia (Total) as Nitrogen	<0.2	mg/L	0.2		02/14/2022	1
	EPA_353_2	Nitrite+Nitrate as Nitrogen	<0.10	mg/L	0.10		02/14/2022	1
	EPA_200_8	Manganese (Total Recoverable)	<0.50	ug/L	0.50		02/15/2022	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		02/15/2022	1
	EPA_200_7	Boron (Total Recoverable)	<20.0	ug/L	20.0			1
		Calcium (Total Recoverable)	<100	ug/L	100			1
		Iron (Total Recoverable)	<10.0	ug/L	10.0			1
		Magnesium (Total Recoverable)	<10.0	ug/L	10.0			1
		Potassium (Total Recoverable)	<300	ug/L	300			1
		Sodium (Total Recoverable)	<200	ug/L	200			1

Flags

*	Analysis performed by an external contract laboratory.
+	Analysis performed in the field.

Data Qualifiers

See below for qualifier descriptions.

Glossary

DQ - Data Qualifer
RL – Reporting Limit
MDL – Method Detection Limit
Dil Fac – Dilution Factor

Case Narrative

B1 - Detection in the blank but the analyte concentration in the sample is 10x greater.
D - Value reported is multiplied by a dilution factor. The reporting limit is not.
EB - The equipment blank analyte concentration is above the RL for the associated samples.
H - Method required holding time for analyte exceeded.
J - Analysis confirms the presence of the analyte at a concentration which is less than the established RL, but greater than the MDL. The associated concentration value reported is approximate.
P3 - Concentration of analyte below RL. Duplicate RPD not used for data validation.
P4 - The precision for the sample duplicate exceeds the laboratory or method control limit.
T1 - The analyte concentration is disproportionate to the spike level and is outside the established range.
T2 - MS recovery not within the method acceptance limits due to sample dilution.
U - Data result less than the method detection limit.

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Grab Samples

CCR Landfill Alternative Source Demonstration

Sample Date: 2-8-22

QC Report Needed

LOCATION	# of Bottles	LIMS #	Sample Time	Sampler	pH, Field (su) SM 4500 H B	Temperature, Field (°C) SM 2550 B	Conductivity, Field (uS/cm) SM 2510 B	Oxidation Reduction Potential (mV), 2580 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	TDS (2540 C), Alkalinity, Carbonate and Bicarbonate (SM 2320 B), Fluoride (SM 4500 F C), and COD (EPA 410.4)	Chloride and Sulfate (EPA 300.0), Ammonia (EPA 350.1) and Nitrite and Nitrate (EPA 353.2)	Manganese & Selenium (EPA 200.8) and Boron, Calcium, Iron, Magnesium, Potassium and Sodium (EPA 200.7)	Comments
					Please mark boxes that apply									
FC-2A	3	467358	1025	Foss	7.47	11.8	10,228	137.7	15.20		x	x	x	
FC-1A	3	467359	1145	Foss	7.22	13.0	22,789	163.9	17.58		x	x	x	
WW-7A	Ø	—	—	Foss	—	—	—	—	—		x	x	x	Well dry.
WW-5A	3	467360	1340	Foss	7.22	13.0	8,219	162.8	23.76		x	x	x	
WW-6A	3	467361	1437	Foss	7.22	13.4	38,627	206.8	12.56		x	x	x	
Equip Blank	3	467367	1532	Foss	—	—	—	—	—		x	x	x	
Duplicate	3	467368	0000	Foss	—	—	—	—	—		x	x	x	
CC-1	3	467362	11:24	DJM	6.74	14.50	24,500	178	17.60		x	x	x	
FC-3B	3	467363	1310	DJM	7.60	12.86	8,270	-222	29.58		x	x	x	
FC-3A	3	467364	1346	DJM	7.28	13.86	8,150	-28	22.57		x	x	x	
SC-8	3	467365	1450	DJM	6.77	12.79	11,800	73	8.62		x	x	x	
SC-10	3	467366	1536	DJM	7.25	14.72	15,700	61	15.02	X	x	x	x	
~~FIELD_DUP~~											~~x~~	~~x~~	~~x~~	
~~EQUIP_BLK~~											~~x~~	~~x~~	~~x~~	
Total # of Bottles	33										1 - 1000 mL plastic	1 - 1000 mL plastic	1 - 1000 mL plastic (new)	

☐ Check if atrium lock-box was used

	Signature/Print last name	Date/Time	Date/Time
Relinquished by	[signature] / Mikalian	2/8/22 @ 1655 WMA 2-8-22	@
Received by	[signature] Asay	2-8-22 @ 1655	@
Relinquished by			@
Received by			@

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL_ASD
Project ID: CCR_RND_1

Samples transported on ice.

Colorado Springs Utilities

Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Alternative Source Demonstration

Sample Date: 2-9-22

QC Report Needed

LOCATION	# of Bottles	LIMS #	Sample Time	Sampler	pH, Field (su) SM 4500 H B	Temperature, Field (°C) SM 2550 B	Conductivity, Field (uS/cm) SM 2510 B	Oxidation Reduction Potential (mV), 2580 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	TDS (2540 C), Alkalinity, Carbonate and Bicarbonate (SM 2320 B), Fluoride (SM 4500 F C), and COD (EPA 410.4)	Chloride and Sulfate (EPA 300.0), Ammonia (EPA 350.1) and Nitrite and Nitrate (EPA 353.2)	Manganese & Selenium (EPA 200.8) and Boron, Calcium, Iron, Magnesium, Potassium and Sodium (EPA 200.7)	Comments
					Please mark boxes that apply.									
SC-7	3	467395	0955	Foss	7.35	12.4	17,124	90.2	9.84		x	x	x	
SC-12	3	467396	1058	Foss	7.51	14.3	13,177	169.7	11.83		x	x	x	
SC-13	3	467397	1154	Foss	7.51	12.6	10,173	51.0	11.97		x	x	x	
SC-14	3	467398	1228	Foss	7.51	11.8	10,055	54.6	12.19		x	x	x	
SC-2	3	467399	1310	Foss	7.52	11.6	10,183	48.3	13.71		x	x	x	
SC-3	3	467400	1410	Foss	7.93	12.5	18,475	55.9	13.87		x	x	x	
SC-11	3	467401	1452	Foss	7.50	14.2	14,832	49.2	12.53		x	x	x	
FC-1	3	467402	1030	DJM	7.16	12.84	21,100	194	18.20		x	x	x	
FC-2	3	467403	11:22	DJM	7.34	12.79	9,450	156	14.69		x	x	x	
WW-3A	3	467404	1359	DJM	7.09	13.76	16,300	188	22.27		x	x	x	
SC-9	3	467405	15:48	DJM	7.24	14.15	20,100	180	19.52	✓	x	x	x	Re-Tubed
											x	x	x	DJM
FIELD_DUP	3	467406	0000	Foss							x	x	x	
EQUIP_BLK	3	467407	1603	Foss							x	x	x	
Total # of Bottles	39										1 - 1000 mL plastic	1 - 1000 mL plastic	1 - 1000 mL plastic (new)	

☐ Check if atrium lock-box was used

	Signature/Print last name	Date/Time	Date/Time	
Relinquished by	[signature] / Mikclien	~~1622~~ 1657 DJM	on 2/9/22	@
Received by	Chris Armstrong	2/9/22		@ 1657
Relinquished by				@
Received by				@

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL_ASD
Project ID: CCR_RND_1

Samples transported on ice.

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Laboratory Services Section Sample/Data Evaluation Form

PART 1: Initiator (person who first noticed incident):

Please complete one form per project.

Initiated by: Wendy Asay Date: 3/8/22

Issue (describe in detail):

Samples 467395 and 467405 were analyzed for nitrite and nitrate twice due to a QC failure on the first analytical run. The values from the second analysis were approximately double what they were on the first analysis. The second analysis was about two weeks after the holding time expired for that analysis. Due to QC failures and holding time issues, the laboratory is unable to determine which analysis is more likely to be accurate.

Action Taken, if any:

The samples were also analyzed for nitrite+nitrate within holding time using a different method and different instrument.

Blank Sample Detections
Sample Name for Blank Detection: LIMS #:

Parameter	Blank value (units)	Reporting Limit (units)	Associated Sample Name	Associated Sample LIMS #	Sample Value (units)

LIMS Section

Sample LIMS #	Sample Point	Sample Date	Analysis Affected
467395	SC_7	3/9/22	Nitrite & Nitrate
467405	SC_9	3/9/22	Nitrite & Nitrate

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Laboratory Services Section Sample/Data Evaluation Form

Part 2: Customer Contact Details (Completed by Project Coordination)**:**

Analysis Details		
Parameters	**Method #**	**Compliance**
Nitrite and Nitrate	EPA 300.0	Yes ◉ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○
		Yes ○ No ○ Both ○

Individual(s) contacted: Patti Zietlow & Heather Barbare Date: 3/8/22

Generally, the project owner(s)

Patti and Heather would like the data from the second analysis reporting since the matrix specific QC was acceptable for that data.

Part 3: **Approval** (Section to be completed by LSS Lead):

Final Actions Taken (Reject Samples/Data, Accept Samples/Data, Qualify Samples/Data, Other)

Nitrate and Nitrite data from the second run will be reported with H qualifier.

Signature/Print last name: Lesley Susic Date: 3/8/22

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Laboratory Services Section
QC Report

CCR Landfill Alternative Source Demonstration
February 2022

Quality Assurance Approval: Lesley Susic Date: 3/08/2022

This report is for sample numbers 467358 – 467368 and 467395 - 467407.

Total Dissolved Solids by Standard Methods 2540 C
There are no anomalies to report for this analysis.

Fluoride by Standard Methods 4500 F C
There are no anomalies to report for this analysis.

Chemical Oxygen Demand by EPA 410.4
No anomalies to report.

Alkalinity by Standard Methods 2320 B
For samples 467367 and 467407, the sample concentration was below the RL. Duplicate RPD not used for data validation.

Nitrite+Nitrate by EPA 353.2
The MS recovery was not within the method acceptance limits due to sample dilution. The associated samples were qualified.

Total Ammonia by EPA 350.1
No anomalies to report.

Anions by EPA Method 300.0
The MS recovery for chloride, sulfate, nitrite, and nitrate was not within the method acceptance limits due to sample dilution. The associated samples were qualified

The precision for the sample duplicate exceeded the laboratory or method control limit. The associated samples were qualified.

EPA 200.7
The analyte concentration in the samples is disproportionate to the spike level for calcium, magnesium and sodium.

The laboratory reagent blank for sodium is above the LRB limit for samples 467358-467368. The LRB value is less than 10% of the concentration of all associated samples, except the equipment blank. The samples are B1 qualified.

EPA 200.8
There are no anomalies to report for this analysis.

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 2/10/22
Sampled date: 2/8/22 for samples 467358 - 467369

Matrix QC performed on samples 467366 and 467358

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	98	85 - 110		
Duplicate	Total Dissolved Solids (467366)			1	<10
Duplicate	Total Dissolved Solids (467358)			2	<10

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 2/11/22
Sampled date: 2/9/22 for samples 467395 - 467407

Matrix QC performed on samples 467405 and 467395

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	100	85 - 110		
Duplicate	Total Dissolved Solids (467405)			1	<10
Duplicate	Total Dissolved Solids (467395)			<1	<10

Method: Fluoride by Standard Methods 4500 F C
Batch Analysis date: 2/17/22
Sampled date: 2/8/22 for samples 467358 – 467368
Sampled date: 2/9/22 for samples 467395 – 467407

Matrix QC performed on samples 467362, 467366 and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Fluoride (Total)	108	90 - 110		
QCS	Fluoride (Total)	96	90 - 110		
MS	Fluoride (Total) (467362)	97	80 - 120		
MSD	Fluoride (Total) (467362)			<1	<20
MS	Fluoride (Total) (467366)	93	80 - 120		
MSD	Fluoride (Total) (467366)			2	<20
MS	Fluoride (Total) (467405)	92	80 - 120		
MSD	Fluoride (Total) (467405)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Fluoride (Total)	<0.10 mg/L	0.10 mg/L

Method: Chemical Oxygen Demand by EPA 410.4
Batch Analysis date: 2/8/22
Sampled date: 2/8/22 for samples 467358 - 467368

Matrix QC performed on samples 467361 and 467366

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Chemical Oxygen Demand	91	80-120		
MS	Chemical Oxygen Demand (467361)	107	80-120		
MSD	Chemical Oxygen Demand (467361)			2	<20
MS	Chemical Oxygen Demand (467366)	102	80-120		
MSD	Chemical Oxygen Demand (467366)			<1	<20

Method: Chemical Oxygen Demand by EPA 410.4
Batch Analysis date: 2/9/22
Sampled date: 2/9/22 for samples 467395 - 467407

Matrix QC performed on samples 467398 and 467402

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Chemical Oxygen Demand	89	80-120		
MS	Chemical Oxygen Demand (467398)	110	80-120		
MSD	Chemical Oxygen Demand (467398)			3	<20
MS	Chemical Oxygen Demand (467402)	90	80-120		
MSD	Chemical Oxygen Demand (467402)			1	<20

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/11/22
Sampled date: 2/8/22 for samples 467358 – 467360 and 467362 - 467365

Matrix QC performed on sample 467364

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	91	80-120		
QCS	Alkalinity (Total)	102	80-120		
Duplicate	Alkalinity (Total)			<1	<20

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/14/22
Sampled date: 2/9/22 for samples 467395 - 467403

Matrix QC performed on sample 467399

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	100	80-120		
QCS	Alkalinity (Total)	103	80-120		
Duplicate	Alkalinity (Total)			<1	<20

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/15/22
Sampled date: 2/9/22 for samples 467404 and 467406

Matrix QC performed on sample 467533

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	99	80-120		
QCS	Alkalinity (Total)	103	80-120		
Duplicate	Alkalinity (Total)			<1	<20

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/16/22
Sampled date: 2/8/22 for samples 467361 and 467368

Matrix QC performed on sample 467361

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	100	80-120		
QCS	Alkalinity (Total)	96	80-120		
Duplicate	Alkalinity (Total)			<1	<20

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/16/22
Sampled date: 2/8/22 for sample 467367
Sampled date: 2/9/22 for sample 467407

Matrix QC performed on sample 467367

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	100	80-120		
QCS	Alkalinity (Total)	102	80-120		
Duplicate	Alkalinity (Total)			***40**	<20

***See Narrative**

Method: Total Alkalinity by Standard Method 2320 B
Batch Analysis date: 2/16/22
Sampled date: 2/8/22 for sample 467366
Sampled date: 2/9/22 for sample 467405

Matrix QC performed on samples 467366 and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Alkalinity (Total)	100	80-120		
QCS	Alkalinity (Total)	102	80-120		
Duplicate	Alkalinity (Total) (467366)			<1	<20
Duplicate	Alkalinity (Total) (467405)			<1	<20

Method: Nitrite + Nitrate by EPA 353.2
Batch Analysis date: 2/14/22
Sampled date: 2/8/22 for samples 467358 - 467368
Sampled date: 2/9/22 for samples 467395 - 467400, 467403, 467405 and 467407

Matrix QC performed on sample 467371, 467366 and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Nitrate + Nitrite as Nitrogen	105	50-150		
LFB	Nitrate + Nitrite as Nitrogen	101	90-110		
MS	Nitrate + Nitrite as Nitrogen (467371)	107	90-110		
MSD	Nitrate + Nitrite as Nitrogen (467371)			1	<20
MS	Nitrate + Nitrite as Nitrogen (467366)	***33**	90-110		
MSD	Nitrate + Nitrite as Nitrogen (467366)			<1	<20
MS	Nitrate + Nitrite as Nitrogen (467405)	***300**	90-110		
MSD	Nitrate + Nitrite as Nitrogen (467405)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Nitrate + Nitrite as Nitrogen	<0.10 mg/L	0.10 mg/L

***See Narrative**

Method: Nitrite + Nitrate by EPA 353.2
Batch Analysis date: 2/15/22
Sampled date: 2/9/22 for samples 467401, 467402, 467404 and 467406

Matrix QC performed on sample 467589

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Nitrate + Nitrite as Nitrogen	98	50-150		
LFB	Nitrate + Nitrite as Nitrogen	99	90-110		
MS	Nitrate + Nitrite as Nitrogen	102	90-110		
MSD	Nitrate + Nitrite as Nitrogen			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Nitrate + Nitrite as Nitrogen	<0.10 mg/L	0.10 mg/L

Method: Ammonia by EPA 350.1
Batch Analysis date: 2/14/22
Sampled date: 2/8/22 for samples 467358 – 467368
Sampled date: 2/9/22 for samples 467395 - 467407

Matrix QC performed on sample 467371, 467366 and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Ammonia (Total) as N	108	50-150		
LFB	Ammonia (Total) as N	103	90-110		
MS	Ammonia (Total) as N (467371)	104	90-110		
MSD	Ammonia (Total) as N (467371)			<1	<20
MS	Ammonia (Total) as N (467366)	105	90-110		
MSD	Ammonia (Total) as N (467366)			<1	<20
MS	Ammonia (Total) as N (467405)	108	90-110		
MSD	Ammonia (Total) as N (467405)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Ammonia (Total) as N	<0.2 mg/L	0.2 mg/L

Method: EPA 300.0
Batch Analysis date: 2/9/22 to 2/12/22

Sampled date: 2/8/22 for samples 467358, 467359 (no SO4), 467360, 467361 (no SO4), 467362 - 467367, and 467368 (no SO4)
Sampled date:2/9/22 for samples 467396 - 467404, 467406, 467407

Matrix QC (MS) performed on LIMS #(s): 467359, 467366, 467395, 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Chloride	110	50-150		
LFB	Chloride	102	90-110	<1	<20
LD	Chloride (467359)			<1	<20
LD	Chloride (467366)			<1	<20
LD	Chloride (467395)			2	<20
LD	Chloride (467405)			1	<20
MS	Chloride (467359)	99	80-120		
MS	Chloride (467366)	105	80-120		
MS	Chloride (467395)	***-13**	80-120		
MS	Chloride (467405)	***-7**	80-120		
MRL	Sulfate	113	50-150		
LFB	Sulfate	103	90-110	<1	<20

LD	Sulfate (467359)			2	<20
LD	Sulfate (467366)			<1	<20
LD	Sulfate (467395)			2	<20
LD	Sulfate (467405)			6	<20
MS	Sulfate (467359)	99	80-120		
MS	Sulfate (467366)	104	80-120		
MS	Sulfate (467395)	***-77**	80-120		
MS	Sulfate (467405)	***-70**	80-120		
MRL	Nitrite	113	50-150		
LFB	Nitrite	103	90-110	<1	<20
LD	Nitrite (467359)			2	<20
LD	Nitrite (467366)			2	<20
LD	Nitrite (467395)			<1	<20
LD	Nitrite (467405)			<1	<20
MS	Nitrite (467359)	112	80-120		
MS	Nitrite (467366)	110	80-120		
MS	Nitrite (467395)	***0**	80-120		
MS	Nitrite (467405)	***1**	80-120		
MRL	Nitrate	109	50-150		
LFB	Nitrate	103	90-110	<1	<20
LD	Nitrate (467359)			<1	<20
LD	Nitrate (467366)			<1	<20
LD	Nitrate (467395)			2	<20
LD	Nitrate (467405)			1	<20
MS	Nitrate (467359)	108	80-120		
MS	Nitrate (467366)	110	80-120		
MS	Nitrate (467395)	***-25**	80-120		
MS	Nitrate (467405)	***66**	80-120		

QC Type	Analyte	Concentration	Limit
LRB	Chloride	<0.17 mg/L	0.17 mg/L
LRB	Sulfate	<0.17 mg/L	0.17 mg/L
LRB	Nitrite	<0.033 mg/L	0.033 mg/L
LRB	Nitrate	<0.033 mg/L	0.033 mg/L

***See Narrative**

Method: EPA 300.0
Batch Analysis date: 2/25/22

Sampled date: 2/8/22 for samples 467359 (SO4), 467361 (SO4) and 467368 (SO4)
Sampled date:2/9/22 for samples 467395 and 457405

Matrix QC (MS) performed on LIMS #(s): 467359 (SO4), 467395, and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Chloride	120	50-150		
LFB	Chloride	101	90-110	3	<20
LD	Chloride (467395)			7	<20
LD	Chloride (467405)			3	<20
MS	Chloride (467395)	99	80-120		
MS	Chloride (467405)	98	80-120		
MRL	Sulfate	111	50-150		
LFB	Sulfate	101	90-110	<1	<20
LD	Sulfate (467359)			2	<20
LD	Sulfate (467395)			<1	<20
LD	Sulfate (467405)			<1	<20
MS	Sulfate (467359)	99	80-120		
MS	Sulfate (467395)	95	80-120		
MS	Sulfate (467405)	95	80-120		
MRL	Nitrite	118	50-150		
LFB	Nitrite	102	90-110	3	<20
LD	Nitrite (467395)			<1	<20
LD	Nitrite (467405)			***200**	<20
MS	Nitrite (467395)	108	80-120		
MS	Nitrite (467405)	107	80-120		
MRL	Nitrate	116	50-150		
LFB	Nitrate	101	90-110	4	<20
LD	Nitrate (467395)			4	<20
LD	Nitrate (467405)			3	<20
MS	Nitrate (467395)	120	80-120		
MS	Nitrate (467405)	102	80-120		

QC Type	Analyte	Concentration	Limit
LRB	Chloride	<0.17 mg/L	0.17 mg/L
LRB	Sulfate	<0.17 mg/L	0.17 mg/L
LRB	Nitrite	<0.033 mg/L	0.033 mg/L
LRB	Nitrate	<0.033 mg/L	0.033 mg/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 2/11/22 for all except B
Batch Analysis date: 2/24/22 for B
Digestion date: 2/10/22 for all except B
Digestion date: 2/23/22 for B
Sampled date: 2/8/22 for samples 467358 - 467368

Matrix QC performed on samples 467363 and 467366

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	103	50-150		
LFB	Boron (Total Recoverable)	104	85-115		
MS	Boron (Total Recoverable) (467363)	108	70-130		
MSD	Boron (Total Recoverable) (467363)			<1	<20
MS	Boron (Total Recoverable) (467366)	110	70-130		
MSD	Boron (Total Recoverable) (467366)			1	<20
MRL	Calcium (Total Recoverable)	114	50-150		
LFB	Calcium (Total Recoverable)	101	85-115		
MS	Calcium (Total Recoverable) (467363)	***39**	70-130		
MSD	Calcium (Total Recoverable) (467363)			<1	<20
MS	Calcium (Total Recoverable) (467366)	***251**	70-130		
MSD	Calcium (Total Recoverable) (467366)			1	<20
MRL	Iron (Total Recoverable)	111	50-150		
LFB	Iron (Total Recoverable)	103	85-115		
MS	Iron (Total Recoverable) (467363)	110	70-130		
MSD	Iron (Total Recoverable) (467363)			<1	<20
MS	Iron (Total Recoverable) (467366)	114	70-130		
MSD	Iron (Total Recoverable) (467366)			2	<20
MRL	Potassium (Total Recoverable)	114	50-150		
LFB	Potassium (Total Recoverable)	103	85-115		
MS	Potassium (Total Recoverable) (467363)	110	70-130		
MSD	Potassium (Total Recoverable) (467363)			<1	<20
MS	Potassium (Total Recoverable) (467366)	115	70-130		
MSD	Potassium (Total Recoverable) (467366)			<1	<20
MRL	Magnesium (Total Recoverable)	112	50-150		
LFB	Magnesium (Total Recoverable)	102	85-115		
MS	Magnesium (Total Recoverable) (467363)	***-65**	70-130		
MSD	Magnesium (Total Recoverable) (467363)			<1	<20
MS	Magnesium (Total Recoverable) (467366)	***383**	70-130		
MSD	Magnesium (Total Recoverable) (467366)			<1	<20
MRL	Sodium (Total Recoverable)	107	50-150		
LFB	Sodium (Total Recoverable)	102	85-115		
MS	Sodium (Total Recoverable) (467363)	***-1680**	70-130		
MSD	Sodium (Total Recoverable) (467363)			1	<20
MS	Sodium (Total Recoverable) (467366)	***857**	70-130		
MSD	Sodium (Total Recoverable) (467366)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<4.80 ug/L	4.80 ug/L
LRB	Calcium (Total Recoverable)	<18.1 ug/L	18.1 ug/L
LRB	Iron (Total Recoverable)	<1.57 ug/L	1.57 ug/L
LRB	Potassium (Total Recoverable)	<227 ug/L	227 ug/L
LRB	Magnesium (Total Recoverable)	<10.0 ug/L	10.0 ug/L
LRB	Sodium (Total Recoverable)	***32.8 ug/L**	24.0 ug/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 2/23/22
Digestion date: 2/14/22
Sampled date: 2/9/22 for samples 467395 - 467407

Matrix QC performed on samples 467401 and 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	108	50-150		
LFB	Boron (Total Recoverable)	108	85-115		
MS	Boron (Total Recoverable) (467401)	127	70-130		
MSD	Boron (Total Recoverable) (467401)			<1	<20
MS	Boron (Total Recoverable) (467405)	114	70-130		
MSD	Boron (Total Recoverable) (467405)			<1	<20
MRL	Calcium (Total Recoverable)	113	50-150		
LFB	Calcium (Total Recoverable)	92	85-115		
MS	Calcium (Total Recoverable) (467401)	***-312**	70-130		
MSD	Calcium (Total Recoverable) (467401)			<1	<20
MS	Calcium (Total Recoverable) (467405)	***159**	70-130		
MSD	Calcium (Total Recoverable) (467405)			<1	<20
MRL	Iron (Total Recoverable)	109	50-150		
LFB	Iron (Total Recoverable)	103	85-115		
MS	Iron (Total Recoverable) (467401)	97	70-130		
MSD	Iron (Total Recoverable) (467401)			<1	<20
MS	Iron (Total Recoverable) (467405)	102	70-130		
MSD	Iron (Total Recoverable) (467405)			<1	<20
MRL	Potassium (Total Recoverable)	110	50-150		
LFB	Potassium (Total Recoverable)	104	85-115		
MS	Potassium (Total Recoverable) (467401)	108	70-130		
MSD	Potassium (Total Recoverable) (467401)			<1	<20
MS	Potassium (Total Recoverable) (467405)	115	70-130		
MSD	Potassium (Total Recoverable) (467405)			<1	<20
MRL	Magnesium (Total Recoverable)	106	50-150		
LFB	Magnesium (Total Recoverable)	103	85-115		
MS	Magnesium (Total Recoverable) (467363)	***150**	70-130		
MSD	Magnesium (Total Recoverable) (467363)			<1	<20

MS	Magnesium (Total Recoverable) (467366)	***494**	70-130		
MSD	Magnesium (Total Recoverable) (467366)			1	<20
MRL	Sodium (Total Recoverable)	126	50-150		
LFB	Sodium (Total Recoverable)	101	85-115		
MS	Sodium (Total Recoverable) (467401)	***600**	70-130		
MSD	Sodium (Total Recoverable) (467401)			<1	<20
MS	Sodium (Total Recoverable) (467405)	***1090**	70-130		
MSD	Sodium (Total Recoverable) (467405)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<4.80 ug/L	4.80 ug/L
LRB	Calcium (Total Recoverable)	<18.1 ug/L	18.1 ug/L
LRB	Iron (Total Recoverable)	<1.57 ug/L	1.57 ug/L
LRB	Potassium (Total Recoverable)	<227 ug/L	227 ug/L
LRB	Magnesium (Total Recoverable)	<10.0 ug/L	10.0 ug/L
LRB	Sodium (Total Recoverable)	<24.0 ug/L	24.0 ug/L

***See Narrative**

EPA Method: EPA 200.8
Digestion date: 2/10/22
Batch Analysis date: 2/14/22
Sampled date: 2/8/22 for samples 467358 – 467363 and 467367

Matrix QC performed on sample 467363

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Manganese (Total Recoverable)	97	50-150		
LFB	Manganese (Total Recoverable)	98	85-115		
MS	Manganese (Total Recoverable)	92	70-130		
MSD	Manganese (Total Recoverable)			<1	<20
MRL	Selenium (Total Recoverable)	112	50-150		
LFB	Selenium (Total Recoverable)	97	85-115		
MS	Selenium (Total Recoverable)	87	70-130		
MSD	Selenium (Total Recoverable)			5	<20

QC Type	Analyte	Concentration	Limit
LRB	Manganese (Total Recoverable)	<0.30 ug/L	0.30 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L

EPA Method: EPA 200.8
Digestion date: 2/14/22
Batch Analysis date: 2/15/22
Sampled date: 2/9/22 for samples 467395 – 467401

Matrix QC performed on sample 467401

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Manganese (Total Recoverable)	117	50-150		
LFB	Manganese (Total Recoverable)	99	85-115		
MS	Manganese (Total Recoverable)	87	70-130		
MSD	Manganese (Total Recoverable)			2	<20
MRL	Selenium (Total Recoverable)	94	50-150		
LFB	Selenium (Total Recoverable)	94	85-115		
MS	Selenium (Total Recoverable)	74	70-130		
MSD	Selenium (Total Recoverable)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Manganese (Total Recoverable)	<0.30 ug/L	0.30 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L

EPA Method: EPA 200.8
Digestion date: 2/15/22
Batch Analysis date: 2/25/22
Sampled date: 2/8/22 for samples 467364 – 467366 and 467368

Matrix QC performed on sample 467366

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Manganese (Total Recoverable)	116	50-150		
LFB	Manganese (Total Recoverable)	98	85-115		
MS	Manganese (Total Recoverable)	108	70-130		
MSD	Manganese (Total Recoverable)			<1	<20
MRL	Selenium (Total Recoverable)	100	50-150		
LFB	Selenium (Total Recoverable)	87	85-115		
MS	Selenium (Total Recoverable)	114	70-130		
MSD	Selenium (Total Recoverable)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Manganese (Total Recoverable)	<0.30 ug/L	0.30 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L

EPA Method: EPA 200.8
Digestion date: 2/14/22
Batch Analysis date: 2/28/22
Sampled date: 2/9/22 for samples 467402 – 467406

Matrix QC performed on sample 467405

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Manganese (Total Recoverable)	118	50-150		
LFB	Manganese (Total Recoverable)	100	85-115		
MS	Manganese (Total Recoverable)	89	70-130		
MSD	Manganese (Total Recoverable)			<1	<20
MRL	Selenium (Total Recoverable)	102	50-150		
LFB	Selenium (Total Recoverable)	95	85-115		
MS	Selenium (Total Recoverable)	81	70-130		
MSD	Selenium (Total Recoverable)			<1	<20

QC Type	Analyte	Concentration	Limit
LRB	Manganese (Total Recoverable)	<0.30 ug/L	0.30 ug/L
LRB	Selenium (Total Recoverable)	<0.44 ug/L	0.44 ug/L

LD – Laboratory Duplicate
LFB – Laboratory Fortified Blank
LRB – Laboratory Reagent Blank (Method Blank)
QCS – Quality Control Sample
MRL – Minimum Reporting Limit (Verification)
MS – Matrix Spike
MSD – Matrix Spike Duplicate
Underline – Data was outside the limit

Laboratory Services Section Sample/Data Evaluation Form

PART 1: Initiator (person who first noticed incident):

Please complete one form per project.

Initiated by: Spencer Hoover Date: 2/22/2022

Issue (describe in detail):

The equipment blank for CSR landfill sampled 2/8/2022 had a measured iron value of 18.5 ppb.
This is above the reporting limit for 200.7 analysis, which is 10.0 ppb.

Action Taken, if any:

Blank Sample Detections
Sample Name for Blank Detection: EQUIP_BLANK LIMS #: 467367

Parameter	Blank value (units)	Reporting Limit (units)	Associated Sample Name	Associated Sample LIMS #	Sample Value (units)

LIMS Section	Sample LIMS #	Sample Point	Sample Date	Analysis Affected
	467395	SC_7	3/9/22	Nitrite & Nitrate
	467405	SC_9	3/9/22	Nitrite & Nitrate

Laboratory Services Section Sample/Data Evaluation Form

Part 2: Customer Contact Details (Completed by Project Coordination)**:**

Analysis Details		
Parameters	Method #	Compliance *(Select one)*
Nitrite and Nitrate	EPA 300.0	☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO

Individual(s) contacted: Brock Foster, Patti Zietlow and Heather Barbare Date: 2/23/22

Generally, the project owner(s)

The customers request that only samples 467364 and 467362 be EB qualified since the sample values for iron are less than 10 times the EQB detection.

The samples to be qualified are actually 467360 and 467362. Sample 467364 does not need to be qualified. wma 3/1/22

Part 3: **Approval** (Section to be completed by LSS Lead):

Final Actions Taken (Reject Samples/Data, Accept Samples/Data, Qualify Samples/Data, Other)

Qualify samples as requested by customer and authorize in LIMS. Please update all other laboratory documentation to reflect this.

Signature/Print last name: Lesley Susic Date: 2-23-2022

Parameter	Associated Sample Name	Associated Sample LIMS #	Sample Date	Sample Concentration (ppb)
200.7 TR Fe	FC_2A	467358	02/08/2022	1210
200.7 TR Fe	FC_1A	467359	02/08/2022	208
200.7 TR Fe	WW_5A	467360	02/08/2022	62.4
200.7 TR Fe	WW_6A	467361	02/08/2022	1130
200.7 TR Fe	DUPLICATE	467368	02/08/2022	278
200.7 TR Fe	CC_1	467362	02/08/2022	36.2
200.7 TR Fe	FC_3B	467363	02/08/2022	1990
200.7 TR Fe	FC_3A	467364	02/08/2022	808
200.7 TR Fe	SC_8	467365	02/08/2022	412
200.7 TR Fe	SC_10	467366	02/08/2022	2380

Laboratory Services Section Sample/Data Evaluation Form

PART 1: Initiator (person who first noticed incident):

Please complete one form per project.

Initiated by: Spencer Hoover Date: 2/22/2022

Issue (describe in detail):

The equipment blank for CSR landfill sampled 2/8/2022 had a measured iron value of 18.5 ppb.
This is above the reporting limit for 200.7 analysis, which is 10.0 ppb.

Action Taken, if any:

Blank Sample Detections
Sample Name for Blank Detection: EQUIP_BLANK LIMS #: 467367

Parameter	Blank value (units)	Reporting Limit (units)	Associated Sample Name	Associated Sample LIMS #	Sample Value (units)

LIMS Section	Sample LIMS #	Sample Point	Sample Date	Analysis Affected
	467395	SC_7	3/9/22	Nitrite & Nitrate
	467405	SC_9	3/9/22	Nitrite & Nitrate

Laboratory Services Section Sample/Data Evaluation Form

Part 2: Customer Contact Details (Completed by Project Coordination)**:**

Analysis Details		
Parameters	Method #	Compliance *(Select one)*
Nitrite and Nitrate	EPA 300.0	☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO
		☐ YES ☐ NO

Individual(s) contacted: Brock Foster, Patti Zietlow and Heather Barbare Date: 2/23/22

Generally, the project owner(s)

The customers request that only samples 467364 and 467362 be EB qualified since the sample values for iron are less than 10 times the EQB detection.

Part 3: **Approval** (Section to be completed by LSS Lead):

Final Actions Taken (Reject Samples/Data, Accept Samples/Data, Qualify Samples/Data, Other)

Qualify samples as requested by customer and authorize in LIMS. Please update all other laboratory documentation to reflect this.

Signature/Print last name: Lesley Susic Date: 2-23-2022

Parameter	Equipment Blank value (units)	Reporting Limit (units)	Associated Sample Name	Associated Sample LIMS #	Sample Value (units)
NO2+NO3	0.21 mg/L	0.10	FC_2A	467358	0.34mg/L
NO2+NO3	0.21 mg/L	0.10	FC_1A	467359	31 mg/L
NO2+NO3	0.21 mg/L	0.10	WW_5A	467360	160 mg/L
NO2+NO3	0.21 mg/L	0.10	WW_6A	467361	750 mg/L
NO2+NO3	0.21 mg/L	0.10	DUPLICATE	467368	750 mg/L
NO2+NO3	0.21 mg/L	0.10	CC_1	467362	26 mg/L
NO2+NO3	0.21 mg/L	0.10	FC_3B	467363	<0.10 mg/L
NO2+NO3	0.21 mg/L	0.10	FC_3A	467364	3.2 mg/L
NO2+NO3	0.21 mg/L	0.10	SC_8	467365	1100 mg/L
NO2+NO3	0.21 mg/L	0.10	SC_10	467366	240 mg/L

Sample LIMS #	Sample Point	Sample Date	Analysis Affected
467358	FC_2A	2/8/2022	NO2+NO3
467359	FC_1A	2/8/2022	NO2+NO3
467360	WW_5A	2/8/2022	NO2+NO3
467361	WW_6A	2/8/2022	NO2+NO3
467368	DUPLICATE	2/8/2022	NO2+NO3
467362	CC_1	2/8/2022	NO2+NO3
467363	FC_3B	2/8/2022	NO2+NO3
467364	FC_3A	2/8/2022	NO2+NO3
467365	SC_8	2/8/2022	NO2+NO3
467366	SC_10	2/8/2022	NO2+NO3

APPENDIX F

Alternative Source Demonstration – Additional Information

Colorado Springs Utilities
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August 9, 2022

Ms. Ashley Lawrence
Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
222 S. Sixth St., Room 232
Grand Junction, CO 81501

Ms. Jill Parisi, P.E.
Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
4300 Cherry Creek Drive South
Denver, Colorado 80246

RE: Additional Information
Alternative Source Demonstration Assessment Monitoring, Selenium
Coal Combustion Residuals Landfill
Colorado Springs Utilities' Clear Spring Ranch
El Paso County, Colorado

Dear Ms. Lawrence and Ms. Parisi,

Colorado Springs Utilities (Utilities) completed the *Coal Combustion Residuals (CCR) Landfill Alternative Source Demonstration Assessment Monitoring, Selenium, Revision 0* in April 2022. On August 4, 2022, Utilities met with you to discuss this Alternative Source Demonstration (ASD) for Selenium. Based on our conversation, we understand that the Colorado Department of Public Health and Environment (CDPHE) is requesting the below information concerning additional activities that Utilities is taking as a result of the CCR Landfill ASD for Selenium. As discussed with you, Utilities will conduct the following activities:

- Install additional background monitoring wells. The planned locations of these additional monitoring wells are depicted in Attachment A.
- Conduct an additional groundwater sampling and analysis event at the proposed new monitoring wells, as well as at surrounding groundwater monitoring wells. The monitoring wells proposed for sample collection and the analytes for laboratory analysis and reporting are shown in Attachment B.
- Prepare a Technical Memorandum summarizing the results of the groundwater monitoring well installation and additional sampling activities evaluation and recommending future compliance actions, activities, and evaluations. The recommendations in the Technical Memorandum will be based on compliance with the EPA CCR Rule and the Colorado Solid Waste Regulations in consideration of the CCR Landfill ASD for Selenium. Utilities will provide the Technical Memorandum to the CDPHE for review.

Environmental Services Department
P.O. Box 1103, Mail Code 940
Colorado Springs, CO 80947-0940

http://www.csu.org

Colorado Springs Utilities
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Utilities respectfully requests that the CDPHE approve the April 2022 CCR Landfill ASD for Selenium. Please let us know if you have any questions or require additional information.

Sincerely,

COLORADO SPRINGS UTILITIES

Heather Barbare, P.E., CHMM
Senior Environmental Engineer
Environmental Services Department | Technical Service Section
hbarbare@csu.org
719-668-1821

Attachment A – Proposed Background Wells Figure
Attachment B – Monitoring Well and Analyte Sampling Table

Electronic Copy: Nina Ruiz, El Paso County Planning Department

Colorado Springs Utilities
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ATTACHMENT A

Project Manager Initials:SW Designer:MKL Checked:CRG Approved:CRG ANSI 11" x 17"

WW-6A
SC-15
WW-3A
SC-16
SC-17
SC-9
SC-8
WW-5A
SC-10
SC-11
SC-7
SC-12
SC-13
SC-14
SC-2
SC-3
FC-1
FC-1A
FC-3A
FC-3B
FC-2
FC-2A
CC-1

5480 5475 5470 5465 5460 5455 5450 5445 5440 5435 5432.5 5430 5425 5420 5432.5

Legend

- Proposed Upgradient Monitoring Well

HSU

- Well in PCA HSU
- Well in Kp HSU
- Groundwater Flow Line

Groundwater Elevation - Feb 2022

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Boundary - Piney Creek Alluvium HSU
- Boundary CCR Landfill
- Boundary Certificate of Designation

Note: Groundwater elevations at monitoring wells completed predominantly in the Kp HSU used as general guidance for construction of PCA HSU elevation contours

Groundwater flow lines are drawn perpendicular to potentiometric surface contours.

N

1 inch = 700 feet

0 250 500 1,000

Feet

AECOM

Title:

Proposed Background Wells
North Paleo-Alluvial Valley
Piney Creek Alluvium HSU Wells

Project:
Groundwater Monitoring Plan Revision
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	
60681138	7/20/2022	**Attachment A**

Colorado Springs Utilities
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ATTACHMENT B

Attachment B

Summary of Monitoring Wells and Analytes of Interest for Background Evaluation ASD SC-10

Well ID	Status	Location Relative to CCR Landfill	Rationale	First Sampled	Last Sampled
SC-15	*Proposed CCR well*	*Upgradient, near WW-3A*	*Proposed PCA HSU background well*	*Proposed*	-
SC-16	*Proposed CCR well*	*Upgradient, near SC-8*	*Proposed PCA HSU background well*	*Proposed*	-
SC-17	*Proposed CCR well*	*Upgradient, near SC-9*	*Proposed PCA HSU background well*	*Proposed*	-
WW-3A	Existing well	Upgradient, Kp HSU	Biosolid area, FSB, KP HSU	Jan-86	Feb-22
SC-8	Existing well	Upgradient/Cross-gradient	Adjacent to CCR Landfill, PCA HSU	Jun-16	Feb-22
SC-9	Existing well	Upgradient/Cross-gradient	Adjacent to CCR Landfill, PCA HSU	Jun-16	Feb-22
SC-10	Existing CCR well	Downgradient (north)	Downgradient CCR Monitoring Well, PCA HSU	Jun-16	Feb-22
SC-11	Existing CCR well	Downgradient (north)	Downgradient CCR Monitoring Well, PCA HSU	Jun-16	Feb-22
SC-12	Existing CCR well	Downgradient (south)	Downgradient CCR Monitoring Well, PCA HSU	Jun-16	Feb-22
SC-13	Existing CCR well	Downgradient (south)	Downgradient CCR Monitoring Well, PCA HSU	Jun-16	Feb-22
SC-7	Existing well	Downgradient (north)	Downgradient of CCR Landfill, PCA HSU	Feb-09	Feb-22

PCA HSU - Piney Creek Alluvium Hydrostratigraphic Unit
Kp HSU - Cretaceous Pierre Shale Hydrostratigraphic Unit

Recommended Analyte List

Analytes	Major ions (calcium, sodium, potassium, magnesium, total alkalinity, bicarbonate, chloride, sulfate), TDS, COD, nitrate, nitrite, nitrate+nitrite as nitrogen, ammonia, iron, manganese, selenium, fluoride, boron
Field water quality parameters	pH, DO, ORP, specific conductance, color, clarity, DTW prior to sampling, DTW after sampling, well yield during sampling

COLORADO
Hazardous Materials
& Waste Management Division
Department of Public Health & Environment

Electronic document submittal

hbarbare@csu.org

August 10, 2022

Ms. Heather Barbare
P.O. Box 1103, Mail Code 940
Colorado Springs, Colorado 80947

RE: Coal Combustion Residuals Landfill
Alternative Source Demonstration - Selenium
Colorado Springs Utilities Clear Spring Ranch
ELP51 / CDPHE SW Monitoring

Dear Ms. Barbare,

The Solid Waste and Materials Management Program, Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and Environment (the Division) completed reviews of the following reports submitted by Colorado Springs Utilities on behalf of Clear Spring Ranch:

- *Coal Combustion Residuals (CCR) Landfill Alternative Source Demonstration, Assessment Monitoring, Selenium, El Paso County, Colorado dated April, 2022. The electronic version was received April, 2022*

- *Additional Information Alternative Source Demonstration Assessment Monitoring, Selenium, El Paso County, Colorado dated August 9, 2022. The electronic version was received August 9, 2022*

The technical review was conducted to determine compliance with the requirements set forth in the Solid Wastes Disposal Sites and Facilities Act, Title 30, Article 20, Part 1 of the Colorado Revised Statutes, as amended (Act), with the regulations promulgated there under 6 CCR 1007-2 (Regulations), with the current EDOP dated March 2008 and the updated Groundwater Monitoring Work Plan dated July 2019.The Water Quality Control Commission Regulation 41, the Basic Standards for Groundwater (BSGW), was also reviewed.

On August 4, 2022 CDPHE met with Colorado Springs Utilities and Clear Springs Ranch to discuss the proposed ASD and path forward for the CCR Landfill. Clear Spring Ranch submitted additional information on August 9, 2022. Based on its review of both documents, the Division accepts the plan proposed by Colorado Springs Utilities and Clear Spring Ranch is approved to begin demonstration activities.

Note: The division's acceptance of the Report is not meant to imply agreement with any opinions, regulatory or technical interpretations, characterization of CDPHE positions or guidance, recommendations for future actions or other subjective statements made in the Report.

In closing, the Division is authorized to bill for the review of technical submittals pursuant to C.R.S. 30-20-109 (2) (b) at the rate of $125 per hour. An invoice for the Division's review will be transmitted to you under separate cover. Should you have any questions regarding this correspondence, please contact me by phone at (720)-213-8028 or email at ashley.lawrence@state.co.us.

With Regards,

Ashley Lawrence
Environmental Protection Specialist
Solid Waste Permitting Unit
Hazardous Materials & Waste Management Division

Ec: Brock Foster – bfoster@csu.org
Jill Parisi – jill.parisi@state.co.us