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ANNUAL GROUNDWATER MONITORING REPORT FOR 2023

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

January 31, 2024

Prepared For:
40 CFR Part 257.90(e)
and
Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Attention:
Ms. Ashley Lawrence
Ms. Jill Parisi

Prepared By:
Colorado Springs Utilities
Environmental Services Department
Technical Services Section

Facility Environmental Activities Contact
Colorado Springs Utilities' Environmental Services
P.O. Box 1103, Mail Code 940, Colorado Springs, CO 80947-0940

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TABLE OF CONTENTS

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1.0 EXECUTIVE SUMMARY

During the 2023 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 2023, 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 well SC-12

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 (ASD) in April 2022, in accordance with §257.95(g)(3)(ii). During 2023, 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 2023 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). Additionally, groundwater investigation activities initiated in 2022 indicate that groundwater flow within the Piney Creek Alluvium Hydrostratigraphic Unit beneath the CCR Landfill is present within hydraulically separated buried paleo-alluvial valley drainages, two of which are separated by a bedrock high located beneath the landfill. These two paleo-alluvial valley drainages are referred to as the "South Paleo-Alluvial Valley" and the "North Paleo-Alluvial Valley."

Groundwater elevation measurements collected the week of October 16, 2023 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 2023 and September 2023. 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 2023.

4.1 Detection Monitoring

During 2023, 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 2023, 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 2023 sampling event a duplicate sample was collected

from monitoring well SC-13, and during the September 2023 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.

QA/QC exceptions noted include:

- Utilities identified matrix interferences associated with EPA Method 200.8, utilized in March 2023 for analysis of antimony, arsenic, barium, beryllium, cadmium, chromium, lead, molybdenum, selenium, and thallium. High total dissolved solids matrix interferences resulted in dilutions and reduced accuracy. Dilutions resulted in an increased reporting limit (RL) for multiple metals in March 2023. To reduce instrument interferences, in September 2023 Utilities analyzed antimony, arsenic, barium, beryllium, cadmium, chromium, lead, molybdenum, selenium, and thallium by EPA Method 200.7.
- In September 2023 chloride was detected in the field duplicate sample at a concentration (1,500 mg/L) six times the concentration of its parent sample SC-12 concentration (250 mg/L). Based on correspondence with the analytical laboratory, field duplicate / parent sample concentration comparability for other analytes, and historical chloride results from monitoring well SC-12, Utilities believes that the field duplicate results are a result of analytical error.
- During the September 2023 sampling event, chloride analysis for samples collected from monitoring wells CC-1, FC-1, FC-2, FC-3A, FC-3B, and the Equipment Blank; and sulfate analysis for samples collected from monitoring wells CC-1, FC-1, FC-2, FC-3A, FC-3B, SC-10, SC-11, SC-12, the Field Duplicate (SC-12) and the Equipment Blank were conducted outside of the 28-day hold time. Hold time exceedances varied from hours to up to three days. Chloride and sulfate concentrations from these samples were generally consistent with historical chloride and sulfate sample concentrations.
- Instrument and method limitations associated with EPA Method 200.7 resulted in thallium and antimony increased RLs and non-detect outliers for September 2023 samples. Outliers are presented in Appendix D. Utilities has arranged to analyze thallium and antimony (as well as arsenic, barium, beryllium, cadmium, chromium, lead, molybdenum, and selenium) in future samples using SW-846 6020 rather than EPA 200.7/200.8. Utilities anticipates that the analytical method update will result in fewer matrix interferences and lower reporting limits for these constituents.

Laboratory quality control activities are discussed in the Appendix C laboratory report case narratives.

4.4 Monitoring Well Installation, Repair, and Abandonment

In September 2023, Utilities installed two additional background groundwater monitoring wells. These monitoring wells were installed as part of currently underway groundwater monitoring network modification activities. Groundwater monitoring network modification is necessary, as it was identified in 2022 that groundwater chemistry is significantly different in the North Paleo-Alluvial Valley as compared to the South Paleo-Alluvial Valley, but the current background data set for statistical evaluation is based only on wells located within the South Paleo-Alluvial Valley (AECOM 2022). Additional information is available in the August 23, 2023, *Groundwater Monitoring Network Modification* letter sent to the CDPHE on August 23, 2023, and acknowledged by the CDPHE on August 25, 2023. See Appendix E.

No CCR landfill monitoring wells were repaired or abandoned in 2023.

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 2023 statistical analysis are presented in Appendix D.

The 2023 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 well SC-12

During 2023, 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 2023 semi-annual sampling events and are provided in the statistical analysis report provided in Appendix D. A summary of the GWPS resulting from the 2023 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	4.67	**6**
Arsenic	10	-	Yes	**12.3**	**12.3**
Barium	**2000**	-	No	33.6	**2000**
Beryllium	**4**	-	No	2	**4**
Cadmium	**5**	-	No	5	**5**
Chromium	**100**	-	No	10.6	**100**
Cobalt	-	6	Yes	**9.08**	**9.08**
Fluoride	**4 mg/l**	-	No	0.754 mg/l	**4 mg/l**
Lead	-	**15**	No	9	**15**
Lithium	-	40	Yes	**1166**	**1166**
Mercury	**2**	-	No	0.009	**2**
Molybdenum	-	**100**	No	12.8	**100**
Selenium	50	-	Yes	**224**	**224**
Thallium	2	-	Yes	**6.64**	**6.64**
Radium 226 and 228 Combined	**5 pCi/l**	-	No	4.72pCi/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 2023 are provided in Appendix D. The confidence interval calculations indicate that no Appendix IV constituents exceeded the GWPS at a statistically significant level in 2023.

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 exhibit a statistically significant increase over background concentrations; therefore, the CCR Landfill will continue with Assessment Monitoring in 2024.

No EPA CCR Rule Appendix IV constituents were measured at a statistically significant level exceeding the GWPS during 2023.

The overall CCR Landfill groundwater monitoring program was reviewed. It was identified that groundwater chemistry is significantly different in the North Paleo-Alluvial Valley as compared to the South Paleo-Alluvial Valley, but the current background data set for statistical evaluation is based only on wells located within the South Paleo-Alluvial Valley (AECOM 2022). In consideration of this complex geology, a previously submitted Alternative Source Demonstration, the August 23, 2023 *Groundwater Monitoring Network Modification* letter (Appendix E), and other constraints, Utilities continues the effort to modify the groundwater monitoring program to account for the full diversity of background geochemical conditions of the North and South Paleo-Alluvial Valleys. Additional monitoring wells are being sampled to establish a new background dataset for the North Paleo-Alluvial Valley. A revised groundwater monitoring plan for the CCR Landfill will be completed following a minimum of eight background monitoring well sampling events. Utilities anticipates that the revised groundwater monitoring plan will be complete in 2025. As recommended in the August 23, 2023 *Groundwater Monitoring Network Modification* letter, Utilities continues to conduct activities in general accordance with the 2017 Professional Engineer-certified and CDPHE-approved Coal Combustion Residuals Landfill Groundwater Detection Monitoring Plan.

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 2024

For 2024, Utilities plans to continue with Detection Monitoring and Assessment Monitoring. Due to groundwater sample matrices, and as discussed in Section 4.3 - Quality Assurance / Quality Control, for future Detection Monitoring and Assessment Monitoring sampling events Utilities will analyze antimony, arsenic, barium, beryllium, cadmium, chromium, lead, molybdenum, selenium, and thallium by SW-846 6020. Utilities will also continue conducting the activities described in the August 23, 2023, *Groundwater Monitoring Network Modification* letter sent to the CDPHE on August 23, 2023. See Appendix E.

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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.

AECOM. 2022. Coal Combustion Residuals (CCR) Landfill Alternative Source Demonstration Assessment Monitoring, Selenium Clear Spring Ranch, El Paso County, Colorado Revision 0. April 2022.

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

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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:

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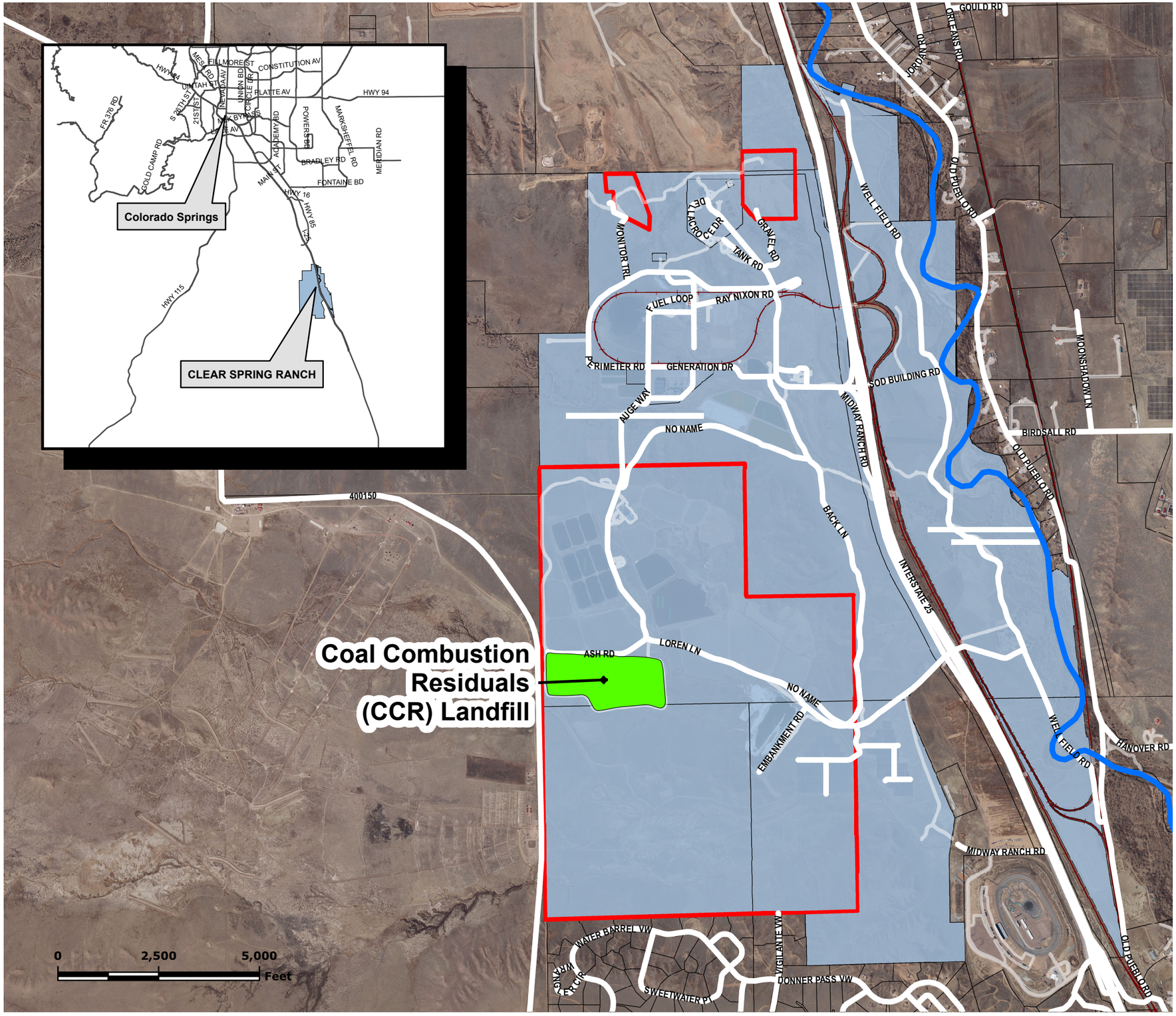
APPENDIX A

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:

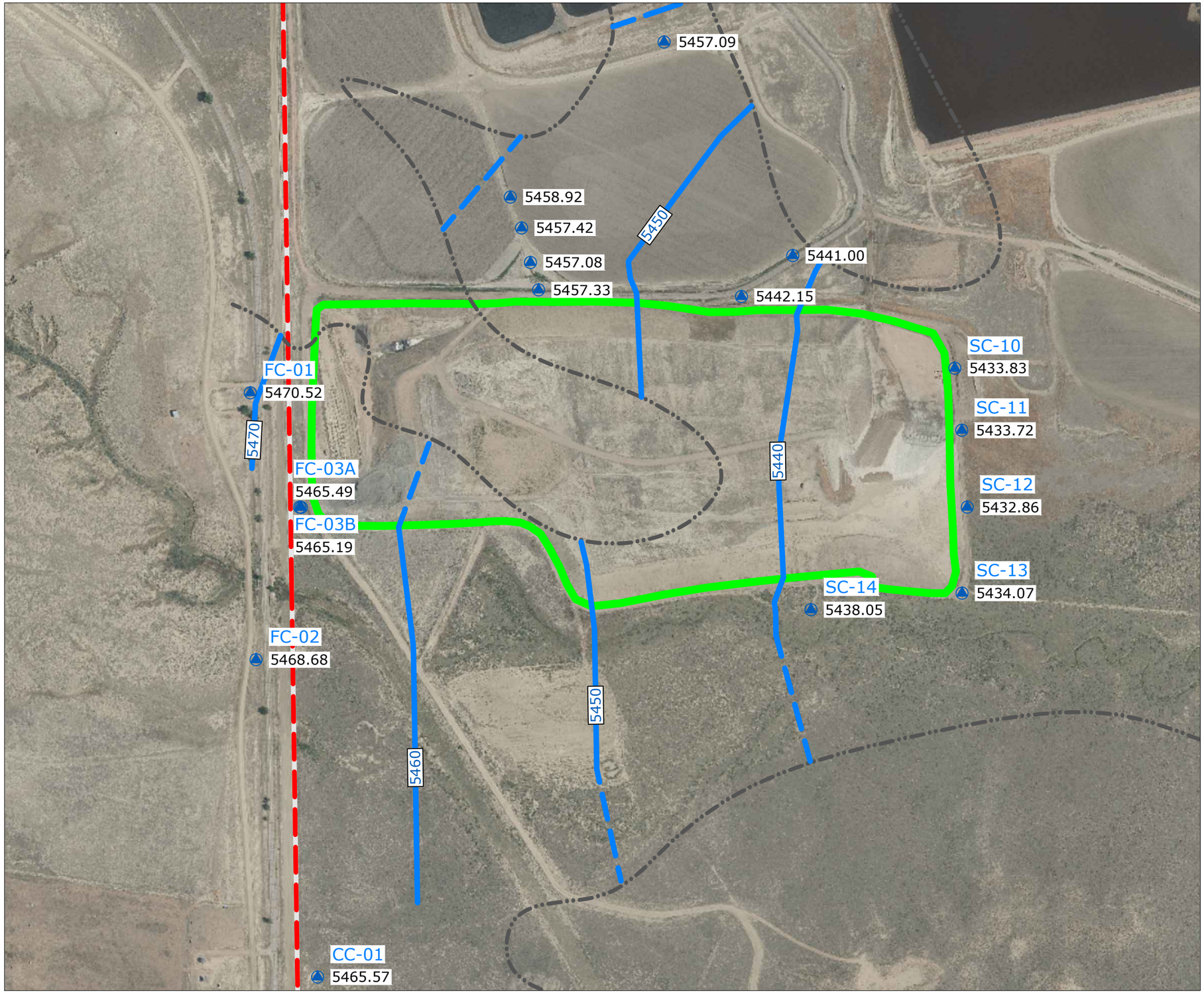
- Fountain Creek
- Boundary - Certificate of Designation CD-04-001
- Boundary - Clear Spring Ranch

VICINITY MAP

Clear Spring Ranch
Coal Combustion Residuals Landfill
El Paso County

Project No:	550-504-7
Prepared By:	Environmental Services
Date:	January 12, 2024

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
- Boundary - Piney Creek Alluvium Hydrostratigraphic Unit (HSU) - Approximate
- Groundwater Potentiometric Surface (Dashed portions are estimated)
- Groundwater Monitoring Well Location
- ## Groundwater Elevation - Feet (Above mean sea level)

Notes:

- Groundwater Elevation Measurements Collected October 17-18, 2023.

Scale:

0 450 Feet 900 Feet

1 Inch = 450 Feet

GROUNDWATER ELEVATION CONTOURS - 2023

Clear Spring Ranch

Coal Combustion Residuals Landfill
El Paso County

Project No: 550-504-7	**Figure Number 2**
Prepared By: Environmental Services	
Date: January 12, 2024	

APPENDIX B

Groundwater Laboratory Analytical Results and Groundwater Depths / Elevations / Hydrographs

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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	3/13/2023	<5.0	10.8	<5.0	<2.0	975	<5.0	452000	1720	<10.0	<5.00	0.33	<5.0	780	0.006	<2.0	6.9	1.43	211	20200	<5.0	33400
	9/25/2023	<15.0	<10.0	5.58	<1.00	994	<1.00	392000	1500	<2.00	<5.00	0.21	<10.0	883	0.004	<5.00	7.1	2.96	294	29000	<10.0	35300
FC-1	3/13/2023	<5.0	17.7	6.7	<2.0	969	<5.0	397000	801	<10.0	<5.00	0.17	<5.0	1050	0.002	<2.0	7.1	2.29	55.1	12700	<5.0	20400
	9/25/2023	<15.0	<10.0	9.62	<1.00	1000	<1.00	381000	690	<2.00	<5.00	0.11	<10.0	1170	0.001	<5.00	7.2	2.48	<15.0	12000	<10.0	21500
FC-2	3/13/2023	<5.0	<10.0	6.2	<2.0	951	<5.0	405000	113	<10.0	<5.00	0.91	<5.0	272	0.006	2.2	7.2	0.531	55.6	6180	<5.0	8620
	9/25/2023	<15.0	<10.0	7.23	<1.00	965	<1.00	398000	80	<2.00	<5.00	0.48	<10.0	297	0.003	<5.00	7.4	0.615	41.8	7300	<10.0	9600
FC-3A	3/13/2023	<5.0	<10.0	7.8	<2.0	1020	<5.0	411000	141	<10.0	<5.00	0.82	<5.0	294	<0.002	6.1	7.4	0.0212	50.0	5300	<5.0	8480
	9/25/2023	<15.0	<10.0	9.51	<1.00	1040	<1.00	392000	120	<2.00	<5.00	0.44	<10.0	317	0.001	8.76	7.6	0.654	60.0	6600	<10.0	9020
FC-3B	3/13/2023	<5.0	<10.0	7.1	<2.0	1120	<5.0	200000	235	<10.0	<5.00	0.91	<5.0	231	<0.002	<2.0	7.6	0.639	18.5	4140	<5.0	7320
	9/25/2023	<15.0	<10.0	10.3	<1.00	1250	<1.00	217000	220	<2.00	<5.00	0.54	<10.0	283	<0.001	28.1	7.4	0.906	<15.0	4100	<10.0	7440
SC-10	3/14/2023	<5.0	10.6	27.2	<2.0	1220	<5.0	371000	979	<10.0	<5.00	1.00	<5.0	826	0.015	4.9	7.3	0.0619	203	9490	<5.0	15700
	9/26/2023	<15.0	<10.0	30.5	<1.00	1220	<1.00	406000	790	3.48	<5.00	0.50	<10.0	838	0.010	<5.00	7.4	0.784	292	8600	<10.0	17300
SC-11	3/14/2023	<5.0	17.0	5.6	<2.0	2570	<5.0	421000	1240	<10.0	<5.00	1.10	<5.0	720	0.008	2.5	7.3	-0.718	277	8060	<5.0	13100
	9/26/2023	<15.0	<10.0	19.8	<1.00	2590	<1.00	457000	1100	2.08	<5.00	0.56	<10.0	683	0.010	<5.00	7.3	2.39	381	8600	<10.0	15400
SC-12	3/14/2023	<5.0	<10.0	<5.0	<2.0	4570	<5.0	395000	336	<10.0	<5.00	1.84	<5.0	500	0.002	4.8	7.3	0.285	23.9	8640	<5.0	12800
	9/26/2023	<15.0	<10.0	6.67	<1.00	4480	<1.00	388000	250	3.95	<5.00	0.91	<10.0	470	0.002	<5.00	7.4	1.55	<15.0	6100	<10.0	13100
	9/26/2023 dup.	<15.0	<10.0	6.37	<1.00	4560	<1.00	383000	1500	<2.00	<5.00	0.91	<10.0	476	0.002	<5.00	7.4	0.389	<15.0	7000	<10.0	12900
SC-13	3/14/2023	<5.0	<10.0	<5.0	<2.0	1530	<5.0	332000	161	<10.0	<5.00	1.46	<5.0	362	0.002	3.2	7.4	0.000646	32.1	6710	<5.0	9180
	3/14/2023 dup.	<5.0	<10.0	<5.0	<2.0	1520	<5.0	382000	156	<10.0	<5.00	1.49	<5.0	359	0.002	3.0	7.4	0.119	39.4	6620	<5.0	10600
	9/26/2023	<15.0	<10.0	5.27	<1.00	1510	<1.00	384000	120	<2.00	<5.00	0.73	<10.0	353	<0.001	<5.00	7.4	0.801	39.2	7600	<10.0	10500
SC-14	3/14/2023	<5.0	<10.0	<5.0	<2.0	1520	<5.0	392000	159	<10.0	<5.00	1.41	<5.0	370	0.002	9.3	7.5	0.297	14.7	6980	<5.0	9540
	9/26/2023	<15.0	<10.0	5.75	<1.00	1450	<1.00	379000	120	<2.00	<5.00	0.70	<10.0	345	<0.001	10.2	7.4	1.27	<15.0	7600	<10.0	11200

* Metals are Total/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	5,435.03	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	5,434.76	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	5,434.62	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	5,434.53	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	5,434.81	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	5,434.90	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	5,434.94	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	5,434.75	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	5,435.27	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	5,435.28	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	-	-	-	-	-	-	-	-	-	-
3/13/2023	13.87	5,464.80	16.71	5,470.16	14.46	5,468.54	19.52	5,464.77	18.72	5,465.03	-	-	-	-	-	-	-	-	-	-
3/14/2023	-	-	-	-	-	-	-	-	-	-	15.91	5,431.74	11.89	5,432.65	12.01	5,432.31	12.12	5,433.86	12.40	5,437.83
9/25/2023	13.32	5,465.35	16.64	5,470.23	14.31	5,468.69	18.88	5,465.41	18.10	5,465.65	-	-	-	-	-	-	-	-	-	-
9/26/2023	-	-	-	-	-	-	-	-	-	-	13.91	5,433.74	10.98	5,433.56	11.57	5,432.75	12.02	5,433.96	12.30	5,437.93

Depth to Water = Feet
Water Surface Elevation = Feet Above Mean Sea Level

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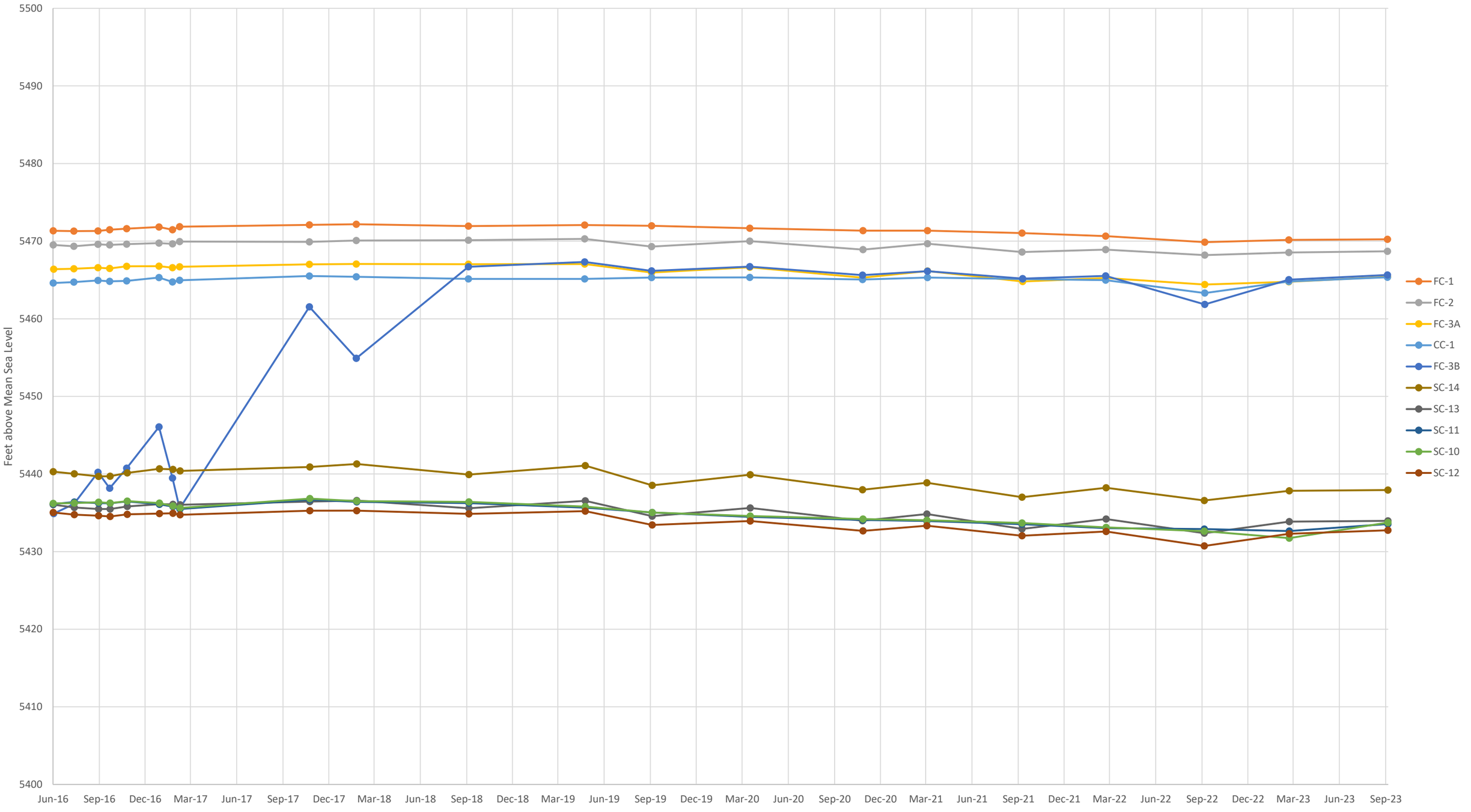
CCR Landfill - Hydrographs



APPENDIX C

Laboratory Analytical Results

Colorado Springs Utilities

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Laboratory Report For:

Coal Combustion Residuals - Landfill

Colorado Springs Utilities Environmental Services

Report Authorized by: Wendy M Asay

Title: Environmental Specialist

Report Date: December 12, 2023

Report generated by: Wendy M. Asay

Revised to correct how dilutions were handled.

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

480211	13-Mar-2023 10:10	Crooked Canyon Well #1
480212	13-Mar-2023 14:27	Fort Carson Well #1
480213	13-Mar-2023 15:11	Fort Carson Well #2
480214	13-Mar-2023 11:15	Fort Carson Well #3A
480215	13-Mar-2023 12:09	Fort Carson Well #3B
480216	13-Mar-2023 16:45	Equipment Blank
480217	14-Mar-2023 09:41	Sand Canyon Well #10
480218	14-Mar-2023 12:21	Sand Canyon Well #13
480219	14-Mar-2023 13:30	Sand Canyon Well #14
480220	14-Mar-2023 10:36	Sand Canyon Well #11
480221	14-Mar-2023 11:19	Sand Canyon Well #12
480222	14-Mar-2023 00:00	Field Duplicate sample

LIMS#: 480211

Sample Date: 3/13/23 10:10 AM

Sample Point: CC_1

Sample Point Description: Crooked Cayon Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	6.9	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	0.33	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	106	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	11.9	degrees C	0.000			1
	SM 2540 C	Total Dissolved Solids	33400	mg/L	10			1
+	SM 2510 B	Conductivity	20900	umhos/cm	1			1
+	SM 2130 B	Turbidity	0.79	NTU	0.05			1
+	NA	Depth to Water	13.87	ft.	0.000			1
	EPA 300.0	Chloride	1720	mg/L	25	D	3/17/2023	50
	EPA 300.0	Sulfate	20200	mg/L	500	D	3/17/2023	1000
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.8	Arsenic (Total Recoverable)	10.8	ug/L	10.0	D	4/13/2023	10
	EPA 200.8	Barium (Total Recoverable)	<5.0	ug/L	5.0	D/T	4/13/2023	10
	EPA 200.8	Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
	EPA 200.8	Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.8	Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
	EPA 200.8	Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.8	Molybdenum (Total Recoverable)	<2.0	ug/L	2.0	D	4/13/2023	10
	EPA 200.8	Selenium (Total Recoverable)	211	ug/L	10.0	D	4/13/2023	10
	EPA 200.8	Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	975	ug/L	20.0		3/16/2023	1
	EPA 200.7	Calcium (Total Recoverable)	452000	ug/L	100000	D/T1	3/17/2023	1000
	EPA 200.7	Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
	EPA 200.7	Lithium (Total Recoverable)	780	ug/L	30.0	T	3/16/2023	1
	EPA 1631	Mercury (Total)	0.006	ug/L	0.002		3/31/2023	1

LIMS#: 480212
Sample Date: 3/13/23 2:27 PM
Sample Point: FC_1
Sample Point Description: Fort Carson Well #1
Collection Comments: Perform MS/MSD
Sample Type: GRAB
Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.1	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	0.17	mg/L	0.10		3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	57	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	13.5	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	20400	mg/L	10			1
+	SM 2510 B	Conductivity	16600	umhos/cm	1			1
+	SM 2130 B	Turbidity	0.33	NTU	0.05			1
+	NA	Depth to Water	16.71	ft.	0.000			1
	EPA 300.0	Chloride	801	mg/L	500	D	3/17/2023	1000
		Sulfate	12700	mg/L	500	D	3/17/2023	1000
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	17.7	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	6.7	ug/L	5.0	D/T	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	<2.0	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	55.1	ug/L	10.0	D	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	969	ug/L	20.0		3/16/2023	1
		Calcium (Total Recoverable)	397000	ug/L	100000	T1/D	3/17/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
		Lithium (Total Recoverable)	1050	ug/L	30.0		3/16/2023	1
	EPA 1631	Mercury (Total)	0.002	ug/L	0.002		3/31/2023	1

LIMS#: 480213
Sample Date: 3/13/23 3:11 PM
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 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.2	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	0.91	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	58	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	12.9	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	8620	mg/L	10			1
+	SM 2510 B	Conductivity	7440	umhos/cm	1			1
+	SM 2130 B	Turbidity	5.9	NTU	0.05			1
+	NA	Depth to Water	14.46	ft.	0.000			1
	EPA 300.0	Chloride	113	mg/L	2.5	D	3/17/2023	5
		Sulfate	6180	mg/L	250	D	3/17/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	6.2	ug/L	5.0	D/T	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	2.2	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	55.6	ug/L	10.0	D	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	951	ug/L	20.0		3/16/2023	10
		Calcium (Total Recoverable)	405000	ug/L	100000	T1/D	3/17/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
		Lithium (Total Recoverable)	272	ug/L	30.0	T	3/16/2023	1
	EPA 1631	Mercury (Total)	0.006	ug/L	0.002		3/31/2023	1

LIMS#: 480214
Sample Date: 3/13/23 11:15 AM
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 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.4	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	0.82	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	141	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	12.5	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	8480	mg/L	10			1
+	SM 2510 B	Conductivity	6670	umhos/cm	1			1
+	SM 2130 B	Turbidity	2.0	NTU	0.05			1
+	NA	Depth to Water	19.52	ft.	0.000			1
	EPA 300.0	Chloride	141	mg/L	2.5	D	3/17/2023	5
		Sulfate	5300	mg/L	250	D	3/17/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	7.8	ug/L	5.0	D/T	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	6.1	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	50.0	ug/L	10.0	D	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1020	ug/L	20.0		3/16/2023	1
		Calcium (Total Recoverable)	411000	ug/L	100000	T1/D	3/17/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
		Lithium (Total Recoverable)	294	ug/L	30.0	T	3/16/2023	1
	EPA 1631	Mercury (Total)	<0.002	ug/L	0.002		3/31/2023	1

LIMS#: 480215
Sample Date: 3/13/23 12:09 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 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.6	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	0.91	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	-234	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	12.6	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	7320	mg/L	10			1
+	SM 2510 B	Conductivity	6620	umhos/cm	1			1
+	SM 2130 B	Turbidity	2.8	NTU	0.05			1
+	NA	Depth to Water	18.72	ft.	0.000			1
	EPA 300.0	Chloride	235	mg/L	5.0	D	3/17/2023	10
		Sulfate	4140	mg/L	100	D	3/17/2023	200
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	7.1	ug/L	5.0	D/T	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	<2.0	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	18.5	ug/L	10.0	D	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1120	ug/L	20.0		3/16/2023	1
		Calcium (Total Recoverable)	200000	ug/L	100000	T1/D	3/17/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
		Lithium (Total Recoverable)	231	ug/L	30.0	T	3/16/2023	1
	EPA 1631	Mercury (Total)	<0.002	ug/L	0.002		3/31/2023	1

LIMS#: 480216
Sample Date: 3/13/23 4:45 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 4500 F C	Fluoride (Total)	<0.10	mg/L	0.10	T	3/17/2023	1
	SM 2540 C	Total Dissolved Solids	<10	mg/L	10			1
	EPA 300.0	Chloride	<0.50	mg/L	0.50		3/17/2023	1
		Sulfate	<0.50	mg/L	0.50		3/17/2023	1
	EPA 200.8	Antimony (Total Recoverable)	<0.50	ug/L	0.50		4/13/2023	1
		Arsenic (Total Recoverable)	<1.0	ug/L	1.0		4/13/2023	1
		Barium (Total Recoverable)	<0.50	ug/L	0.50	T	4/13/2023	1
		Beryllium (Total Recoverable)	<0.20	ug/L	0.20	T	4/13/2023	1
		Cadmium (Total Recoverable)	<0.50	ug/L	0.50		4/13/2023	1
		Chromium (Total Recoverable)	<1.0	ug/L	1.0		4/13/2023	1
		Lead (Total Recoverable)	<0.50	ug/L	0.50		4/13/2023	1
		Molybdenum (Total Recoverable)	<0.20	ug/L	0.20		4/13/2023	1
		Selenium (Total Recoverable)	<1.0	ug/L	1.0		4/13/2023	1
		Thallium (Total Recoverable)	<0.50	ug/L	0.50		4/13/2023	1
	EPA 200.7	Boron (Total Recoverable)	<20.0	ug/L	20.0		3/16/2023	1
		Calcium (Total Recoverable)	<100	ug/L	100	T1	3/17/2023	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/16/2023	1
		Lithium (Total Recoverable)	<30.0	ug/L	30.0	T	3/16/2023	1
	EPA 1631	Mercury (Total)	<0.002	ug/L	0.002		3/31/2023	1

LIMS#: 480217
Sample Date: 3/14/23 9:41 AM
Sample Point: SC_10
Sample Point Description: Sand Cayon Well #10
Collection Comments:
Sample Type: GRAB
Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.3	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	1.00	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	34	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	14.0	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	15700	mg/L	10			1
+	SM 2510 B	Conductivity	13700	umhos/cm	1			1
+	SM 2130 B	Turbidity	92	NTU	0.05			1
+	NA	Depth to Water	15.91	ft.	0.000			1
	EPA 300.0	Chloride	979	mg/L	25	D	3/17/2023	50
		Sulfate	9490	mg/L	250	D	3/17/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	10.6	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	27.2	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	4.9	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	203	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1220	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	371000	ug/L	100000	D/T1	3/23/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	826	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.015	ug/L	0.002		3/31/2023	1

LIMS#: 480218
Sample Date: 3/14/23 12:21 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 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.4	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	1.46	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	99	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	12.5	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	9180	mg/L	10			1
+	SM 2510 B	Conductivity	8170	umhos/cm	1			1
+	SM 2130 B	Turbidity	1.4	NTU	0.05			1
+	NA	Depth to Water	12.12	ft.	0.000			1
	EPA 300.0	Chloride	161	mg/L	2.5	D	3/18/2023	5
		Sulfate	6710	mg/L	250	D	3/18/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	3.2	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	32.1	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1530	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	332000	ug/L	100000	D/T1	3/23/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	362	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.002	ug/L	0.002		4/7/2023	1

LIMS#: 480219
Sample Date: 3/14/23 1:30 PM
Sample Point: SC_14
Sample Point Description: Sand Cayon Well #14
Collection Comments:
Sample Type: GRAB
Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.5	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	1.41	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	63	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	12.1	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	9540	mg/L	10			1
+	SM 2510 B	Conductivity	8040	umhos/cm	1			1
+	SM 2130 B	Turbidity	1.4	NTU	0.05			1
+	NA	Depth to Water	12.40	ft.	0.000			1
	EPA 300.0	Chloride	159	mg/L	2.5	D	3/18/2023	5
		Sulfate	6980	mg/L	250	D	3/18/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	9.3	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	14.7	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1520	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	392000	ug/L	100000	D/T1	3/23/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	370	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.002	ug/L	0.002		4/7/2023	1

LIMS#: 480220

Sample Date: 3/14/23 10:36 AM

Sample Point: SC_11

Sample Point Description: Sand Cayon Well #11

Collection Comments: Perform MS/MSD

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.3	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	1.10	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	48	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	14.3	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	13100	mg/L	10			1
+	SM 2510 B	Conductivity	12700	umhos/cm	1			1
+	SM 2130 B	Turbidity	3.4	NTU	0.05			1
+	NA	Depth to Water	11.89	ft.	0.000			1
	EPA 300.0	Chloride	1240	mg/L	25	D	3/18/2023	50
		Sulfate	8060	mg/L	250	D	3/18/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	17.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	5.6	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	2.5	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	277	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	2570	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	421000	ug/L	100000	D/T1	3/22/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	720	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.008	ug/L	0.002		4/7/2023	1

LIMS#: 480221

Sample Date: 3/14/23 11:19 AM

Sample Point: SC_12

Sample Point Description: Sand Cayon Well #12

Collection Comments:

Sample Type: GRAB

Sampler Initials: TERRACON

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
+	SM 4500 O G	Dissolved Oxygen	<1.0	mg/L	1.0			1
+	SM 4500 H B	pH	7.3	SU	2.0			1
	SM 4500 F C	Fluoride (Total)	1.84	mg/L	0.10	T	3/17/2023	1
+	SM 2580 B	Oxidation-Reduction Potential	210	mV	0			1
+	SM 2550 B	Temperature Centigrade (Field)	14.1	degrees_C	0.000			1
	SM 2540 C	Total Dissolved Solids	12800	mg/L	10			1
+	SM 2510 B	Conductivity	10700	umhos/cm	1			1
+	SM 2130 B	Turbidity	1.90	NTU	0.05			1
+	NA	Depth to Water	12.01	ft.	0.000			1
	EPA 300.0	Chloride	336	mg/L	5.0	D	3/18/2023	10
		Sulfate	8640	mg/L	250	D	3/18/2023	500
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	4.8	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	23.9	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	4570	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	395000	ug/L	100000	D/T1	3/23/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	500	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.002	ug/L	0.002		4/7/2023	1

LIMS#: 480222
Sample Date: 3/14/23 12:00 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 4500 F C	Fluoride (Total)	1.49	mg/L	0.10	T	3/17/2023	1
	SM 2540 C	Total Dissolved Solids	10600	mg/L	10			1
	EPA 300.0	Chloride	156	mg/L	25	D	3/18/2023	50
		Sulfate	6620	mg/L	500	D	3/18/2023	1000
	EPA 200.8	Antimony (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Arsenic (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Barium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Beryllium (Total Recoverable)	<2.0	ug/L	2.0	D/T	4/13/2023	10
		Cadmium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Chromium (Total Recoverable)	<10.0	ug/L	10.0	D	4/13/2023	10
		Lead (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
		Molybdenum (Total Recoverable)	3.0	ug/L	2.0	D	4/13/2023	10
		Selenium (Total Recoverable)	39.4	ug/L	10.0	D/T1	4/13/2023	10
		Thallium (Total Recoverable)	<5.0	ug/L	5.0	D	4/13/2023	10
	EPA 200.7	Boron (Total Recoverable)	1520	ug/L	20.0		3/22/2023	1
		Calcium (Total Recoverable)	382000	ug/L	100000	D/T1	3/22/2023	1000
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		3/22/2023	1
		Lithium (Total Recoverable)	359	ug/L	30.0		3/22/2023	1
	EPA 1631	Mercury (Total)	0.002	ug/L	0.002		4/7/2023	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.
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

Colorado Springs Utilities

Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Upgradient Wells

Sample Date: 3/13/2023

QC Report Needed

Sampler: DJM/MP

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)	Dissolved Oxygen (mg/L)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	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	7	480211	1010	6.89	11.9	20,885	106.3	0.71	0.79	13.87		x	x	x	x	x	x	x	
FC_1	7	480212	1427	7.07	13.5	14,601	56.7	0.28	0.33	16.71	X	x	x	x	x	x	x	x	
FC_2	7	480213	1511	7.21	12.9	7440	57.9	0.13	5.93	14.46		x	x	x	x	x	x	x	Hg bottle cap broke **
FC_3A	7	480214	1115	7.38	12.5	6,672	140.5	0.22	1.97	19.52		x	x	x	x	x	x	x	
FC_3B	7	480215	1209	7.64	12.6	6,618	-231.0	0.18	2.77	18.72		x	x	x	x	x	x	x	
EQUIP_BLK	7	480216	1645									x	x	x	x	x	x	x	
Total # of Bottles	42											1-500 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: DJM/MP — Date/Time: 3/13/23 @ 1815

Received by: Kelly Nelson Nelson — Date/Time: 3/14/23* @ 0722

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

* Samples left on ice in coolers overnight in locked SK cabinets KAN 3/14/23

** The bottle cap for the Hg sample for well FC-2 broke. Was replaced at the lab when it was received. Sample bottle was propped up ~~and~~ in cooler – appears there was no loss of sample. KAN 3/14/23

Colorado Springs Utilities

Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Downgradient and Cross Gradient Wells

Sample Date: 3/14/2023

QC Report Needed

Sampler: DSM, MP

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)	Dissolved Oxygen (mg/L)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	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	7	480217	0941	7.34	14.0	13,725	33.5	0.11	92.1	15.91		X	X	X	X	X	X	X	
SC_11	7	480220	1036	7.31	14.3	12,727	47.8	0.13	3.41	11.89	✓	X	X	X	X	X	X	X	
SC_12	7	480221	1119	7.32	14.1	10,696	20.2	0.15	1.87	12.01		X	X	X	X	X	X	X	
SC_13	7	480218	1221	7.36	12.5	8,116	99.1	0.17	1.36	12.12		X	X	X	X	X	X	X	
SC_14	7	480219	1340	7.48	12.1	8,044	63.0	0.05	1.36	12.40		X	X	X	X	X	X	X	
FIELD_DUP	7	480222	0000									X	X	X	X	X	X	X	
Total # of Bottles	42											1-500 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: 3/14/23 @ 1515

Received by — Kelly Milton Nelson — 3/14/23 @ 1515

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

Colorado Springs Utilities

It's how we're all connected

Laboratory Services Section
QC Report

CCR Landfill Wells
March 2023

Quality Assurance Approval: Lesley Susic Date: 4/21/23 and 12/13/23

This report is for sample numbers 480211 – 480222.

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 480220 and 480246. 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

The calcium concentrations in samples 480212 and 480220 are disproportionate to the spike level and are outside the established range. Associated data are qualified.

The matrix spike recovery is outside the established range for lithium in sample 480212. The recovery is matrix related, not method related. Associated lithium data are T qualified.

EPA 200.8

The matrix spike recoveries are outside the established range for beryllium in samples 480220 and 480212. The recoveries are matrix related, not method related. Associated beryllium data are qualified.

The selenium concentration is disproportionate to the spike level and it outside the established range for sample 480220. Associated data is qualified.

The matrix spike recovery is outside the established range for barium in sample 480220. The recovery is matrix related, not method related. Associated barium data is qualified.

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 3/17/23
Sampled date: 3/13/23 for samples 480211 - 480216
Sampled date: 3/14/23 for samples 480217 – 480222

Matrix QC performed on samples 480212, 480220, 480246 and 480260

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	99	90 - 110		
Duplicate	Total Dissolved Solids (480212)			7	<10
Duplicate	Total Dissolved Solids (480220)			9	<10
Duplicate	Total Dissolved Solids (480246)			5	<10
Duplicate	Total Dissolved Solids (480260)			5	<10

Method: Fluoride by Standard Methods 4500 F C
Batch Analysis date: 3/17/23
Sampled date: 3/13/23 for samples 480211 - 480216
Sampled date: 3/14/23 for samples 480217 – 480222

Matrix QC performed on samples 480220 and 480246

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Fluoride (Total)	91	90 - 110		
QCS	Fluoride (Total)	94	90 - 110		
MS	Fluoride (Total) (480212)	116	80 - 120		
MSD	Fluoride (Total) (480212)			4	<20
MS	Fluoride (Total) (480220)	***148**	80 - 120		
MSD	Fluoride (Total) (480220)			1	<20
MS	Fluoride (Total) (480246)	***121**	80 - 120		
MSD	Fluoride (Total) (480246)			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: 3/17/23
Sampled date: 3/13/23 for samples 480211 - 480216
Sampled date: 3/14/23 for samples 480217 – 480222

Matrix QC performed on samples 480212 and 480220

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Chloride	113	50-150		
LFB	Chloride	98	90-110	0	<20
LD	Chloride (480212)			4	<20
LD	Chloride (480220)			0	<20
MS	Chloride (480212)	100	80-120		
MS	Chloride (480220)	94	80-120		
MRL	Sulfate	119	50-150		
LFB	Sulfate	93	90-110	0	<20
LD	Sulfate (480212)			5	<20
LD	Sulfate (480220)			0	<20
MS	Sulfate (480212)	102	80-120		
MS	Sulfate (480220)	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: 3/31/23
Sampled date: 3/13/23 for samples 480211 - 480216
Sampled date: 3/14/23 for sample 480217

Matrix QC performed on sample 480212

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Mercury (Total)	100	60-140		
QCS	Mercury (Total)	102	77-123		
MS	Mercury (Total)	103	71-125		
MSD	Mercury (Total)			5	<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: 4/7/23
Sampled date: 3/14/23 for samples 480218 – 480222

Matrix QC performed on sample 480220

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Mercury (Total)	88	60-140		
QCS	Mercury (Total)	88	77-123		
MS	Mercury (Total) (480220)	84	71-125		
MSD	Mercury (Total) (480220)			2	<24

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

Method: EPA 200.7
Batch Analysis date: 3/16/23 for B, Co and Li
Batch Analysis date: 3/17/23 for Ca
Digestion date: 3/15/23
Sampled date: 3/13/23 for samples 480211 - 480216

Matrix QC performed on sample 480212

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	97	50-150		
LFB	Boron (Total Recoverable)	100	85-115		
MS	Boron (Total Recoverable)	110	70-130		
MSD	Boron (Total Recoverable)			2	<20
MRL	Calcium (Total Recoverable)	104	50-150		
LFB	Calcium (Total Recoverable)	99	85-115		
MS	Calcium (Total Recoverable)	***-64**	70-130		
MSD	Calcium (Total Recoverable)			3	<20
MRL	Cobalt (Total Recoverable)	92	50-150		
LFB	Cobalt (Total Recoverable)	97	85-115		
MS	Cobalt (Total Recoverable)	74	70-130		
MSD	Cobalt (Total Recoverable)			1	<20
MRL	Lithium (Total Recoverable)	91	50-150		
LFB	Lithium (Total Recoverable)	114	85-115		
MS	Lithium (Total Recoverable)	***168**	70-130		
MSD	Lithium (Total Recoverable)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<14.3 ug/L	14.3 ug/L
LRB	Calcium (Total Recoverable)	<71.1 ug/L	71.1 ug/L
LRB	Cobalt (Total Recoverable)	<4.25 ug/L	4.25 ug/L
LRB	Lithium (Total Recoverable)	<22.2 ug/L	22.2 ug/L

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 3/22/23 for B, Co and Li
Batch Analysis date: 3/23/23 for Ca
Digestion date: 3/16/23
Sampled date: 3/14/23 for samples 480217 - 480222

Matrix QC performed on sample 480220

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	101	50-150		
LFB	Boron (Total Recoverable)	103	85-115		
MS	Boron (Total Recoverable)	118	70-130		
MSD	Boron (Total Recoverable)			0	<20
MRL	Calcium (Total Recoverable)	97	50-150		
LFB	Calcium (Total Recoverable)	100	85-115		
MS	Calcium (Total Recoverable)	***471**	70-130		
MSD	Calcium (Total Recoverable)			3	<20
MRL	Cobalt (Total Recoverable)	97	50-150		
LFB	Cobalt (Total Recoverable)	99	85-115		
MS	Cobalt (Total Recoverable)	85	70-130		
MSD	Cobalt (Total Recoverable)			0	<20
MRL	Lithium (Total Recoverable)	110	50-150		
LFB	Lithium (Total Recoverable)	91	85-115		
MS	Lithium (Total Recoverable)	129	70-130		
MSD	Lithium (Total Recoverable)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<14.3ug/L	14.3 ug/L
LRB	Calcium (Total Recoverable)	<71.1 ug/L	71.1 ug/L
LRB	Cobalt (Total Recoverable)	<4.25 ug/L	4.25 ug/L
LRB	Lithium (Total Recoverable)	<22.2 ug/L	22.2 ug/L

***See Narrative**

EPA Method: EPA 200.8
Digestion date: 4/10/23
Batch Analysis date: 4/13/23
Sampled date: 3/13/23 for samples 480211 - 480216
Sampled date: 3/14/23 for samples 480217 – 480222

Matrix QC performed on samples 480220 and 480212

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total Recoverable)	103	50-150		
LFB	Antimony (Total Recoverable)	103	85-115		
MS	Antimony (Total Recoverable) (480220)	77	70-130		
MSD	Antimony (Total Recoverable) (480220)			1	<20
MS	Antimony (Total Recoverable) (480212)	70	70-130		
MSD	Antimony (Total Recoverable) (480212)			2	<20

MRL	Arsenic (Total Recoverable)	94	50-150		
LFB	Arsenic (Total Recoverable)	108	85-115		
MS	Arsenic (Total Recoverable) (480220)	82	70-130		
MSD	Arsenic (Total Recoverable) (480220)			0	<20
MS	Arsenic (Total Recoverable) (480212)	82	70-130		
MSD	Arsenic (Total Recoverable) (480212)			5	<20
MRL	Barium (Total Recoverable)	101	50-150		
LFB	Barium (Total Recoverable)	100	85-115		
MS	Barium (Total Recoverable) (480220)	75	70-130		
MSD	Barium (Total Recoverable) (480220)			1	<20
MS	Barium (Total Recoverable) (480212)	***69**	70-130		
MSD	Barium (Total Recoverable) (480212)			2	<20
MRL	Beryllium (Total Recoverable)	102	50-150		
LFB	Beryllium (Total Recoverable)	107	85-115		
MS	Beryllium (Total Recoverable) (480220)	***69**	70-130		
MSD	Beryllium (Total Recoverable) (480220)			6	<20
MS	Beryllium (Total Recoverable) (480212)	***63**	70-130		
MSD	Beryllium (Total Recoverable) (480212)			1	<20
MRL	Cadmium (Total Recoverable)	102	50-150		
LFB	Cadmium (Total Recoverable)	97	85-115		
MS	Cadmium (Total Recoverable) (480220)	77	70-130		
MSD	Cadmium (Total Recoverable) (480220)			2	<20
MS	Cadmium (Total Recoverable) (480212)	70	70-130		
MSD	Cadmium (Total Recoverable) (480212)			2	<20
MRL	Chromium (Total Recoverable)	75	50-150		
LFB	Chromium (Total Recoverable)	101	85-115		
MS	Chromium (Total Recoverable) (480220)	78	70-130		
MSD	Chromium (Total Recoverable) (480220)			16	<20
MS	Chromium (Total Recoverable) (480212)	74	70-130		
MSD	Chromium (Total Recoverable) (480212)			8	<20
MRL	Lead (Total Recoverable)	97	50-150		
LFB	Lead (Total Recoverable)	100	85-115		
MS	Lead (Total Recoverable) (480220)	85	70-130		
MSD	Lead (Total Recoverable) (480220)			4	<20
MS	Lead (Total Recoverable) (480212)	83	70-130		
MSD	Lead (Total Recoverable) (480212)			4	<20
MRL	Molybdenum (Total Recoverable)	100	50-150		
LFB	Molybdenum (Total Recoverable)	95	85-115		
MS	Molybdenum (Total Recoverable) (480220)	81	70-130		
MSD	Molybdenum (Total Recoverable) (480220)			4	<20
MS	Molybdenum (Total Recoverable) (480212)	82	70-130		
MSD	Molybdenum (Total Recoverable) (480212)			3	<20
MRL	Selenium (Total Recoverable)	98	50-150		

LFB	Selenium (Total Recoverable)	108	85-115		
MS	Selenium (Total Recoverable) (480220)	**<u>*50</u>**	70-130		
MSD	Selenium (Total Recoverable) (480220)			2	<20
MS	Selenium (Total Recoverable) (480212)	108	70-130		
MSD	Selenium (Total Recoverable) (480212)			3	<20
MRL	Thallium (Total Recoverable)	90	50-150		
LFB	Thallium (Total Recoverable)	95	85-115		
MS	Thallium (Total Recoverable) (480220)	88	70-130		
MSD	Thallium (Total Recoverable) (480220)			1	<20
MS	Thallium (Total Recoverable) (480212)	78	70-130		
MSD	Thallium (Total Recoverable) (480212)			0	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total Recoverable)	<0.11 ug/L	0.11 ug/L
LRB	Arsenic (Total Recoverable)	<1.0 ug/L	1.0 ug/L
LRB	Barium (Total Recoverable)	<0.25 ug/L	0.25 ug/L
LRB	Beryllium (Total Recoverable)	<0.033 ug/L	0.033 ug/L
LRB	Cadmium (Total Recoverable)	<0.063 ug/L	0.063 ug/L
LRB	Chromium (Total Recoverable)	<1.0 ug/L	1.0 ug/L
LRB	Lead (Total Recoverable)	<0.30 ug/L	0.30 ug/L
LRB	Molybdenum (Total Recoverable)	<0.16 ug/L	0.16 ug/L
LRB	Selenium (Total Recoverable)	<0.37 ug/L	0.37 ug/L
LRB	Thallium (Total Recoverable)	<0.071 ug/L	0.071 ug/L

<u>*See Narrative</u>

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
<u>Underline</u> – Data was outside the limit

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Ms. Wendy Asay
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

Generated 4/17/2023 5:47:27 PM

JOB DESCRIPTION

CCR Landfill and ASD

JOB NUMBER

160-49292-1

Eurofins St. Louis
13715 Rider Trail North
Earth City MO 63045

See page two for job notes and contact information.

Job Notes

The test results in this report meet NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted. Results pertain only to samples listed in this report. Pursuant to NELAP, this report shall not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins TestAmerica and its client. All questions regarding this report should be directed to the Eurofins TestAmerica Project Manager.

Louisiana Lab Certification ID (Non-Potable, Solid/Haz. Material): 106151
Florida Lab Certification ID (Drinking Water): E87689.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

Authorization

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4/17/2023 5:47:27 PM

Authorized for release by
Rhonda Ridenhower, Business Unit Manager
Rhonda.Ridenhower@et.eurofinsus.com
(314)298-8566

Table of Contents

Job ID: 160-49292-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-49292-1

Receipt
The samples were received on 3/16/2023 9:25 AM. 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 0.8º C and 2.4º 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 Prep Batch 604615
Insufficient sample volume was available to perform a sample duplicate for the following samples: 480213 FC_2 (160-49292-3), 480214 FC_3A (160-49292-4), 480215 FC_3B (160-49292-5) and 480216 EQUIP_BLK (160-49292-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Radium 226 Prep Batch 604605
Insufficient sample volume was available to perform a sample duplicate for the following samples: 480213 FC_2 (160-49292-3), 480214 FC_3A (160-49292-4), 480215 FC_3B (160-49292-5) and 480216 EQUIP_BLK (160-49292-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

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 and ASD	☐ 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:
480211 CC_1	3/13/23	10:10	G	GW	2	N		X	X	X	
480212 FC_1	3/13/23	14:27	G	GW	2	N		X	X	X	
480213 FC_2	3/13/23	15:11	G	GW	2	N		X	X	X	
480214 FC_3A	3/13/23	11:15	G	GW	2	N		X	X	X	
480215 FC_3B	3/13/23	12:09	G	GW	2	N		X	X	X	
480216 EQUIP_BLK	3/13/23	16:45	G	GW	2	N		X	X	X	

160-49292 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.:____

	Company	Date/Time		Company	Date/Time
Relinquished by: Kelly Nelson	Colorado Springs Utilities	3/15/23 11:25	Received by: FEDEX		
Relinquished by: FEDEX			Received by: Briana Gonzalez	ETASTL	3/16/23 0925
Relinquished by:			Received in Laboratory by:		

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

4/17/2023

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-49292-1

Login Number: 49292
List Number: 1
Creator: Sharkey-Gonzalez, Briana L

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.	True	
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 and ASD

Job ID: 160-49292-1

Qualifiers

Rad

Qualifier	Qualifier Description
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 and ASD

Job ID: 160-49292-1

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 and ASD

Job ID: 160-49292-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-49292-1	480211 CC_1	Water	03/13/23 10:10	03/16/23 09:25
160-49292-2	480212 FC_1	Water	03/13/23 14:27	03/16/23 09:25
160-49292-3	480213 FC_2	Water	03/13/23 15:11	03/16/23 09:25
160-49292-4	480214 FC_3A	Water	03/13/23 11:15	03/16/23 09:25
160-49292-5	480215 FC_3B	Water	03/13/23 12:09	03/16/23 09:25
160-49292-6	480216 EQUIP_BLK	Water	03/13/23 16:45	03/16/23 09:25

Client Sample ID: 480211 CC_1

Date Collected: 03/13/23 10:10
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49292-1
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	0.319	U	0.235	0.237	1.00	0.345	pCi/L	03/22/23 09:00	04/14/23 10:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*03/22/23 09:00*	*04/14/23 10:07*	*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	**1.11**		0.474	0.485	1.00	0.598	pCi/L	03/22/23 09:43	04/12/23 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*03/22/23 09:43*	*04/12/23 12:23*	*1*
Y Carrier	*89.7*		*30 - 110*	*03/22/23 09:43*	*04/12/23 12:23*	*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	**1.43**		0.529	0.540	5.00	0.598	pCi/L		04/17/23 14:15	1

Client Sample ID: 480212 FC_1

Date Collected: 03/13/23 14:27
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49292-2
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	**0.346**		0.183	0.185	1.00	0.225	pCi/L	03/22/23 09:00	04/14/23 10:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*30 - 110*	*03/22/23 09:00*	*04/14/23 10:07*	*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	**1.94**		0.529	0.558	1.00	0.578	pCi/L	03/22/23 09:43	04/12/23 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*30 - 110*	*03/22/23 09:43*	*04/12/23 12:23*	*1*
Y Carrier	*92.0*		*30 - 110*	*03/22/23 09:43*	*04/12/23 12:23*	*1*

Client Sample ID: 480212 FC_1
Lab Sample ID: 160-49292-2
Date Collected: 03/13/23 14:27
Matrix: Water
Date Received: 03/16/23 09:25

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	2.29		0.560	0.588	5.00	0.578	pCi/L		04/17/23 14:15	1

Client Sample ID: 480213 FC_2
Lab Sample ID: 160-49292-3
Date Collected: 03/13/23 15:11
Matrix: Water
Date Received: 03/16/23 09:25

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	0.247	U	0.271	0.271	1.00	0.439	pCi/L	03/22/23 11:09	04/14/23 10:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.0*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:09*	*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	0.284	U	0.400	0.401	1.00	0.673	pCi/L	03/22/23 11:32	04/13/23 12:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.0*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:05*	*1*
Y Carrier	*90.5*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:05*	*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	0.531	U	0.483	0.484	5.00	0.673	pCi/L		04/17/23 14:15	1

Client Sample ID: 480214 FC_3A
Lab Sample ID: 160-49292-4
Date Collected: 03/13/23 11:15
Matrix: Water
Date Received: 03/16/23 09:25

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	-0.141	U	0.200	0.201	1.00	0.454	pCi/L	03/22/23 11:09	04/14/23 10:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*65.5*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:09*	*1*

Client Sample ID: 480214 FC_3A

Lab Sample ID: 160-49292-4

Date Collected: 03/13/23 11:15

Matrix: Water

Date Received: 03/16/23 09:25

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	0.162	U	0.358	0.358	1.00	0.630	pCi/L	03/22/23 11:32	04/13/23 12:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*65.5*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*1*
Y Carrier	*93.8*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*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	0.0212	U	0.410	0.411	5.00	0.630	pCi/L		04/17/23 14:15	1

Client Sample ID: 480215 FC_3B

Lab Sample ID: 160-49292-5

Date Collected: 03/13/23 12:09

Matrix: Water

Date Received: 03/16/23 09:25

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	0.283	U	0.280	0.282	1.00	0.443	pCi/L	03/22/23 11:09	04/14/23 10:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*52.1*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:11*	*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	0.356	U	0.480	0.481	1.00	0.803	pCi/L	03/22/23 11:32	04/13/23 12:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*52.1*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*1*
Y Carrier	*92.3*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*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	0.639	U	0.556	0.558	5.00	0.803	pCi/L		04/17/23 14:15	1

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49292-1

Client Sample ID: 480216 EQUIP_BLK

Date Collected: 03/13/23 16:45
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49292-6

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	0.0253	U	0.140	0.140	1.00	0.268	pCi/L	03/22/23 11:09	04/14/23 10:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:11*	*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	0.0990	U	0.241	0.241	1.00	0.427	pCi/L	03/22/23 11:32	04/13/23 12:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*1*
Y Carrier	*90.1*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*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	0.124	U	0.279	0.279	5.00	0.427	pCi/L		04/17/23 14:15	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-604593/1-A
Matrix: Water
Analysis Batch: 607421

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604593

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.06431	U	0.0917	0.0919	1.00	0.156	pCi/L	03/22/23 09:00	04/14/23 09:57	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.8*		*30 - 110*	*03/22/23 09:00*	*04/14/23 09:57*	*1*

Lab Sample ID: LCS 160-604593/2-A
Matrix: Water
Analysis Batch: 607421

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604593

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.23		1.17	1.00	0.148	pCi/L	90	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*95.6*		*30 - 110*

Lab Sample ID: MB 160-604605/1-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604605

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1104	U	0.151	0.152	1.00	0.255	pCi/L	03/22/23 11:09	04/14/23 10:08	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.6*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:08*	*1*

Lab Sample ID: LCS 160-604605/2-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604605

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.443		1.16	1.00	0.215	pCi/L	83	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.2*		*30 - 110*

Lab Sample ID: LCSD 160-604605/3-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 604605

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.81		1.29	1.00	0.255	pCi/L	95	75 - 125	0.56	1

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

Lab Sample ID: LCSD 160-604605/3-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 604605

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	97.7		30 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-604595/1-A
Matrix: Water
Analysis Batch: 607020

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604595

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.03867	U	0.250	0.250	1.00	0.482	pCi/L	03/22/23 09:43	04/12/23 12:17	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.8		30 - 110	03/22/23 09:43	04/12/23 12:17	1
Y Carrier	89.0		30 - 110	03/22/23 09:43	04/12/23 12:17	1

Lab Sample ID: LCS 160-604595/2-A
Matrix: Water
Analysis Batch: 607020

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604595

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.04	7.589		1.08	1.00	0.571	pCi/L	94	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	95.6		30 - 110
Y Carrier	92.0		30 - 110

Lab Sample ID: MB 160-604615/1-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604615

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2491	U	0.294	0.295	1.00	0.485	pCi/L	03/22/23 11:32	04/13/23 12:03	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	96.6		30 - 110	03/22/23 11:32	04/13/23 12:03	1
Y Carrier	90.5		30 - 110	03/22/23 11:32	04/13/23 12:03	1

Lab Sample ID: LCS 160-604615/2-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604615

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.04	8.995		1.19	1.00	0.438	pCi/L	112	75 - 125		

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

Lab Sample ID: LCS 160-604615/2-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604615

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	97.2		30 - 110
Y Carrier	91.2		30 - 110

Lab Sample ID: LCSD 160-604615/3-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 604615

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.04	8.425		1.16	1.00	0.516	pCi/L	105	75 - 125	0.24	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	97.7		30 - 110
Y Carrier	88.6		30 - 110

QC Association Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49292-1

Rad

Prep Batch: 604593

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49292-1	480211 CC_1	Total/NA	Water	PrecSep-21	
160-49292-2	480212 FC_1	Total/NA	Water	PrecSep-21	
MB 160-604593/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-604593/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 604595

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49292-1	480211 CC_1	Total/NA	Water	PrecSep_0	
160-49292-2	480212 FC_1	Total/NA	Water	PrecSep_0	
MB 160-604595/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-604595/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Prep Batch: 604605

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49292-3	480213 FC_2	Total/NA	Water	PrecSep-21	
160-49292-4	480214 FC_3A	Total/NA	Water	PrecSep-21	
160-49292-5	480215 FC_3B	Total/NA	Water	PrecSep-21	
160-49292-6	480216 EQUIP_BLK	Total/NA	Water	PrecSep-21	
MB 160-604605/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-604605/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-604605/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 604615

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49292-3	480213 FC_2	Total/NA	Water	PrecSep_0	
160-49292-4	480214 FC_3A	Total/NA	Water	PrecSep_0	
160-49292-5	480215 FC_3B	Total/NA	Water	PrecSep_0	
160-49292-6	480216 EQUIP_BLK	Total/NA	Water	PrecSep_0	
MB 160-604615/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-604615/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-604615/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49292-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (30-110)
160-49292-1	480211 CC_1	88.7
160-49292-2	480212 FC_1	104
160-49292-3	480213 FC_2	67.0
160-49292-4	480214 FC_3A	65.5
160-49292-5	480215 FC_3B	52.1
160-49292-6	480216 EQUIP_BLK	95.6
LCS 160-604593/2-A	Lab Control Sample	95.6
LCS 160-604605/2-A	Lab Control Sample	97.2
LCSD 160-604605/3-A	Lab Control Sample Dup	97.7
MB 160-604593/1-A	Method Blank	94.8
MB 160-604605/1-A	Method Blank	96.6

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (30-110)	Y (30-110)
160-49292-1	480211 CC_1	88.7	89.7
160-49292-2	480212 FC_1	104	92.0
160-49292-3	480213 FC_2	67.0	90.5
160-49292-4	480214 FC_3A	65.5	93.8
160-49292-5	480215 FC_3B	52.1	92.3
160-49292-6	480216 EQUIP_BLK	95.6	90.1
LCS 160-604595/2-A	Lab Control Sample	95.6	92.0
LCS 160-604615/2-A	Lab Control Sample	97.2	91.2
LCSD 160-604615/3-A	Lab Control Sample Dup	97.7	88.6
MB 160-604595/1-A	Method Blank	94.8	89.0
MB 160-604615/1-A	Method Blank	96.6	90.5

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

eurofins | Environment Testing

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

ANALYTICAL REPORT

PREPARED FOR

Attn: Ms. Wendy Asay
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

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JOB DESCRIPTION

CCR Landfill and ASD

JOB NUMBER

160-49293-1

Eurofins St. Louis
13715 Rider Trail North
Earth City MO 63045

See page two for job notes and contact information.

Eurofins St. Louis

Job Notes

The test results in this report meet NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted. Results pertain only to samples listed in this report. Pursuant to NELAP, this report shall not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins TestAmerica and its client. All questions regarding this report should be directed to the Eurofins TestAmerica Project Manager.

Louisiana Lab Certification ID (Non-Potable, Solid/Haz. Material): 106151
Florida Lab Certification ID (Drinking Water): E87689.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

Authorization

Rhonda Ridenhower

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Authorized for release by
Rhonda Ridenhower, Business Unit Manager
Rhonda.Ridenhower@et.eurofinsus.com
(314)298-8566

Table of Contents

Case Narrative

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49293-1

Job ID: 160-49293-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-49293-1

Receipt
The samples were received on 3/16/2023 9:25 AM. 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 0.8º C and 2.4º 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 prep batch 604615
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. 480217 SC_10 (160-49293-1) and 480220 SC_11 (160-49293-4)

The following samples were prepared at a reduced aliquot due to Matrix: 480217 SC_10 (160-49293-1) and 480220 SC_11 (160-49293-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Insufficient sample volume was available to perform a sample duplicate for the following samples: 480218 SC_13 (160-49293-2), 480219 SC_14 (160-49293-3), 480221 SC_12 (160-49293-5) and 480222 FIELD_DUP (160-49293-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Radium 226 Prep Batch 604605
The following samples were prepared at a reduced aliquot due to Matrix: 480217 SC_10 (160-49293-1) and 480220 SC_11 (160-49293-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Insufficient sample volume was available to perform a sample duplicate for the following samples: 480218 SC_13 (160-49293-2), 480219 SC_14 (160-49293-3), 480221 SC_12 (160-49293-5) and 480222 FIELD_DUP (160-49293-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

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: CCR Landfill and ASD	☐ 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:
480217 SC_10	3/14/23	09:41	G	GW	2	N		X	X	X	
480218 SC_13	3/14/23	12:21	G	GW	2	N		X	X	X	
480219 SC_14	3/14/23	13:30	G	GW	2	N		X	X	X	
480220 SC_11	3/14/23	10:36	G	GW	2	N		X	X	X	
480221 SC_12	3/14/23	11:19	G	GW	2	N		X	X	X	
480222 FIELD_DUP	3/14/23	00:00	G	GW	2	N		X	X	X	

160-49293 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:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Kelly Nielsen	Colorado Springs Utilities	3/15/23 11:20	FEDEX		
Relinquished by: FEDEX	Company:	Date/Time:	Received by: Briana Gonzalez	Company: ETASTL	Date/Time: 3/16/23 0985
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

Page 5 of 17

4/17/2023

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-49293-1

Login Number: 49293
List Number: 1
Creator: Sharkey-Gonzalez, Briana L

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.	True	
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 and ASD

Job ID: 160-49293-1

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 and ASD

Job ID: 160-49293-1

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 and ASD

Job ID: 160-49293-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-49293-1	480217 SC_10	Water	03/14/23 09:41	03/16/23 09:25
160-49293-2	480218 SC_13	Water	03/14/23 12:21	03/16/23 09:25
160-49293-3	480219 SC_14	Water	03/14/23 13:30	03/16/23 09:25
160-49293-4	480220 SC_11	Water	03/14/23 10:36	03/16/23 09:25
160-49293-5	480221 SC_12	Water	03/14/23 11:19	03/16/23 09:25
160-49293-6	480222 FIELD_DUP	Water	03/14/23 00:00	03/16/23 09:25

Client Sample ID: 480217 SC_10

Date Collected: 03/14/23 09:41
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49293-1
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	0.166	U	0.453	0.453	1.00	0.828	pCi/L	03/22/23 11:09	04/14/23 10:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*61.1*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:11*	*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	-0.104	U G	0.729	0.729	1.00	1.41	pCi/L	03/22/23 11:32	04/13/23 12:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*61.1*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*1*
Y Carrier	*93.5*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:07*	*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	0.0619	U	0.858	0.858	5.00	1.41	pCi/L		04/17/23 14:15	1

Client Sample ID: 480218 SC_13

Date Collected: 03/14/23 12:21
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49293-2
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	0.0628	U	0.192	0.192	1.00	0.359	pCi/L	03/22/23 11:09	04/14/23 10:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*62.6*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:11*	*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	-0.0621	U	0.397	0.397	1.00	0.762	pCi/L	03/22/23 11:32	04/13/23 12:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*62.6*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*1*
Y Carrier	*86.0*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*1*

Client Sample ID: 480218 SC_13

Lab Sample ID: 160-49293-2
Date Collected: 03/14/23 12:21
Matrix: Water
Date Received: 03/16/23 09:25

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	0.000646	U	0.441	0.441	5.00	0.762	pCi/L		04/17/23 14:15	1

Client Sample ID: 480219 SC_14

Lab Sample ID: 160-49293-3
Date Collected: 03/14/23 13:30
Matrix: Water
Date Received: 03/16/23 09:25

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	-0.0195	U	0.158	0.158	1.00	0.333	pCi/L	03/22/23 11:09	04/14/23 10:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.0*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:12*	*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	0.317	U	0.369	0.370	1.00	0.605	pCi/L	03/22/23 11:32	04/13/23 12:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.0*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*1*
Y Carrier	*90.1*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*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	0.297	U	0.401	0.402	5.00	0.605	pCi/L		04/17/23 14:15	1

Client Sample ID: 480220 SC_11

Lab Sample ID: 160-49293-4
Date Collected: 03/14/23 10:36
Matrix: Water
Date Received: 03/16/23 09:25

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	0.114	U	0.263	0.264	1.00	0.481	pCi/L	03/22/23 11:09	04/14/23 10:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*59.3*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:12*	*1*

Client Sample ID: 480220 SC_11

Lab Sample ID: 160-49293-4

Date Collected: 03/14/23 10:36

Matrix: Water

Date Received: 03/16/23 09:25

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	-0.832	U G	0.472	0.478	1.00	1.11	pCi/L	03/22/23 11:32	04/13/23 12:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*59.3*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*1*
Y Carrier	*91.6*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:10*	*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	-0.718	U	0.540	0.546	5.00	1.11	pCi/L		04/17/23 14:15	1

Client Sample ID: 480221 SC_12

Lab Sample ID: 160-49293-5

Date Collected: 03/14/23 11:19

Matrix: Water

Date Received: 03/16/23 09:25

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	0.0725	U	0.144	0.144	1.00	0.260	pCi/L	03/22/23 11:09	04/14/23 10:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.4*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:12*	*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	0.213	U	0.309	0.309	1.00	0.521	pCi/L	03/22/23 11:32	04/13/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.4*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:13*	*1*
Y Carrier	*96.1*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:13*	*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	0.285	U	0.341	0.341	5.00	0.521	pCi/L		04/17/23 14:15	1

Client Sample ID: 480222 FIELD_DUP

Date Collected: 03/14/23 00:00
Date Received: 03/16/23 09:25

Lab Sample ID: 160-49293-6

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	0.0214	U	0.133	0.133	1.00	0.260	pCi/L	03/22/23 11:09	04/14/23 10:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.0*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:12*	*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	0.0979	U	0.268	0.268	1.00	0.477	pCi/L	03/22/23 11:32	04/13/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.0*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:13*	*1*
Y Carrier	*87.9*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:13*	*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	0.119	U	0.299	0.299	5.00	0.477	pCi/L		04/17/23 14:15	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-604605/1-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604605

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1104	U	0.151	0.152	1.00	0.255	pCi/L	03/22/23 11:09	04/14/23 10:08	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.6*		*30 - 110*	*03/22/23 11:09*	*04/14/23 10:08*	*1*

Lab Sample ID: LCS 160-604605/2-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604605

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.443		1.16	1.00	0.215	pCi/L	83	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.2*		*30 - 110*

Lab Sample ID: LCSD 160-604605/3-A
Matrix: Water
Analysis Batch: 607424

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 604605

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.81		1.29	1.00	0.255	pCi/L	95	75 - 125	0.56	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*97.7*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-604615/1-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 604615

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2491	U	0.294	0.295	1.00	0.485	pCi/L	03/22/23 11:32	04/13/23 12:03	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.6*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:03*	*1*
Y Carrier	*90.5*		*30 - 110*	*03/22/23 11:32*	*04/13/23 12:03*	*1*

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

Lab Sample ID: LCS 160-604615/2-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 604615

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.04	8.995		1.19	1.00	0.438	pCi/L	112	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.2*		*30 - 110*
Y Carrier	*91.2*		*30 - 110*

Lab Sample ID: LCSD 160-604615/3-A
Matrix: Water
Analysis Batch: 607345

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 604615

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.04	8.425		1.16	1.00	0.516	pCi/L	105	75 - 125	0.24	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*97.7*		*30 - 110*
Y Carrier	*88.6*		*30 - 110*

QC Association Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49293-1

Rad

Prep Batch: 604605

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49293-1	480217 SC_10	Total/NA	Water	PrecSep-21	
160-49293-2	480218 SC_13	Total/NA	Water	PrecSep-21	
160-49293-3	480219 SC_14	Total/NA	Water	PrecSep-21	
160-49293-4	480220 SC_11	Total/NA	Water	PrecSep-21	
160-49293-5	480221 SC_12	Total/NA	Water	PrecSep-21	
160-49293-6	480222 FIELD_DUP	Total/NA	Water	PrecSep-21	
MB 160-604605/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-604605/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-604605/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 604615

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-49293-1	480217 SC_10	Total/NA	Water	PrecSep_0	
160-49293-2	480218 SC_13	Total/NA	Water	PrecSep_0	
160-49293-3	480219 SC_14	Total/NA	Water	PrecSep_0	
160-49293-4	480220 SC_11	Total/NA	Water	PrecSep_0	
160-49293-5	480221 SC_12	Total/NA	Water	PrecSep_0	
160-49293-6	480222 FIELD_DUP	Total/NA	Water	PrecSep_0	
MB 160-604615/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-604615/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-604615/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill and ASD

Job ID: 160-49293-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (30-110)
160-49293-1	480217 SC_10	61.1
160-49293-2	480218 SC_13	62.6
160-49293-3	480219 SC_14	67.0
160-49293-4	480220 SC_11	59.3
160-49293-5	480221 SC_12	80.4
160-49293-6	480222 FIELD_DUP	93.0
LCS 160-604605/2-A	Lab Control Sample	97.2
LCSD 160-604605/3-A	Lab Control Sample Dup	97.7
MB 160-604605/1-A	Method Blank	96.6

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (30-110)	Y (30-110)
160-49293-1	480217 SC_10	61.1	93.5
160-49293-2	480218 SC_13	62.6	86.0
160-49293-3	480219 SC_14	67.0	90.1
160-49293-4	480220 SC_11	59.3	91.6
160-49293-5	480221 SC_12	80.4	96.1
160-49293-6	480222 FIELD_DUP	93.0	87.9
LCS 160-604615/2-A	Lab Control Sample	97.2	91.2
LCSD 160-604615/3-A	Lab Control Sample Dup	97.7	88.6
MB 160-604615/1-A	Method Blank	96.6	90.5

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: December 4, 2023

Report generated by: Wendy M. Asay

Revised 12/28/23 to correct the chloride value on sample 488147 after receiving revised report from the external laboratory. Wendy M Asay

Revised 1/17/24 to correct the chloride value on sample 488152 after receiving revised report from the external laboratory and to remove unnecessary qualifiers. 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

488143	25-Sep-2023 13:05	Crooked Canyon Well #1
488144	25-Sep-2023 10:32	Fort Carson Well #1
488145	25-Sep-2023 11:20	Fort Carson Well #2
488146	25-Sep-2023 14:30	Fort Carson Well #3A
488147	25-Sep-2023 15:18	Fort Carson Well #3B
488148	25-Sep-2023 15:45	Equipment Blank
488149	26-Sep-2023 14:14	Sand Canyon Well #10
488150	26-Sep-2023 10:55	Sand Canyon Well #13
488151	26-Sep-2023 10:05	Sand Canyon Well #14
488152	26-Sep-2023 13:10	Sand Canyon Well #11
488153	26-Sep-2023 11:58	Sand Canyon Well #12
488154	26-Sep-2023 00:00	Field Duplicate sample

LIMS #: 488143

Sample Date: 9/25/2023 1:05:38 PM

Sample Point: CC_1

Sample Point Description: Crooked Canyon Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	5.58	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	294	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.1	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.3	degrees C	0.000			1
+	SM_2510_B	Conductivity	29100	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	13.32	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	35300	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.21	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	994	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	392000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	883	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	1500	mg/L	150	H	10/24/2023	1
		Sulfate	29000	mg/L	1000	H/T	10/24/2023	1
+	SM_2130_B	Turbidity	14	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.004	ug/L	0.001		10/18/2023	1

LIMS #: 488144

Sample Date: 9/25/2023 10:32:38 AM

Sample Point: FC_1

Sample Point Description: Fort Carson Well #1

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	9.62	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.2	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	21800	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	16.64	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	21500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.11	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1000	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	381000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	1170	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	690	mg/L	150	H	10/23/2023	1
		Sulfate	12000	mg/L	1000	H	10/24/2023	1
+	SM_2130_B	Turbidity	13	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488145

Sample Date: 9/25/2023 11:20:38 AM

Sample Point: FC_2

Sample Point Description: Fort Carson Well #2

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	7.23	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	41.8	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.3	degrees C	0.000			1
+	SM_2510_B	Conductivity	9790	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	14.31	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	9600	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.48	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	965	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	398000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	297	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	80	mg/L	30	H	10/23/2023	1
		Sulfate	7300	mg/L	250	H	10/23/2023	1
+	SM_2130_B	Turbidity	19	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.003	ug/L	0.001		10/18/2023	1

LIMS #: 488146

Sample Date: 9/25/2023 2:30:38 PM

Sample Point: FC_3A

Sample Point Description: Fort Carson Well #3A

Collection Comments: Perform Matrix QC

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	9.51	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	8.76	ug/L	5.00		10/09/2023	1
		Selenium (Total)	60.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.6	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	9100	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	18.88	ft.	0.000			1
	SM_4500_FC	Fluoride (Total)	0.44	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1040	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	392000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	317	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	120	mg/L	30	H/T	10/23/2023	1
		Sulfate	6600	mg/L	250	H/T/P1	10/23/2023	1
+	SM_2130_B	Turbidity	3.3	NTU	0.05			1
	SM_2540_C	Total Dissolved Solids	9020	mg/L	10			1
*	EPA_1631	Mercury (Total)	0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488147

Sample Date: 9/25/2023 3:18:38 PM

Sample Point: FC_3B

Sample Point Description: Fort Carson Well #3B

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	10.3	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	28.1	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.3	degrees C	0.000			1
+	SM_2510_B	Conductivity	8850	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	18.10	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	7440	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.54	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1250	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	217000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	283	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	220	mg/L	150	H	10/24/2023	1
		Sulfate	4100	mg/L	250	H	10/24/2023	1
+	SM_2130_B	Turbidity	14	NTU	0.05			1
*	EPA_1631	Mercury (Total)	<0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488148

Sample Date: 9/25/2023 3:45:38 PM

Sample Point: EQUIP_BLK

Sample Point Description: Equipment Blank

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
	SM_2540_C	Total Dissolved Solids	<10	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	<0.10	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	<20.0	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	<100	ug/L	100	T1	10/03/2023	1
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	<30.0	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	<3.0	mg/L	3.0	H	10/23/2023	1
		Sulfate	<5.0	mg/L	5.0	H	10/23/2023	1
*	EPA_1631	Mercury (Total)	<0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488149

Sample Date: 9/26/2023 2:14:40 PM

Sample Point: SC_10

Sample Point Description: Sand Canyon Well #10

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	30.5	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	3.48	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	292	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	14.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	17800	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	13.91	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	17300	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.50	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1220	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	406000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	838	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	790	mg/L	150		10/23/2023	1
		Sulfate	8600	mg/L	500	H	10/24/2023	1
+	SM_2130_B	Turbidity	77	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.010	ug/L	0.001		10/18/2023	1

LIMS #: 488150

Sample Date: 9/26/2023 10:55:40 AM

Sample Point: SC_13

Sample Point Description: Sand Canyon Well #13

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	5.27	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	39.2	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	13.1	degrees C	0.000			1
+	SM_2510_B	Conductivity	10800	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	12.02	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	10500	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.73	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1510	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	384000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	353	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	120	mg/L	30		10/23/2023	1
		Sulfate	7600	mg/L	250		10/23/2023	1
+	SM_2130_B	Turbidity	2.5	NTU	0.05			1
*	EPA_1631	Mercury (Total)	<0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488151

Sample Date: 9/26/2023 10:05:40 AM

Sample Point: SC_14

Sample Point Description: Sand Canyon Well #14

Collection Comments: Perform Matrix QC

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	5.75	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	10.2	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	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	10800	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	12.30	ft.	0.000			1
	SM_4500_FC	Fluoride (Total)	0.70	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	1450	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	379000	ug/L	1000	D	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	345	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	120	mg/L	30		10/23/2023	1
		Sulfate	7600	mg/L	250		10/23/2023	1
+	SM_2130_B	Turbidity	2.8	NTU	0.05			1
	SM_2540_C	Total Dissolved Solids	11200	mg/L	10			1
*	EPA_1631	Mercury (Total)	<0.001	ug/L	0.001		10/18/2023	1

LIMS #: 488152

Sample Date: 9/26/2023 1:10:40 PM

Sample Point: SC_11

Sample Point Description: Sand Canyon Well #11

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	19.8	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	2.08	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	381	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.3	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	15.0	degrees C	0.000			1
+	SM_2510_B	Conductivity	16500	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	10.98	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	15400	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.56	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	2590	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	457000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	683	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	1100	mg/L	60		10/24/2023	20
		Sulfate	8600	mg/L	250	H	10/26/2023	50
+	SM_2130_B	Turbidity	43	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.010	ug/L	0.001		10/18/2023	1

LIMS #: 488153

Sample Date: 9/26/2023 11:58:40 AM

Sample Point: SC_12

Sample Point Description: Sand Canyon Well #12

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	6.67	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	3.95	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
+	SM_4500HB	pH	7.4	SU	2.0			1
+	SM_2550_B	Temperature Centigrade (Field)	15.9	degrees C	0.000			1
+	SM_2510_B	Conductivity	13300	umhos/cm	1			1
+	SM_4500_OG	Dissolved Oxygen	<1.0	mg/L	1.0			1
	NA	Depth to Water	11.57	ft.	0.000			1
	SM_2540_C	Total Dissolved Solids	13100	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.91	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	4480	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	388000	ug/L	1000	D/T1	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	470	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	250	mg/L	30		10/23/2023	1
		Sulfate	6100	mg/L	500	H	10/24/2023	1
+	SM_2130_B	Turbidity	5.7	NTU	0.05			1
*	EPA_1631	Mercury (Total)	0.002	ug/L	0.001		10/18/2023	1

LIMS #: 488154

Sample Date: 9/26/2023 12:00:40 AM

Sample Point: FIELD_DUP

Sample Point Description: Field Duplicate sample

Collection Comments:

Sample Type: GRAB

Sampler Initials: AKH

Flag	Method	Analyte	Result	Units	RL	Data Qualifiers	Analyzed On	Dilution Factor
	EPA_200_7	Antimony (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Arsenic (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Barium (Total)	6.37	ug/L	2.00		10/09/2023	1
		Beryllium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Cadmium (Total)	<1.00	ug/L	1.00		10/09/2023	1
		Chromium (Total)	<2.00	ug/L	2.00		10/09/2023	1
		Lead (Total)	<10.0	ug/L	10.0		10/09/2023	1
		Molybdenum (Total)	<5.00	ug/L	5.00		10/09/2023	1
		Selenium (Total)	<15.0	ug/L	15.0		10/09/2023	1
		Thallium (Total)	<10.0	ug/L	10.0		10/09/2023	1
	SM_2540_C	Total Dissolved Solids	12900	mg/L	10			1
	SM_4500_FC	Fluoride (Total)	0.91	mg/L	0.10	T	10/18/2023	1
	EPA_200_7	Boron (Total Recoverable)	4560	ug/L	20.0		10/03/2023	1
		Calcium (Total Recoverable)	383000	ug/L	1000	D	10/03/2023	10
		Cobalt (Total Recoverable)	<5.00	ug/L	5.00		10/03/2023	1
		Lithium (Total Recoverable)	476	ug/L	30.0		10/03/2023	1
*	EPA_300_0	Chloride	1500	mg/L	30		10/24/2023	1
		Sulfate	7000	mg/L	500	H	10/24/2023	1
*	EPA_1631	Mercury (Total)	0.002	ug/L	0.001		10/18/2023	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.
H - Method required holding time for analyte exceeded.
P1 - The precision for the MS/MSD exceeds the laboratory or method control limit.
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: 9/25/2023

QC Report Needed

Sampler: A. Holmberg

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)	Dissolved Oxygen (mg/L)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	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	7	488143	13:05	7.06	13.3	29,114	-	0.29	14.24	13.32		x	x	x	x	x	x	x	
FC_1	7	488144	10:32	7.22	13.9	21,804	—	0.20	12.72	16.64		x	x	x	x	x	x	x	
FC_2	7	488145	11:20	7.41	13.3	9,792	-	0.15	18.73	14.31		x	x	x	x	x	x	x	
FC_3A	7	488146	14:30	7.56	13.9	9,105	-	0.25	3.28	18.88	X	x	x	x	x	x	x	x	
FC_3B	7	488147	15:18	7.42	14.3	8851	-	0.07	14.29	18.10		x	x	x	x	x	x	x	
EQUIP_BLK	7	488148	15:45									x	x	x	x	x	x	x	
Total # of Bottles	42											1-500 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: Amber Davis / Holmberg — 9-25-23 — Date/Time @ 16:50

Received by: Kelly Nelson Nelson — 9/26/23 — @ 0709 *

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

*Samples left in SR walk-in cooler overnight
KAN 9/26/23

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Colorado Springs Utilities
Laboratory Services
Grab Samples

CCR Landfill Groundwater Assessment Downgradient and Cross Gradient Wells

Sample Date: 9/26/2023

QC Report Needed

Sampler: A. Holmberg

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)	Dissolved Oxygen (mg/L)	Turbidity, Field (NTU), SM 2130 B	Depth to Water (feet)	Check which sample should have MS/MSD performed on it	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								1-500 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	
SC_10	7	488149	14:14	7.39	14.9	17,782	–	0.06	76.63	13.91		X	X	X	X	X	X	X	Turbid
SC_11	7	~~488150~~ 488152	13:10	7.33	15.0	16,478	–	0.05	42.83	10.98		X	X	X	X	X	X	X	
SC_12	7	~~488151~~ 488153	11:58	7.39	15.9	13,333	–	0.12	5.70	11.57		X	X	X	X	X	X	X	
SC_13	7	~~488152~~ 488150	10:55	7.41	13.1	10,774	–	0.09	2.52	12.02		X	X	X	X	X	X	X	
SC_14	7	~~488153~~ 488151	10:05	7.42	12.1	10,766	–	0.11	2.82	12.30	X	X	X	X	X	X	X	X	
FIELD_DUP	7	488154	00:00									X	X	X	X	X	X	X	
Total # of Bottles	42	KAN 9/27/23																	

Relinquished by — Signature/Print last name: ~~Samuel K Hunz~~ Holmberg — Date/Time: 9-26-23 @ 16:10

Received by — Signature/Print last name: ~~Kelly Nelson~~ Nelson — Date/Time: ~~9/26/23~~ KAN 9/27/23 ~~9/27/23~~ 9/27/23 @ 0706 *

Additional Comments / Sample Rejections/ Actions

Workflow: CCR_LANDFILL
Project ID: CCR_LAND
Test Schedule: CCR_LAND

Samples are NOT filtered in the field.

* Samples left in SR walk-in overnight KAN 9/27/23

Colorado Springs Utilities

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Laboratory Services Section
QC Report

CCR Landfill Wells
September 2023

Quality Assurance Approval: Lesley Susic Date: 12/4/2023

Revised 1/22/24 to correct typos. WMA

This report is for sample numbers 488143 – 488154.

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. The recovery is matrix related, not method related. Associated data are T qualified.

EPA 200.7

The calcium concentrations in sample 488146 is disproportionate to the spike level and is outside the established range. Associated data are T1 qualified.

EPA 200.7

There are no anomalies to report for this analysis.

Method: Total Dissolved Solids by Standard Methods 2540 C
Batch Analysis date: 9/28/23
Sampled date: 9/25/23 for samples 488143 - 488148
Sampled date: 9/26/23 for samples 488149 – 488154

Matrix QC performed on samples 488146, 488151 and 488191

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
QCS	Total Dissolved Solids	102	90 - 118		
Duplicate	Total Dissolved Solids (488146)			5	<10
Duplicate	Total Dissolved Solids (488151)			2	<10
Duplicate	Total Dissolved Solids (488191)			1	<10

Method: Fluoride by Standard Methods 4500 F C
Batch Analysis date: 10/18/23
Sampled date: 9/25/23 for samples 488143 - 488148
Sampled date: 9/26/23 for samples 488149 – 488154

Matrix QC performed on samples 488146, 488151 and 488191

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Fluoride (Total)	102	90 - 110		
QCS	Fluoride (Total)	96	90 - 110		
MS	Fluoride (Total) (488146)	***74**	80 - 120		
MSD	Fluoride (Total) (488146)			1	<20
MS	Fluoride (Total) (488151)	***70**	80 - 120		
MSD	Fluoride (Total) (488151)			1	<20
MS	Fluoride (Total) (488191)	***67**	80 - 120		
MSD	Fluoride (Total) (488191)			1	<20

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

***See Narrative**

Method: EPA 200.7
Batch Analysis date: 10/3/23
Digestion date: 9/29/23
Sampled date: 9/25/23 for samples 488143 - 488148
Sampled date: 9/26/23 for samples 488149 - 488154

Matrix QC performed on samples 488146 and 488151

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Boron (Total Recoverable)	104	50-150		
LFB	Boron (Total Recoverable)	102	85-115		
MS	Boron (Total Recoverable) (488146)	107	70-130		
MSD	Boron (Total Recoverable) (488146)			1	<20
MS	Boron (Total Recoverable) (488151)	100	70-130		
MSD	Boron (Total Recoverable) (488151)			0	<20
MRL	Calcium (Total Recoverable)	102	50-150		
LFB	Calcium (Total Recoverable)	102	85-115		
MS	Calcium (Total Recoverable) (488146)	***224**	70-130		
MSD	Calcium (Total Recoverable) (488146)			0	<20
MS	Calcium (Total Recoverable) (488151)	86	70-130		
MSD	Calcium (Total Recoverable) (488151)			2	<20
MRL	Cobalt (Total Recoverable)	101	50-150		
LFB	Cobalt (Total Recoverable)	102	85-115		
MS	Cobalt (Total Recoverable) (488146)	92	70-130		
MSD	Cobalt (Total Recoverable) (488146)			1	<20
MS	Cobalt (Total Recoverable) (488151)	89	70-130		
MSD	Cobalt (Total Recoverable) (488151)			1	<20
MRL	Lithium (Total Recoverable)	98	50-150		
LFB	Lithium (Total Recoverable)	103	85-115		
MS	Lithium (Total Recoverable) (488146)	125	70-130		
MSD	Lithium (Total Recoverable) (488146)			0	<20
MS	Lithium (Total Recoverable) (488151)	123	70-130		
MSD	Lithium (Total Recoverable) (488151)			0	<20

QC Type	Analyte	Concentration	Limit
LRB	Boron (Total Recoverable)	<14.3 ug/L	14.3 ug/L
LRB	Calcium (Total Recoverable)	<71.1 ug/L	71.1 ug/L
LRB	Cobalt (Total Recoverable)	<4.25 ug/L	4.25 ug/L
LRB	Lithium (Total Recoverable)	<22.2 ug/L	22.2 ug/L

***See Narrative**

EPA Method: EPA 200.7
Digestion dates: 9/29/23 and 10/2/23
Batch Analysis date: 10/9/23
Sampled date: 9/25/23 for samples 488143 -488146

Matrix QC performed on samples 488146

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total)	122	50-150		
LFB	Antimony (Total)	105	85-115		
MS	Antimony (Total)	115	70-130		
MSD	Antimony (Total)			2	<20
MRL	Arsenic (Total)	141	50-150		
LFB	Arsenic (Total)	109	85-115		
MS	Arsenic (Total)	118	70-130		
MSD	Arsenic (Total)			1	<20
MRL	Barium (Total)	105	50-150		
LFB	Barium (Total)	102	85-115		
MS	Barium (Total)	109	70-130		
MSD	Barium (Total)			1	<20
MRL	Beryllium (Total)	104	50-150		
LFB	Beryllium (Total)	103	85-115		
MS	Beryllium (Total)	101	70-130		
MSD	Beryllium (Total)			1	<20
MRL	Cadmium (Total)	104	50-150		
LFB	Cadmium (Total)	104	85-115		
MS	Cadmium (Total)	93	70-130		
MSD	Cadmium (Total)			1	<20
MRL	Chromium (Total)	118	50-150		
LFB	Chromium (Total)	106	85-115		
MS	Chromium (Total)	104	70-130		
MSD	Chromium (Total)			1	<20
MRL	Lead (Total)	107	50-150		
LFB	Lead (Total)	104	85-115		
MS	Lead (Total)	96	70-130		
MSD	Lead (Total)			1	<20
MRL	Molybdenum (Total)	106	50-150		
LFB	Molybdenum (Total)	106	85-115		
MS	Molybdenum (Total)	106	70-130		
MSD	Molybdenum (Total)			2	<20
MRL	Selenium (Total)	106	50-150		
LFB	Selenium (Total)	105	85-115		
MS	Selenium (Total)	124	70-130		
MSD	Selenium (Total)			1	<20
MRL	Thallium (Total)	104	50-150		
LFB	Thallium (Total)	104	85-115		
MS	Thallium (Total)	86	70-130		
MSD	Thallium (Total)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total)	<11.6 ug/L	11.6 ug/L
LRB	Arsenic (Total)	<7.61 ug/L	7.61 ug/L
LRB	Barium (Total)	<0.378 ug/L	0.378 ug/L

LRB	Beryllium (Total)	<0.660 ug/L	0.660 ug/L
LRB	Cadmium (Total)	<0.81 ug/L	0.81 ug/L
LRB	Chromium (Total)	<1.98 ug/L	1.98 ug/L
LRB	Lead (Total)	<6.47 ug/L	6.47 ug/L
LRB	Molybdenum (Total)	<2.01 ug/L	2.01 ug/L
LRB	Selenium (Total)	<13.5 ug/L	13.5 ug/L
LRB	Thallium (Total)	<4.95 ug/L	4.95 ug/L

EPA Method: EPA 200.7
Digestion dates: 9/29/23 and 10/2/23
Batch Analysis date: 10/9/23
Sampled date: 9/25/23 for samples 488147
Sampled date: 9/26/23 for samples 488149 - 488154

Matrix QC performed on samples 488151

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total)	122	50-150		
LFB	Antimony (Total)	104	85-115		
MS	Antimony (Total)	110	70-130		
MSD	Antimony (Total)			1	<20
MRL	Arsenic (Total)	141	50-150		
LFB	Arsenic (Total)	107	85-115		
MS	Arsenic (Total)	113	70-130		
MSD	Arsenic (Total)			1	<20
MRL	Barium (Total)	105	50-150		
LFB	Barium (Total)	101	85-115		
MS	Barium (Total)	103	70-130		
MSD	Barium (Total)			1	<20
MRL	Beryllium (Total)	104	50-150		
LFB	Beryllium (Total)	102	85-115		
MS	Beryllium (Total)	94	70-130		
MSD	Beryllium (Total)			1	<20
MRL	Cadmium (Total)	104	50-150		
LFB	Cadmium (Total)	103	85-115		
MS	Cadmium (Total)	86	70-130		
MSD	Cadmium (Total)			1	<20
MRL	Chromium (Total)	118	50-150		
LFB	Chromium (Total)	104	85-115		
MS	Chromium (Total)	100	70-130		
MSD	Chromium (Total)			2	<20
MRL	Lead (Total)	107	50-150		
LFB	Lead (Total)	102	85-115		
MS	Lead (Total)	89	70-130		
MSD	Lead (Total)			1	<20
MRL	Molybdenum (Total)	106	50-150		
LFB	Molybdenum (Total)	105	85-115		
MS	Molybdenum (Total)	100	70-130		
MSD	Molybdenum (Total)			1	<20

MRL	Selenium (Total)	106	50-150		
LFB	Selenium (Total)	104	85-115		
MS	Selenium (Total)	122	70-130		
MSD	Selenium (Total)			1	<20
MRL	Thallium (Total)	104	50-150		
LFB	Thallium (Total)	103	85-115		
MS	Thallium (Total)	81	70-130		
MSD	Thallium (Total)			1	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total)	<11.6 ug/L	11.6 ug/L
LRB	Arsenic (Total)	<7.61 ug/L	7.61 ug/L
LRB	Barium (Total)	<0.378 ug/L	0.378 ug/L
LRB	Beryllium (Total)	<0.660 ug/L	0.660 ug/L
LRB	Cadmium (Total)	<0.81 ug/L	0.81 ug/L
LRB	Chromium (Total)	<1.98 ug/L	1.98 ug/L
LRB	Lead (Total)	<6.47 ug/L	6.47 ug/L
LRB	Molybdenum (Total)	<2.01 ug/L	2.01 ug/L
LRB	Selenium (Total)	<13.5 ug/L	13.5 ug/L
LRB	Thallium (Total)	<4.95 ug/L	4.95 ug/L

EPA Method: EPA 200.7
Digestion dates: 9/29/23 and 10/2/23
Batch Analysis date: 10/9/23
Sampled date: 9/25/23 for samples 488148

Matrix QC performed on samples 488191

QC Type	Analyte	Recovery (%)	Acceptable Range (%)	RPD (%)	RPD Limit (%)
MRL	Antimony (Total)	122	50-150		
LFB	Antimony (Total)	104	85-115		
MS	Antimony (Total)	114	70-130		
MSD	Antimony (Total)			1	<20
MRL	Arsenic (Total)	141	50-150		
LFB	Arsenic (Total)	107	85-115		
MS	Arsenic (Total)	115	70-130		
MSD	Arsenic (Total)			1	<20
MRL	Barium (Total)	105	50-150		
LFB	Barium (Total)	101	85-115		
MS	Barium (Total)	108	70-130		
MSD	Barium (Total)			1	<20
MRL	Beryllium (Total)	104	50-150		
LFB	Beryllium (Total)	102	85-115		
MS	Beryllium (Total)	97	70-130		
MSD	Beryllium (Total)			2	<20
MRL	Cadmium (Total)	104	50-150		
LFB	Cadmium (Total)	103	85-115		
MS	Cadmium (Total)	87	70-130		
MSD	Cadmium (Total)			2	<20

MRL	Chromium (Total)	118	50-150		
LFB	Chromium (Total)	104	85-115		
MS	Chromium (Total)	100	70-130		
MSD	Chromium (Total)			2	<20
MRL	Lead (Total)	107	50-150		
LFB	Lead (Total)	102	85-115		
MS	Lead (Total)	91	70-130		
MSD	Lead (Total)			2	<20
MRL	Molybdenum (Total)	106	50-150		
LFB	Molybdenum (Total)	105	85-115		
MS	Molybdenum (Total)	104	70-130		
MSD	Molybdenum (Total)			2	<20
MRL	Selenium (Total)	106	50-150		
LFB	Selenium (Total)	104	85-115		
MS	Selenium (Total)	115	70-130		
MSD	Selenium (Total)			1	<20
MRL	Thallium (Total)	104	50-150		
LFB	Thallium (Total)	103	85-115		
MS	Thallium (Total)	82	70-130		
MSD	Thallium (Total)			2	<20

QC Type	Analyte	Concentration	Limit
LRB	Antimony (Total)	<11.6 ug/L	11.6 ug/L
LRB	Arsenic (Total)	<7.61 ug/L	7.61 ug/L
LRB	Barium (Total)	<0.378 ug/L	0.378 ug/L
LRB	Beryllium (Total)	<0.660 ug/L	0.660 ug/L
LRB	Cadmium (Total)	<0.81 ug/L	0.81 ug/L
LRB	Chromium (Total)	<1.98 ug/L	1.98 ug/L
LRB	Lead (Total)	<6.47 ug/L	6.47 ug/L
LRB	Molybdenum (Total)	<2.01 ug/L	2.01 ug/L
LRB	Selenium (Total)	<13.5 ug/L	13.5 ug/L
LRB	Thallium (Total)	<4.95 ug/L	4.95 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

ANALYTICAL REPORT

PREPARED FOR

Attn: Ms. Wendy Asay
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

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JOB DESCRIPTION

CCR LANDFILL

JOB NUMBER

160-51679-1

Eurofins St. Louis
13715 Rider Trail North
Earth City MO 63045

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

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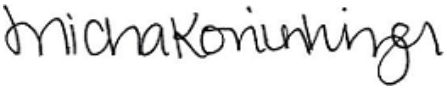

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Authorized for release by
Micha Korrinhizer, Project Manager
Micha.Korrinhizer@et.eurofinsus.com
Designee for
Rhonda Ridenhower, Business Unit Manager
Rhonda.Ridenhower@et.eurofinsus.com
(314)298-8566

Table of Contents

Job ID: 160-51679-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-51679-1

Receipt
The samples were received on 10/2/2023 9:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved. The temperature of the cooler at receipt time was 21.6°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.

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

Gas Flow Proportional Counter
Radium-228
The detection goal was not met for the following sample in batch 160-630679: 488149 SC_10 (160-51679-7). The sample was prepped at a reduced volume due to the presence of matrix interferences. Analytical results are reported with the detection limit achieved.

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:
488143 CC_1	9/25/23	13:05	G	GW	2	N		X	X	X	
488144 FC_1	9/25/23	10:32	G	GW	2	N		X	X	X	
488145 FC_2	9/25/23	11:20	G	GW	2	N		X	X	X	
488146 FC_3A	9/25/23	14:30	G	GW	2	N		X	X	X	
488147 FC_3B	9/25/23	15:18	G	GW	2	N		X	X	X	
488148 EQUIP_BLK	9/25/23	15:45	G	GW	2	N		X	X	X	
488149 SC_10	9/26/23	14:14	G	GW	2	N		X	X	X	
488150 SC_13	9/26/23	10:55	G	GW	2	N		X	X	X	

160-51679 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 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	Company: Colorado Springs Utilities	Date/Time: 9/26/23 11:55	Received by: Fed Ex	Company:	Date/Time:
Relinquished by: Fed EX	Company:	Date/Time:	Received by: Jayna Arnalt	Company: ETAST	Date/Time: 10/2/23 0900
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

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-51679-1

Login Number: 51679
List Number: 1
Creator: Awalt, Jayna K

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").	N/A	
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: 160-51679-1

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: 160-51679-1

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: 160-51679-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-51679-1	488143 CC_1	Water	09/25/23 13:05	10/02/23 09:00
160-51679-2	488144 FC_1	Water	09/25/23 10:32	10/02/23 09:00
160-51679-3	488145 FC_2	Water	09/25/23 11:20	10/02/23 09:00
160-51679-4	488146 FC_3A	Water	09/25/23 14:30	10/02/23 09:00
160-51679-5	488147 FC_3B	Water	09/25/23 15:18	10/02/23 09:00
160-51679-6	488148 EQUIP_BLK	Water	09/25/23 15:45	10/02/23 09:00
160-51679-7	488149 SC_10	Water	09/26/23 14:14	10/02/23 09:00
160-51679-8	488150 SC_13	Water	09/26/23 10:55	10/02/23 09:00

Client Sample ID: 488143 CC_1

Date Collected: 09/25/23 13:05
Date Received: 10/02/23 09:00

Lab Sample ID: 160-51679-1

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	0.277	U	0.196	0.197	1.00	0.281	pCi/L	10/04/23 11:33	10/26/23 07:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.9*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:37*	*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	**2.68**		0.665	0.709	1.00	0.718	pCi/L	10/04/23 11:37	10/24/23 11:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.9*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*
Y Carrier	*84.9*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*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**		0.693	0.736	5.00	0.718	pCi/L		10/27/23 16:21	1

Client Sample ID: 488144 FC_1

Date Collected: 09/25/23 10:32
Date Received: 10/02/23 09:00

Lab Sample ID: 160-51679-2

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	**0.527**		0.235	0.240	1.00	0.285	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.0*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*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	**1.95**		0.529	0.558	1.00	0.536	pCi/L	10/04/23 11:37	10/24/23 11:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.0*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*
Y Carrier	*86.7*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*

Client Sample ID: 488144 FC_1

Lab Sample ID: 160-51679-2
Date Collected: 09/25/23 10:32
Matrix: Water
Date Received: 10/02/23 09:00

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	2.48		0.579	0.607	5.00	0.536	pCi/L		10/27/23 16:21	1

Client Sample ID: 488145 FC_2

Lab Sample ID: 160-51679-3
Date Collected: 09/25/23 11:20
Matrix: Water
Date Received: 10/02/23 09:00

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	0.120	U	0.136	0.136	1.00	0.221	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*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	0.496	U	0.352	0.355	1.00	0.531	pCi/L	10/04/23 11:37	10/24/23 11:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*
Y Carrier	*80.0*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*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	0.615		0.377	0.380	5.00	0.531	pCi/L		10/27/23 16:21	1

Client Sample ID: 488146 FC_3A

Lab Sample ID: 160-51679-4
Date Collected: 09/25/23 14:30
Matrix: Water
Date Received: 10/02/23 09:00

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	0.0528	U	0.107	0.107	1.00	0.192	pCi/L	10/04/23 11:33	10/26/23 07:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:39*	*1*

Client Sample ID: 488146 FC_3A

Lab Sample ID: 160-51679-4

Date Collected: 09/25/23 14:30

Matrix: Water

Date Received: 10/02/23 09:00

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	0.601		0.359	0.363	1.00	0.522	pCi/L	10/04/23 11:37	10/24/23 11:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*1*
Y Carrier	*81.5*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*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	0.654		0.375	0.378	5.00	0.522	pCi/L		10/27/23 16:21	1

Client Sample ID: 488147 FC_3B

Lab Sample ID: 160-51679-5

Date Collected: 09/25/23 15:18

Matrix: Water

Date Received: 10/02/23 09:00

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	0.0825	U	0.115	0.116	1.00	0.195	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*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	0.824		0.355	0.363	1.00	0.464	pCi/L	10/04/23 11:37	10/24/23 11:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*1*
Y Carrier	*81.9*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*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	0.906		0.373	0.381	5.00	0.464	pCi/L		10/27/23 16:21	1

Client Sample ID: 488148 EQUIP_BLK

Lab Sample ID: 160-51679-6

Date Collected: 09/25/23 15:45

Matrix: Water

Date Received: 10/02/23 09:00

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	0.0261	U	0.118	0.118	1.00	0.225	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*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	0.392	U	0.403	0.404	1.00	0.653	pCi/L	10/04/23 11:37	10/24/23 11:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*1*
Y Carrier	*83.4*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:17*	*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	0.418	U	0.420	0.421	5.00	0.653	pCi/L		10/27/23 16:21	1

Client Sample ID: 488149 SC_10

Lab Sample ID: 160-51679-7

Date Collected: 09/26/23 14:14

Matrix: Water

Date Received: 10/02/23 09:00

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	-0.0784	U	0.220	0.220	1.00	0.492	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.0*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*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	0.863	U G	0.972	0.975	1.00	1.59	pCi/L	10/04/23 11:37	10/24/23 11:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.0*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:18*	*1*
Y Carrier	*83.0*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:18*	*1*

Client Sample ID: 488149 SC_10

Lab Sample ID: 160-51679-7

Date Collected: 09/26/23 14:14

Matrix: Water

Date Received: 10/02/23 09:00

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	0.784	U	0.997	1.00	5.00	1.59	pCi/L		10/27/23 16:21	1

Client Sample ID: 488150 SC_13

Lab Sample ID: 160-51679-8

Date Collected: 09/26/23 10:55

Matrix: Water

Date Received: 10/02/23 09:00

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	0.0906	U	0.118	0.118	1.00	0.196	pCi/L	10/04/23 11:33	10/26/23 07:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.8*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:39*	*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	**0.710**		0.357	0.363	1.00	0.489	pCi/L	10/04/23 11:37	10/24/23 11:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.8*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:18*	*1*
Y Carrier	*86.4*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:18*	*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	**0.801**		0.376	0.382	5.00	0.489	pCi/L		10/27/23 16:21	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-630678/1-A
Matrix: Water
Analysis Batch: 633700

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 630678

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.04924	U	0.117	0.117	1.00	0.261	pCi/L	10/04/23 11:33	10/26/23 07:38	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.5*		*30 - 110*	*10/04/23 11:33*	*10/26/23 07:38*	*1*

Lab Sample ID: LCS 160-630678/2-A
Matrix: Water
Analysis Batch: 633700

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 630678

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.71		1.25	1.00	0.264	pCi/L	95	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*88.5*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-630679/1-A
Matrix: Water
Analysis Batch: 633137

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 630679

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3615	U	0.366	0.368	1.00	0.589	pCi/L	10/04/23 11:37	10/24/23 11:16	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.5*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*
Y Carrier	*81.1*		*30 - 110*	*10/04/23 11:37*	*10/24/23 11:16*	*1*

Lab Sample ID: LCS 160-630679/2-A
Matrix: Water
Analysis Batch: 633137

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 630679

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			7.77	8.507		1.19	1.00	0.486	pCi/L	109	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*88.5*		*30 - 110*
Y Carrier	*84.9*		*30 - 110*

QC Association Summary

Client: Colorado Springs Utilities
Project/Site: CCR LANDFILL

Job ID: 160-51679-1

Rad

Prep Batch: 630678

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-51679-1	488143 CC_1	Total/NA	Water	PrecSep-21	
160-51679-2	488144 FC_1	Total/NA	Water	PrecSep-21	
160-51679-3	488145 FC_2	Total/NA	Water	PrecSep-21	
160-51679-4	488146 FC_3A	Total/NA	Water	PrecSep-21	
160-51679-5	488147 FC_3B	Total/NA	Water	PrecSep-21	
160-51679-6	488148 EQUIP_BLK	Total/NA	Water	PrecSep-21	
160-51679-7	488149 SC_10	Total/NA	Water	PrecSep-21	
160-51679-8	488150 SC_13	Total/NA	Water	PrecSep-21	
MB 160-630678/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-630678/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 630679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-51679-1	488143 CC_1	Total/NA	Water	PrecSep_0	
160-51679-2	488144 FC_1	Total/NA	Water	PrecSep_0	
160-51679-3	488145 FC_2	Total/NA	Water	PrecSep_0	
160-51679-4	488146 FC_3A	Total/NA	Water	PrecSep_0	
160-51679-5	488147 FC_3B	Total/NA	Water	PrecSep_0	
160-51679-6	488148 EQUIP_BLK	Total/NA	Water	PrecSep_0	
160-51679-7	488149 SC_10	Total/NA	Water	PrecSep_0	
160-51679-8	488150 SC_13	Total/NA	Water	PrecSep_0	
MB 160-630679/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-630679/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: CCR LANDFILL

Job ID: 160-51679-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(30-110)
160-51679-1	488143 CC_1	94.9
160-51679-2	488144 FC_1	99.0
160-51679-3	488145 FC_2	91.7
160-51679-4	488146 FC_3A	95.6
160-51679-5	488147 FC_3B	101
160-51679-6	488148 EQUIP_BLK	88.5
160-51679-7	488149 SC_10	76.0
160-51679-8	488150 SC_13	88.8
LCS 160-630678/2-A	Lab Control Sample	88.5
MB 160-630678/1-A	Method Blank	76.5

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	(30-110)	(30-110)
160-51679-1	488143 CC_1	94.9	84.9
160-51679-2	488144 FC_1	99.0	86.7
160-51679-3	488145 FC_2	91.7	80.0
160-51679-4	488146 FC_3A	95.6	81.5
160-51679-5	488147 FC_3B	101	81.9
160-51679-6	488148 EQUIP_BLK	88.5	83.4
160-51679-7	488149 SC_10	76.0	83.0
160-51679-8	488150 SC_13	88.8	86.4
LCS 160-630679/2-A	Lab Control Sample	88.5	84.9
MB 160-630679/1-A	Method Blank	76.5	81.1

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Ms. Wendy Asay
Colorado Springs Utilities
Laboratory Services Section
701 E. Las Vegas St., MC 1465
Colorado Springs, Colorado 80903

Generated 10/30/2023 2:14:37 PM

JOB DESCRIPTION

CCR Landfill

JOB NUMBER

160-51666-1

Eurofins St. Louis
13715 Rider Trail North
Earth City MO 63045

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

Authorization

Rhonda Ridenhower

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10/30/2023 2:14:37 PM

Authorized for release by
Rhonda Ridenhower, Business Unit Manager
Rhonda.Ridenhower@et.eurofinsus.com
(314)298-8566

Table of Contents

Job ID: 160-51666-1

Laboratory: Eurofins St. Louis

Narrative

Job Narrative
160-51666-1

Receipt
The samples were received on 9/29/2023 8:25 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved. The temperature of the cooler at receipt was 14.2º C.

Receipt Exceptions
The samplers name is not listed on the COC: 488151 SC_14 (160-51666-1), 488152 SC_11 (160-51666-2), 488153 SC_12 (160-51666-3), 488154 FIELD_DUP (160-51666-4), 488186 SC_8 (160-51666-5), 488187 SC_9 (160-51666-6).

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 Prep batch 630346
The detection goal was not met for the following sample. Sample was prepped at a reduced volume due to the presence of matrix interferences: 488152 SC_11 (160-51666-2). Analytical results are reported with the detection limit achieved.

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

TestAmerica Laboratories, Inc.

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

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:
488151 SC_14	9/26/23	10:05	G	GW	2	N		X	X	X	
488152 SC_11	9/26/23	13:10	G	GW	2	N		X	X	X	
488153 SC_12	9/26/23	11:58	G	GW	2	N		X	X	X	
488154 FIELD_DUP	9/26/23	00:00	G	GW	2	N		X	X	X	
488186 SC_8	9/27/23	14:25	G	GW	2	N		X	X	X	
488187 SC_9	9/27/23	15:15	G	GW	2	N		X	X	X	

160-51666 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 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	Company: Colorado Springs Utilities	Date/Time: 9/28/23 11:45	Received by: FED EX	Company:	Date/Time:
Relinquished by: FED EX	Company:	Date/Time:	Received by: Sierra Woodrington	Company: ESAT	Date/Time: 9/29/23 0825
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

Login Sample Receipt Checklist

Client: Colorado Springs Utilities

Job Number: 160-51666-1

Login Number: 51666
List Number: 1
Creator: Worthington, Sierra M

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?	False	The samplers name is not listed on the COC.
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").	N/A	
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: 160-51666-1

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: 160-51666-1

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: 160-51666-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-51666-1	488151 SC_14	Water	09/26/23 10:05	09/29/23 08:25
160-51666-2	488152 SC_11	Water	09/26/23 13:10	09/29/23 08:25
160-51666-3	488153 SC_12	Water	09/26/23 11:58	09/29/23 08:25
160-51666-4	488154 FIELD_DUP	Water	09/26/23 00:00	09/29/23 08:25
160-51666-5	488186 SC_8	Water	09/27/23 14:25	09/29/23 08:25
160-51666-6	488187 SC_9	Water	09/27/23 15:15	09/29/23 08:25

Client Sample ID: 488151 SC_14

Date Collected: 09/26/23 10:05
Date Received: 09/29/23 08:25

Lab Sample ID: 160-51666-1
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	0.109	U	0.0920	0.0926	1.00	0.138	pCi/L	10/02/23 11:03	10/24/23 16:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:16*	*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	**1.16**		0.463	0.475	1.00	0.609	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*82.2*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*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	**1.27**		0.472	0.484	5.00	0.609	pCi/L		10/30/23 11:12	1

Client Sample ID: 488152 SC_11

Date Collected: 09/26/23 13:10
Date Received: 09/29/23 08:25

Lab Sample ID: 160-51666-2
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	0.251	U	0.193	0.194	1.00	0.268	pCi/L	10/02/23 11:03	10/24/23 16:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*44.5*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:18*	*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	**2.14**	**G**	1.04	1.06	1.00	1.40	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*44.5*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*78.9*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*

Client Sample ID: 488152 SC_11

Lab Sample ID: 160-51666-2

Date Collected: 09/26/23 13:10

Matrix: Water

Date Received: 09/29/23 08:25

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	2.39		1.06	1.08	5.00	1.40	pCi/L		10/30/23 11:12	1

Client Sample ID: 488153 SC_12

Lab Sample ID: 160-51666-3

Date Collected: 09/26/23 11:58

Matrix: Water

Date Received: 09/29/23 08:25

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	0.109	U	0.0999	0.100	1.00	0.150	pCi/L	10/02/23 11:03	10/24/23 16:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:18*	*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	1.44		0.638	0.652	1.00	0.890	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*82.2*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*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	1.55		0.646	0.660	5.00	0.890	pCi/L		10/30/23 11:12	1

Client Sample ID: 488154 FIELD_DUP

Lab Sample ID: 160-51666-4

Date Collected: 09/26/23 00:00

Matrix: Water

Date Received: 09/29/23 08:25

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	0.0375	U	0.0649	0.0650	1.00	0.115	pCi/L	10/02/23 11:03	10/24/23 16:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:18*	*1*

Client Sample ID: 488154 FIELD_DUP

Lab Sample ID: 160-51666-4

Date Collected: 09/26/23 00:00

Matrix: Water

Date Received: 09/29/23 08:25

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	0.351	U	0.353	0.354	1.00	0.570	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*80.7*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*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	0.389	U	0.359	0.360	5.00	0.570	pCi/L		10/30/23 11:12	1

Client Sample ID: 488186 SC_8

Lab Sample ID: 160-51666-5

Date Collected: 09/27/23 14:25

Matrix: Water

Date Received: 09/29/23 08:25

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	0.150	U	0.114	0.114	1.00	0.162	pCi/L	10/02/23 11:03	10/24/23 16:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:18*	*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	**0.851**		0.514	0.520	1.00	0.753	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*78.5*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*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	**1.00**		0.526	0.532	5.00	0.753	pCi/L		10/30/23 11:12	1

Client Sample ID: 488187 SC_9

Date Collected: 09/27/23 15:15
Date Received: 09/29/23 08:25

Lab Sample ID: 160-51666-6

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	**0.166**		0.109	0.110	1.00	0.135	pCi/L	10/02/23 11:03	10/24/23 16:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.1*		*30 - 110*	*10/02/23 11:03*	*10/24/23 16:19*	*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	0.429	U	0.518	0.519	1.00	0.855	pCi/L	10/02/23 11:12	10/19/23 11:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.1*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*1*
Y Carrier	*80.4*		*30 - 110*	*10/02/23 11:12*	*10/19/23 11:38*	*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	0.595	U	0.529	0.531	5.00	0.855	pCi/L		10/30/23 11:12	1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-630344/1-A
Matrix: Water
Analysis Batch: 633299

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 630344

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.01818	U	0.0671	0.0671	1.00	0.147	pCi/L	10/02/23 11:03	10/24/23 13:39	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*10/02/23 11:03*	*10/24/23 13:39*	*1*

Lab Sample ID: LCS 160-630344/2-A
Matrix: Water
Analysis Batch: 633541

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 630344

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	8.730		0.950	1.00	0.126	pCi/L	77	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*90.2*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-630346/1-A
Matrix: Water
Analysis Batch: 632573

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 630346

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3997	U	0.548	0.549	1.00	0.919	pCi/L	10/02/23 11:12	10/19/23 16:56	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*30 - 110*	*10/02/23 11:12*	*10/19/23 16:56*	*1*
Y Carrier	*84.5*		*30 - 110*	*10/02/23 11:12*	*10/19/23 16:56*	*1*

Lab Sample ID: LCS 160-630346/2-A
Matrix: Water
Analysis Batch: 632572

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 630346

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			7.79	7.825		1.13	1.00	0.522	pCi/L	100	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*91.4*		*30 - 110*
Y Carrier	*87.9*		*30 - 110*

QC Association Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-51666-1

Rad

Prep Batch: 630344

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-51666-1	488151 SC_14	Total/NA	Water	PrecSep-21	
160-51666-2	488152 SC_11	Total/NA	Water	PrecSep-21	
160-51666-3	488153 SC_12	Total/NA	Water	PrecSep-21	
160-51666-4	488154 FIELD_DUP	Total/NA	Water	PrecSep-21	
160-51666-5	488186 SC_8	Total/NA	Water	PrecSep-21	
160-51666-6	488187 SC_9	Total/NA	Water	PrecSep-21	
MB 160-630344/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-630344/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 630346

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-51666-1	488151 SC_14	Total/NA	Water	PrecSep_0	
160-51666-2	488152 SC_11	Total/NA	Water	PrecSep_0	
160-51666-3	488153 SC_12	Total/NA	Water	PrecSep_0	
160-51666-4	488154 FIELD_DUP	Total/NA	Water	PrecSep_0	
160-51666-5	488186 SC_8	Total/NA	Water	PrecSep_0	
160-51666-6	488187 SC_9	Total/NA	Water	PrecSep_0	
MB 160-630346/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-630346/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Colorado Springs Utilities
Project/Site: CCR Landfill

Job ID: 160-51666-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(30-110)
160-51666-1	488151 SC_14	91.7
160-51666-2	488152 SC_11	44.5
160-51666-3	488153 SC_12	92.9
160-51666-4	488154 FIELD_DUP	94.4
160-51666-5	488186 SC_8	93.2
160-51666-6	488187 SC_9	84.1
LCS 160-630344/2-A	Lab Control Sample	90.2
MB 160-630344/1-A	Method Blank	95.6

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	(30-110)	(30-110)
160-51666-1	488151 SC_14	91.7	82.2
160-51666-2	488152 SC_11	44.5	78.9
160-51666-3	488153 SC_12	92.9	82.2
160-51666-4	488154 FIELD_DUP	94.4	80.7
160-51666-5	488186 SC_8	93.2	78.5
160-51666-6	488187 SC_9	84.1	80.4
LCS 160-630346/2-A	Lab Control Sample	91.4	87.9
MB 160-630346/1-A	Method Blank	95.6	84.5

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

APPENDIX D

Statistical Analysis Report

Statistical Analysis Report for CSU Clear Spring Ranch

2023 CCR Program, Annual Update, Ash Landfill Network

Kirk Cameron, PhD, MacStat Consulting, Ltd

2024-01-15

Table of contents

1 Introduction

This report summarizes the statistical analysis performed on groundwater quality constituents monitored during 2023 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., 2023), 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 2023 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 2023 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 2023.

As required by the USEPA's Coal Combustion Residuals (CCR) Rule section describing the Assessment Monitoring Program (§257.95), test results for the 2023 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**).

As summarized in **Attachment A**, this screening process was applied both to the background and downgradient data. Visual checks of the time series plots were made for possible seasonality. In addition, possible trends were also tested using weighted linear regression. Cases with statistically significant slopes (i.e., 'U' = increasing or 'D' = decreasing) are listed in **Attachment A**. Note that the presence of a statistically significant trend does not always indicate that the data need to be truncated. In some instances, the slope may be significant but of small magnitude, thus suggesting modest change over time. Also, with multiple background wells, the grouped background data may not be trending as a whole or in the same direction, even when individual background wells are trending.

Groundwater samples were analyzed for 21 distinct constituents as required under Appendix III and Appendix IV of the CCR Rule (listed in **Table 2**). 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. In addition, 'stacked' time series plots, with all network wells graphed on the same set of axes for each constituent, offer another visual summary of the same data.

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.

Table 2: CCR Rule Monitored Constituents

Constituent	Begin Date	End Date	Appendix
Antimony	2016-06-22	2023-09-26	IV
Arsenic	2016-06-22	2023-09-26	IV
Barium	2016-06-22	2023-09-26	IV
Beryllium	2016-06-22	2023-09-26	IV
Boron	2016-06-22	2023-09-26	III
Cadmium	2016-06-22	2023-09-26	IV
Calcium	2016-06-22	2023-09-26	III
Chloride	2016-06-22	2023-09-26	III
Chromium	2016-06-22	2023-09-26	IV
Cobalt	2016-06-22	2023-09-26	IV
Fluoride	2016-06-22	2023-09-26	III, IV
Lead	2016-06-22	2023-09-26	IV
Lithium	2016-06-22	2023-09-26	IV
Mercury	2016-06-22	2023-09-26	IV
Molybdenum	2016-06-22	2023-09-26	IV
pH	2016-06-22	2023-09-26	III
Rad226+228	2016-06-22	2023-09-26	IV
Selenium	2016-06-22	2023-09-26	IV
Sulfate	2016-06-22	2023-09-26	III
TDS	2016-06-22	2023-09-26	III
Thallium	2016-06-22	2023-09-26	IV

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.
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

When computing each prediction limit (UPL) or prediction interval, the following steps were conducted:

1. All baseline data from designated upgradient or background wells collected through September 2023 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 an updated procedure that better balances the twin goals of using as much of the laboratory-validated data as possible while preventing outlying measurements from negatively impacting statistical estimates:

Probable outliers were flagged by first fitting a broad, non-linear, locally-weighted trend to each COC-well pair, using the well-known *locally-estimated scatterplot smoother* or LOESS (Cleveland, 1979). By taking the standard error (SE) from each LOESS trend, which is computed from the mean square of the residuals:

$$s_e^2 = \sum_{i=1}^{n} e_i^2/(n-2) = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2/(n-2)$$

the internally studentized residual (Draper & Smith, 1998) distance (i.e., gap) between each reported value and its trend estimate was computed with the formula:

$$t_i = (y_i - \hat{y})/s_e(1 - h_{ii})^{1/2}$$

where h_{ii} is the ith diagonal element of the 'hat' matrix H in regression theory. The studentized residuals t_i thus account for the typical variation exhibited by the observed data as well as the leverage (i.e., x-position) of the point being estimated.

These studentized residuals follow a standard scale similar to a standard Student's t-distribution with $(n-3)$ degrees of freedom. As a consequence, any studentized residual larger than 3 may be deemed a probable outlier, and residuals larger than 6 may be deemed extreme outliers (relative to the local trend).

Any flagged outliers were then *down-weighted* using a tri-cube weighting function, such that the further the point from its trend estimate, the smaller its statistical weight (w_i). Outlier residuals furthest from the trend thus received the smallest weights, while those closer to the trend were given larger weights. Further, any observations not classified as residual outliers were given the maximum weight of 1.

Handling outliers in this manner offers certain benefits, especially since 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 in this manner is consistent, non-subjective, and does not exclude any data; yet minimizes the impact of true outliers on subsequent UPL estimates.

Based on internal testing, the outlier methodology distinguishes between 'extreme' and 'probable' outliers. Probable outliers exert less impact on subsequent statistical estimates are are thus afforded greater statistical weight. In addition, probable outliers typically far outnumber extreme outliers. At the Clear Spring Ranch Ash Landfill network, 72 probable outliers were flagged in the background data. Similarly, 66 probable outliers were were flagged at downgradient wells.

By contrast, 6 extreme outliers were flagged in the background data. Further, 7 extreme outliers were were flagged at downgradient wells.

Any extreme background outliers are listed in **Table 3** below. These values were down-weighted using the values shown in the Weight column. Note that non-outliers have weights equal to 1. Extreme downgradient outliers are listed in **Table 4**.

Table 3: Down-Weighted Background Outliers

COC	Well	Result	ND.Flag	Date	Units	Outlier	Weight
Antimony	FC-1	15	1	2023-09-25	ug/L	OUT	8.96e-10
Antimony	FC-2	15	1	2023-09-25	ug/L	OUT	4.75e-13
Thallium	FC-2	10	1	2023-09-25	ug/L	OUT	1.7e-06
Antimony	CC-1	15	1	2023-09-25	ug/L	OUT	3.64e-09
Antimony	FC-3A	15	1	2023-09-25	ug/L	OUT	6.05e-13
Antimony	FC-3B	15	1	2023-09-25	ug/L	OUT	3.82e-12

Table 4: Down-Weighted Downgradient Outliers

COC	Well	Result	ND.Flag	Date	Units	Outlier	Weight
Antimony	SC-14	15	1	2023-09-26	ug/L	OUT	5.11e-13
Thallium	SC-14	10	1	2023-09-26	ug/L	OUT	4.89e-06
Antimony	SC-13	15	1	2023-09-26	ug/L	OUT	1.3e-06
Thallium	SC-13	10	1	2023-09-26	ug/L	OUT	3.63e-06
Antimony	SC-12	15	1	2023-09-26	ug/L	OUT	4.66e-09
Antimony	SC-11	15	1	2023-09-26	ug/L	OUT	2.38e-09
Antimony	SC-10	15	1	2023-09-26	ug/L	OUT	1.88e-10

2. The grouped baseline data were analyzed to determine whether they could be fit to a known statistical model. If so, a quasi-parametric bootstrap-t prediction limit/interval was computed; if not, a nonparametric prediction limit/interval was constructed.

Any possible outliers, as described above, were down-weighted. Any observations not classified as outliers were given the maximum weight of 1. These weights (w_i) were subsequently utilized in computing each prediction limit/interval (or tolerance limit below).

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 weighted correlation between the observed values and normal z-scores on a probability plot. The final statistical model for each parameter was used to compute a bootstrap-t background prediction limit, if appropriate.

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 *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. 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 bootstrap-t 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 a good model fit 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 bootstrap-t could be applied. Further, the bootstrap-t 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 substantially 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 bootstrap-t, while multi-modality or correlations below this cutoff led to calculation of a nonparametric prediction limit/interval. For nonparametric models, the prediction limit was selected as a weighted interpolation of the largest sample values.

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

2.2 Comparing Compliance Data Against Prediction Limits

To assess whether any SSIs occurred during 2023 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

Table 5: Clear Spring Ranch Ash Landfill Interwell Prediction Limits

COI	N	ND.Pct	Model	1-of-m	FPR	Units	LPL	UPL
Boron	105	0	NP	2	0.0109	ug/L	NA	1730
Calcium	100	0	NP	2	0.0127	ug/L	NA	472099
Chloride	100	0	NP	2	0.0122	mg/L	NA	1680
Fluoride	105	0	NP	2	0.0111	mg/L	NA	0.748
pH	105	0	NP	2	0.0109	SU	6.8	7.7
Sulfate	95	0	NP	2	0.0138	mg/L	NA	20197
TDS	100	0	NP	2	0.0122	mg/L	NA	34398

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 2023 statistical tests at the Clear Spring Ranch Ash Landfill CCR unit where a confirmed or potential SSI occurred. Plots of the 2023 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: 2023 Confirmed/Potential Prediction Limit SSIs at Clear Spring Ranch Ash Landfill CCR Site

COC	Well	Date	Result	Units	Stage	LPL	UPL	SSI
Boron	SC-11	2023-03-14	2570	ug/L	Sample	NA	1730	YES
Boron	SC-11	2023-09-26	2590	ug/L	Resample	NA	1730	YES
Boron	SC-12	2023-03-14	4570	ug/L	Sample	NA	1730	YES
Boron	SC-12	2023-09-26	4480	ug/L	Resample	NA	1730	YES
Fluoride	SC-12	2023-03-14	1.84	mg/L	Sample	NA	0.748	YES
Fluoride	SC-12	2023-09-26	0.91	mg/L	Resample	NA	0.748	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 2023. Red cells indicate the opposite: an SSI was flagged during 2023. Yellow cells indicate *potential* SSIs, pending confirmatory resamples.

At the Clear Spring Ranch Ash Landfill CCR network in 2023, a total of 3 Appendix III SSIs were identified at Program network wells.

Table 7: Appendix III 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**	**GRN**	**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 background data were first summarized and modeled, as described in **Section 2**.

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, sec. 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 steps similar to those applied in computating the prediction limits for Appendix III parameters:

1. All baseline data from designated upgradient or background wells collected through September 2023 were grouped and initially screened for possible outliers. This outlier screening was performed 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.

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

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 weighted correlation between pairs on the probability plot. The statistical weights described earlier were utilized to not only fit the best models, but also to compute the UTLs.

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 *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. 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 bootstrap-t 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 could not be identified, a weighted nonparametric UTL was computed instead, similar to the nonparametric prediction limits described earlier.

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

Table 8: 2023 Clear Spring Ranch Ash Landfill CCR Unit GWPS Limits

COI	Model	N	Coverage	Confidence	UTL	RegLimit	GWPS	Units
Rad226+228	TBOOT-Fourth Root	105	0.95	0.95	4.72	5	5	pCi/L
Mercury	NP	105	0.95	0.967	0.009	2	2	ug/L
Antimony	TBOOT-Log	105	0.95	0.95	4.67	6	6	ug/L
Arsenic	TBOOT-Cube Root	105	0.95	0.95	12.3	10	12.3	ug/L
Barium	TBOOT-Log	105	0.95	0.95	33.6	2000	2000	ug/L
Beryllium	NP	105	0.95	0.97	2	4	4	ug/L
Cadmium	BOOT	105	0.95	0.97	5	5	5	ug/L
Chromium	TBOOT-Normal	105	0.95	0.95	10.6	100	100	ug/L
Cobalt	TBOOT-Fourth Root	105	0.95	0.95	9.08	6	9.08	ug/L
Fluoride	NP	105	0.95	0.966	0.754	4	4	mg/L
Lead	TBOOT-Square Root	105	0.95	0.95	9	15	15	ug/L
Lithium	NP	105	0.95	0.97	1166	40	1166	ug/L
Molybdenum	TBOOT-Eighth Root	105	0.95	0.95	12.8	100	100	ug/L
Selenium	NP	105	0.95	0.966	224	50	224	ug/L
Thallium	TBOOT-Log	105	0.95	0.95	6.64	2	6.64	ug/L

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 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 the weighted 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. For pairs with any non-detects, Monte Carlo imputation was used to substitute a random value between 0 and the reporting limit (RL) for each non-detect prior to computing the linear regression and confidence band. Then this process was repeated many times and the results averaged to determine the final regression and confidence band estimates.

3.3 Comparing Confidence Interval Bands Against GWPS

To assess whether any SSIs have occurred during the 2023 Assessment Monitoring at the CSU CCR site, the confidence interval (CI) bands described in **Section 3.2** were compared against the constituent-specific groundwater protection standards (GWPS) described in **Section 3.1**. 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 watched. These cases have a CI band whose lower limit is at least two-thirds of the GWPS, or 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 2023 annual Assessment Monitoring analysis.

Table 9: Appendix IV 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 = CI Straddles GWPS or Lower Bound at least 2/3 of GWPS

4 References

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Appendix A: Exploratory Plots

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

Time Series Plots

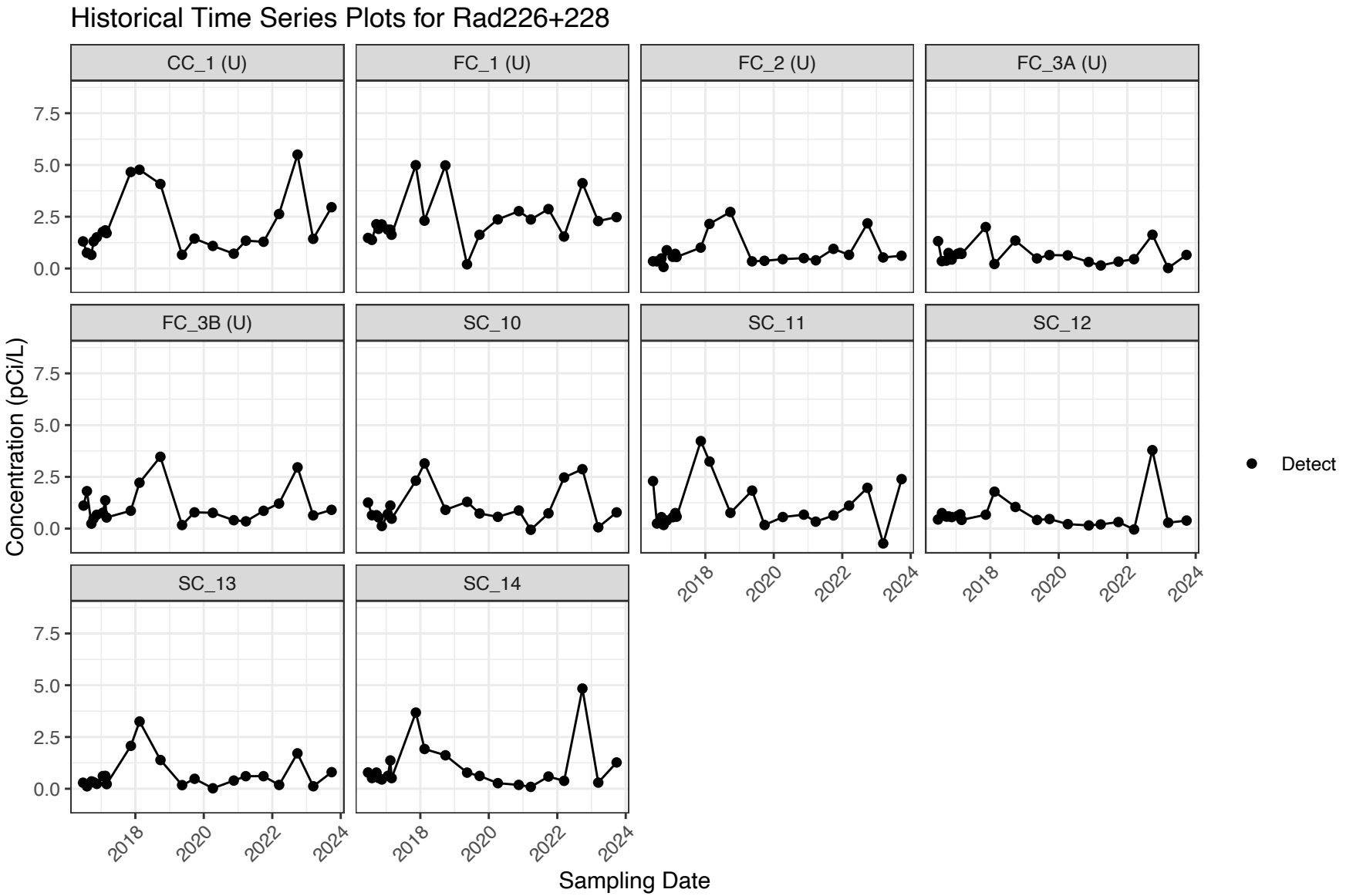


Figure 1: Time Series Plots

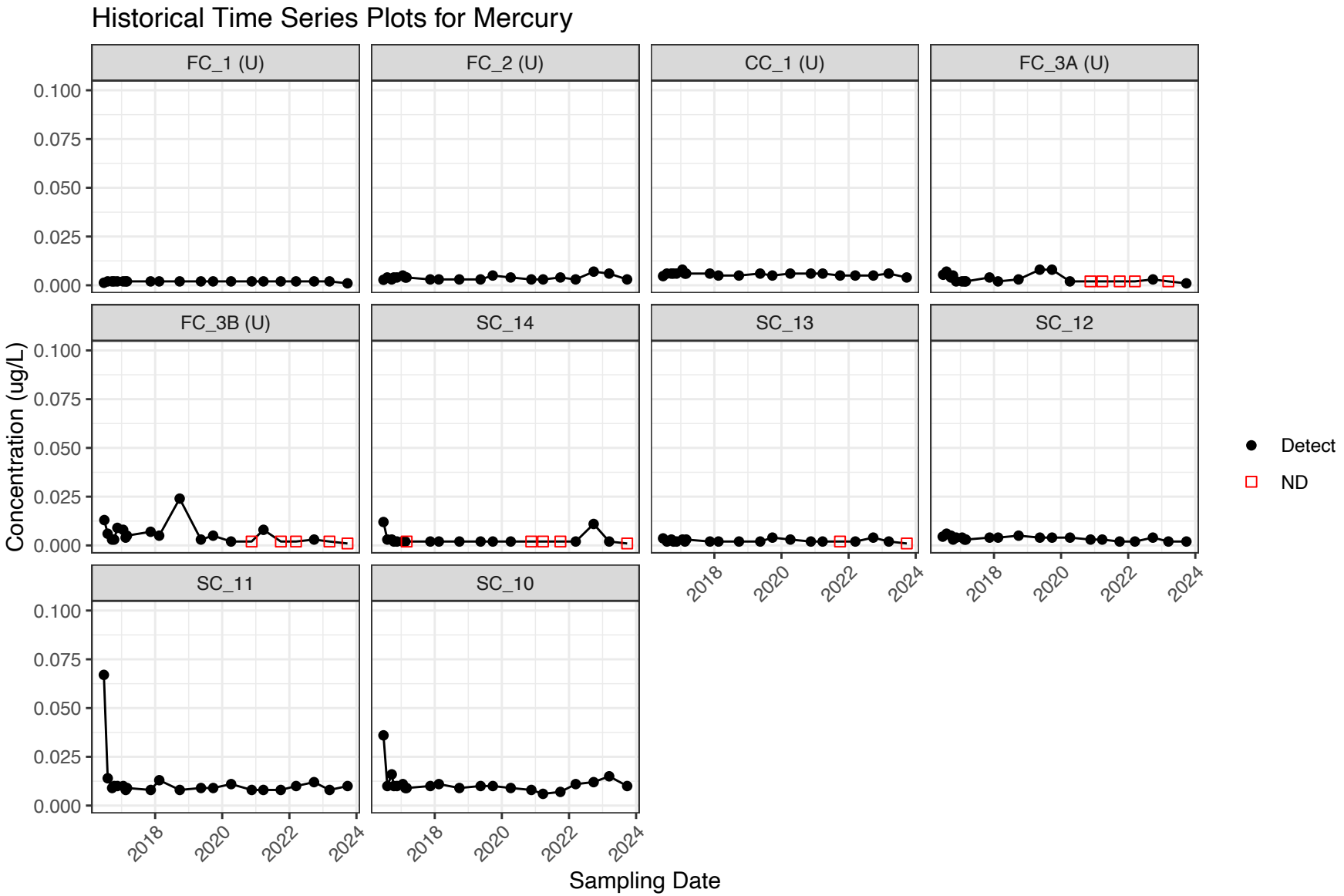


Figure 2: Time Series Plots

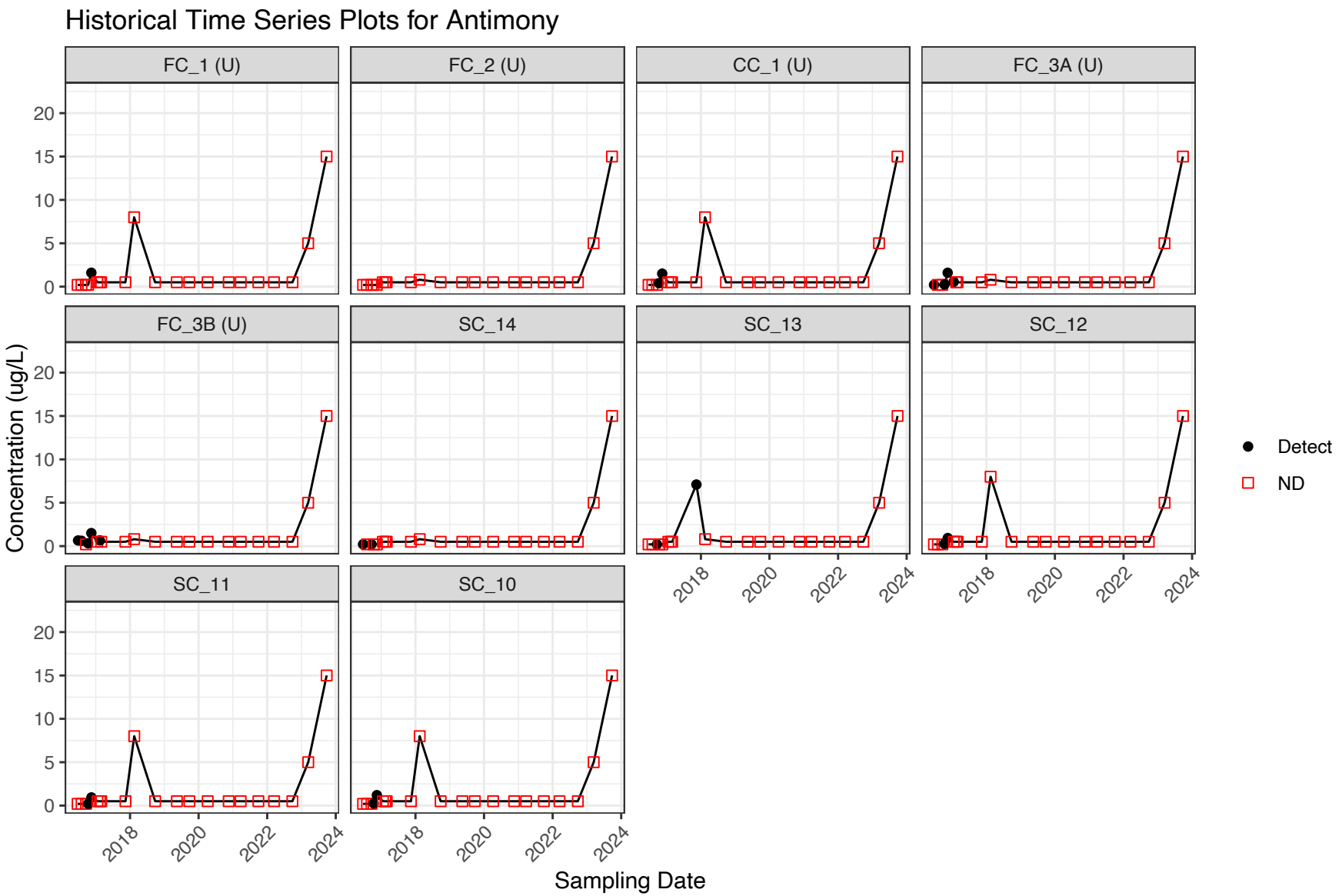


Figure 3: Time Series Plots

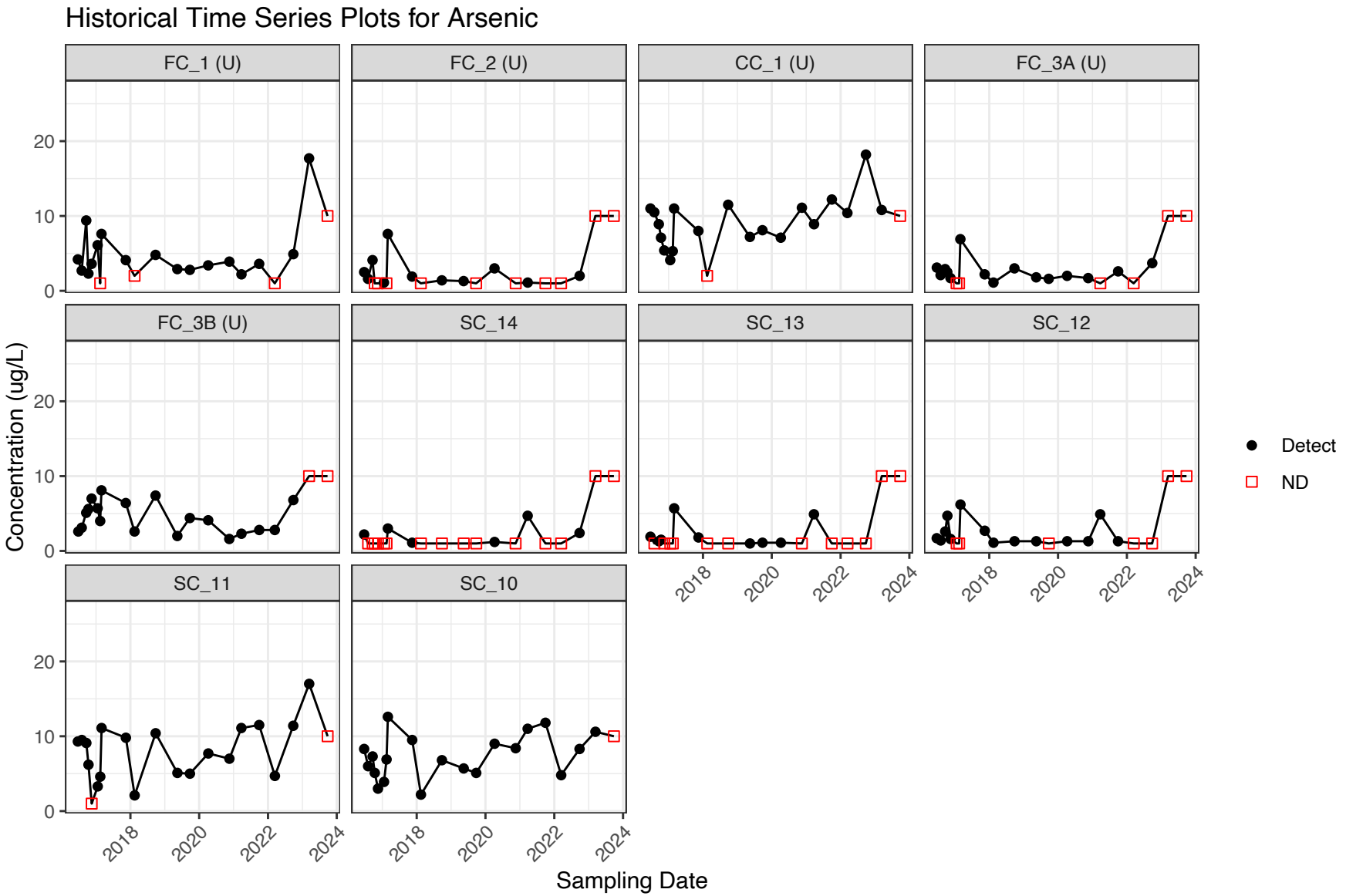


Figure 4: Time Series Plots

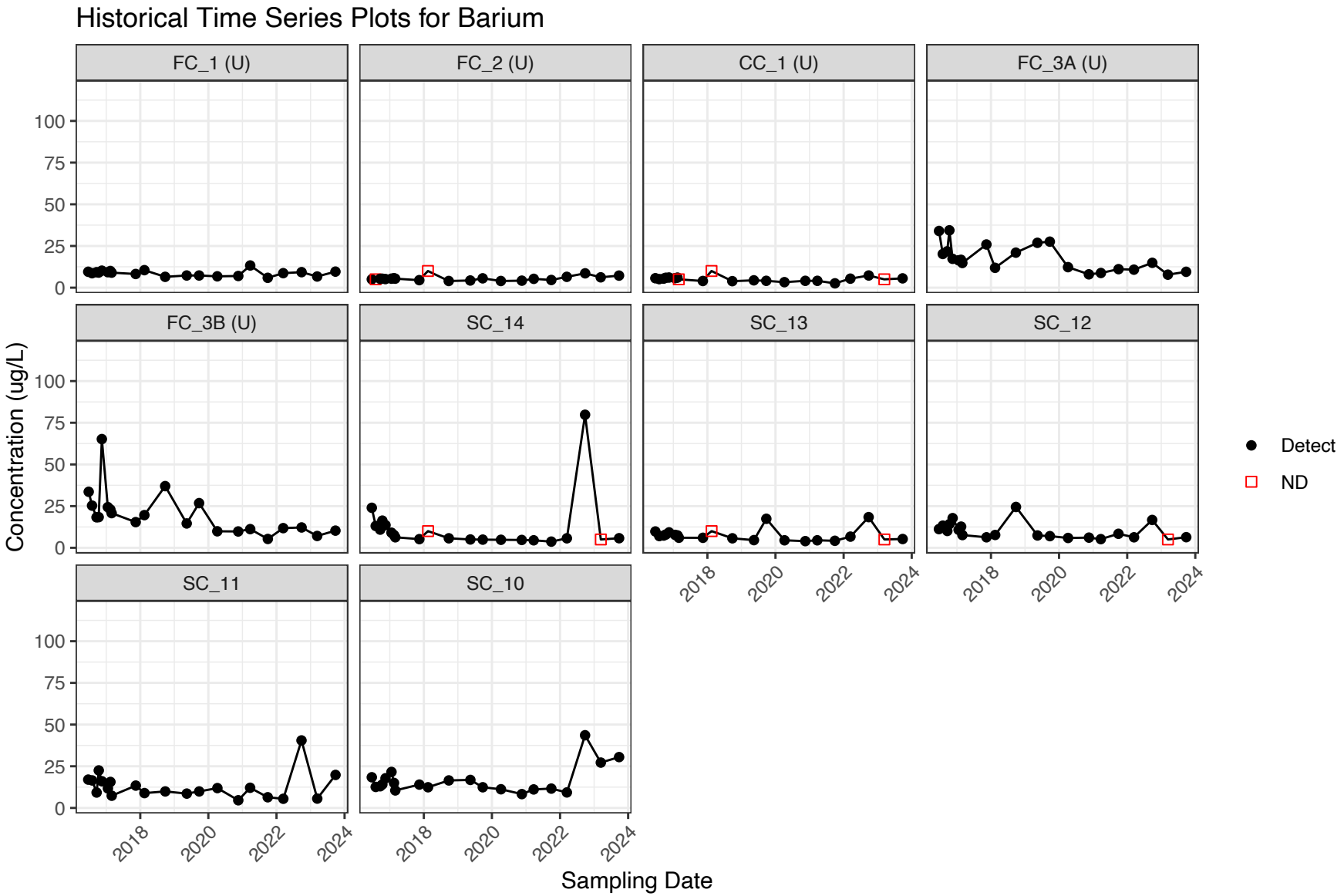


Figure 5: Time Series Plots

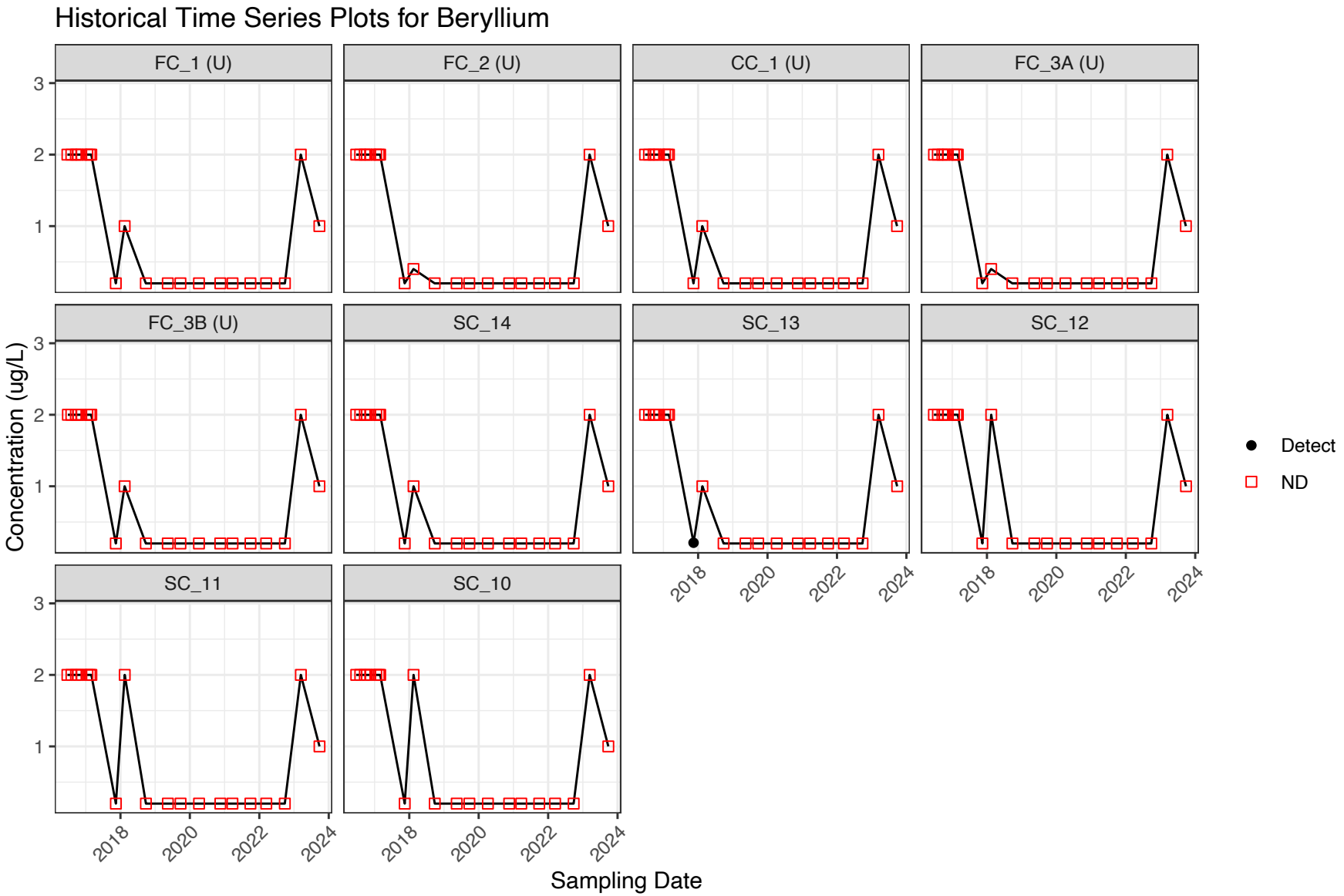


Figure 6: Time Series Plots

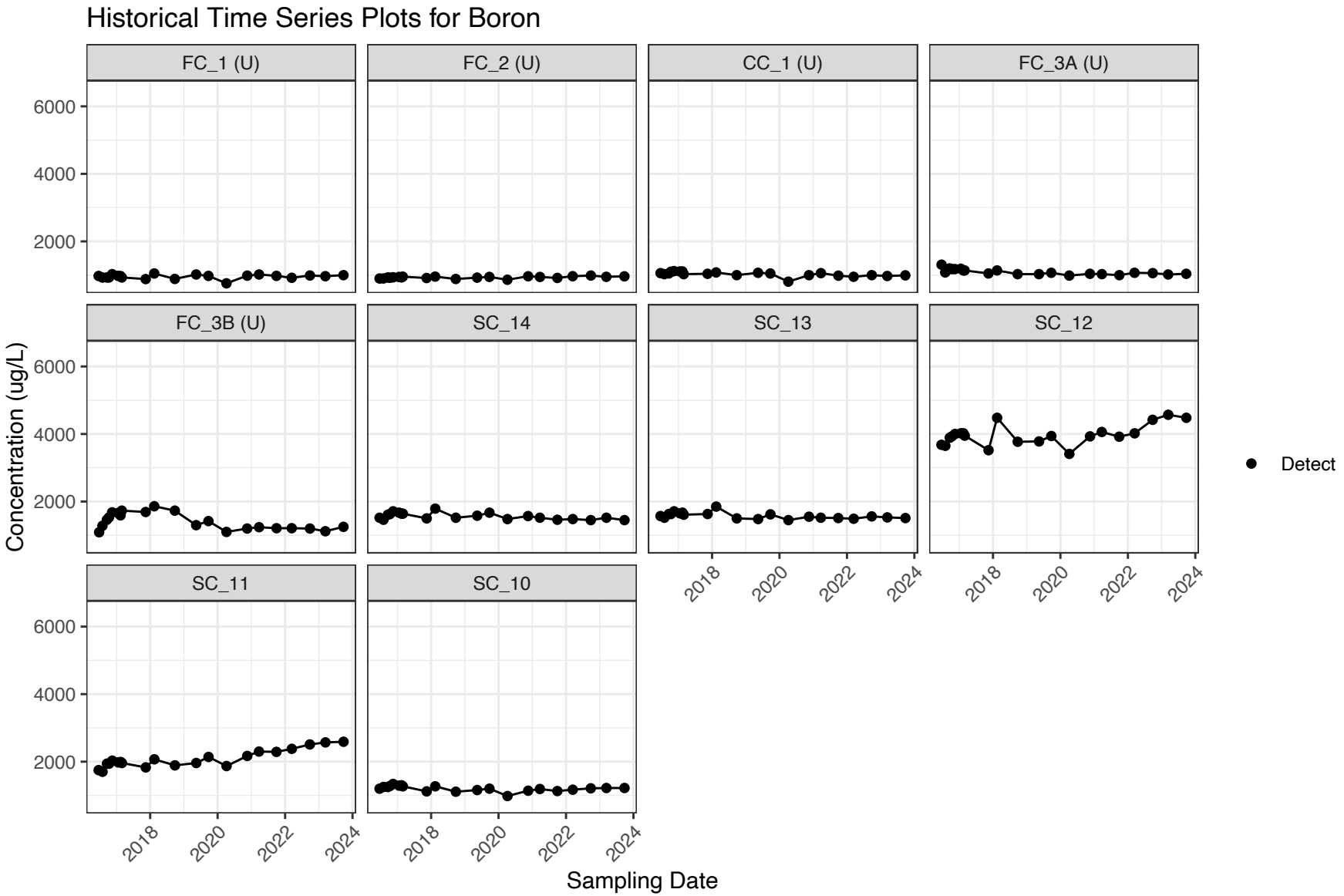


Figure 7: Time Series Plots

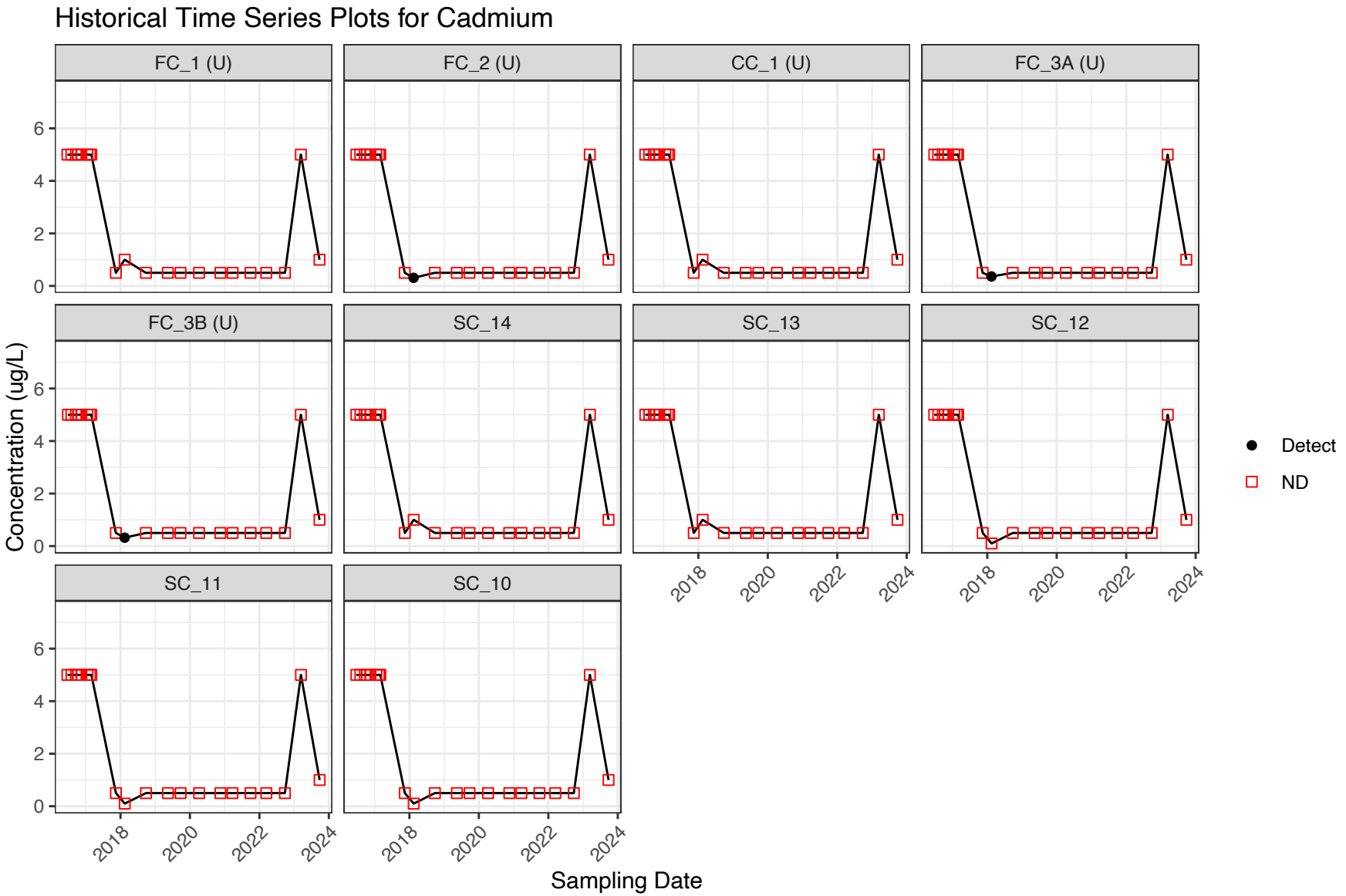


Figure 8: Time Series Plots

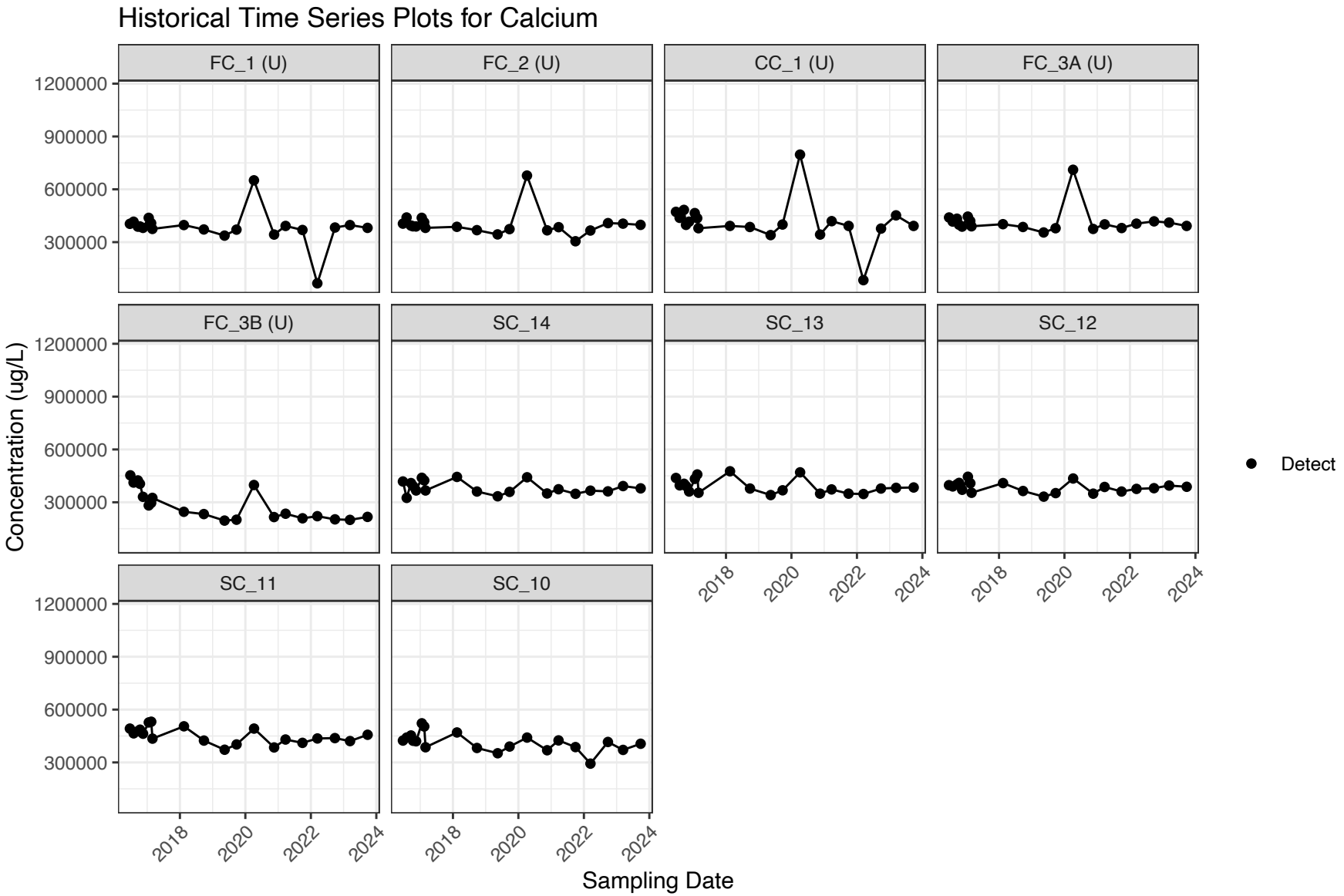


Figure 9: Time Series Plots

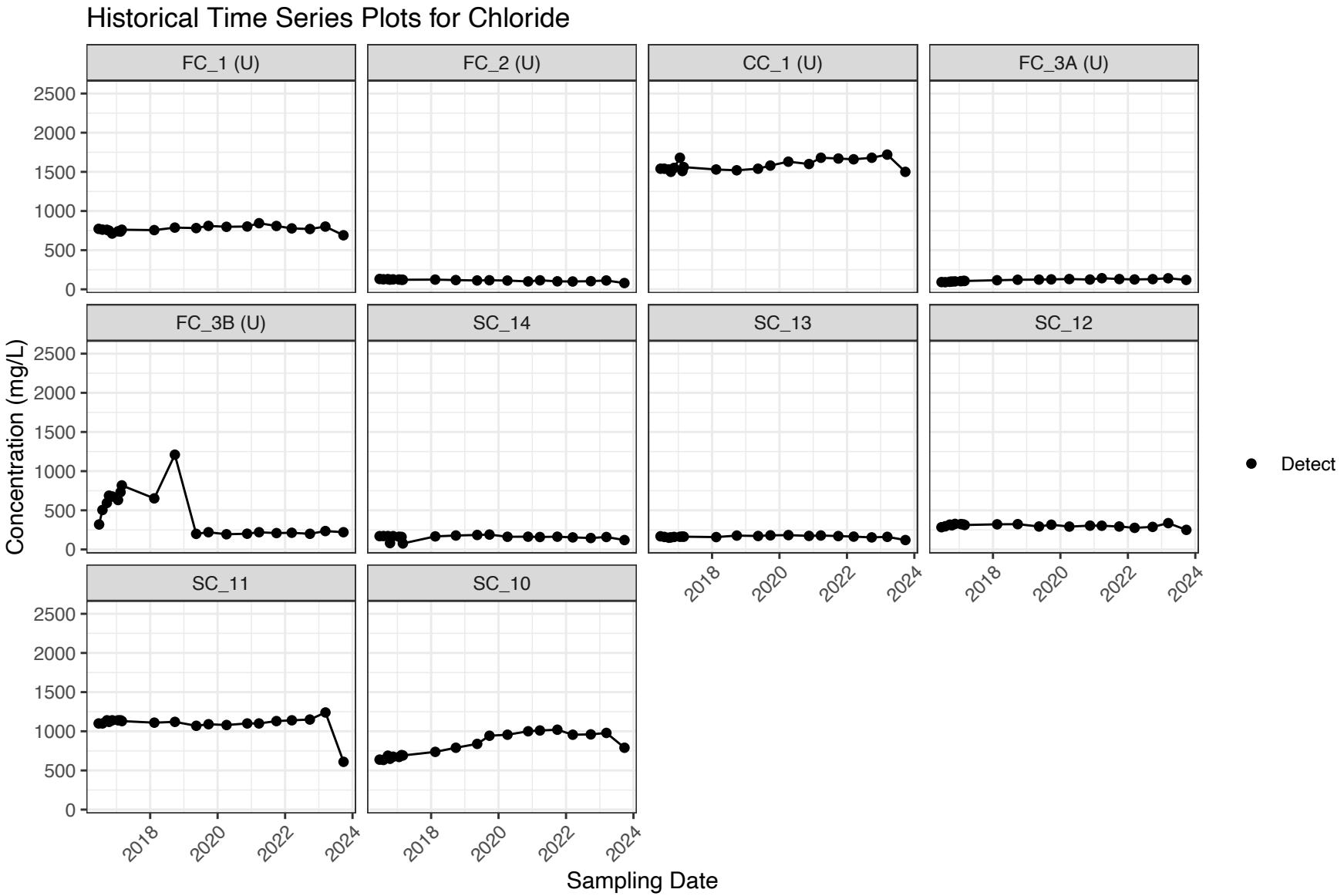


Figure 10: Time Series Plots

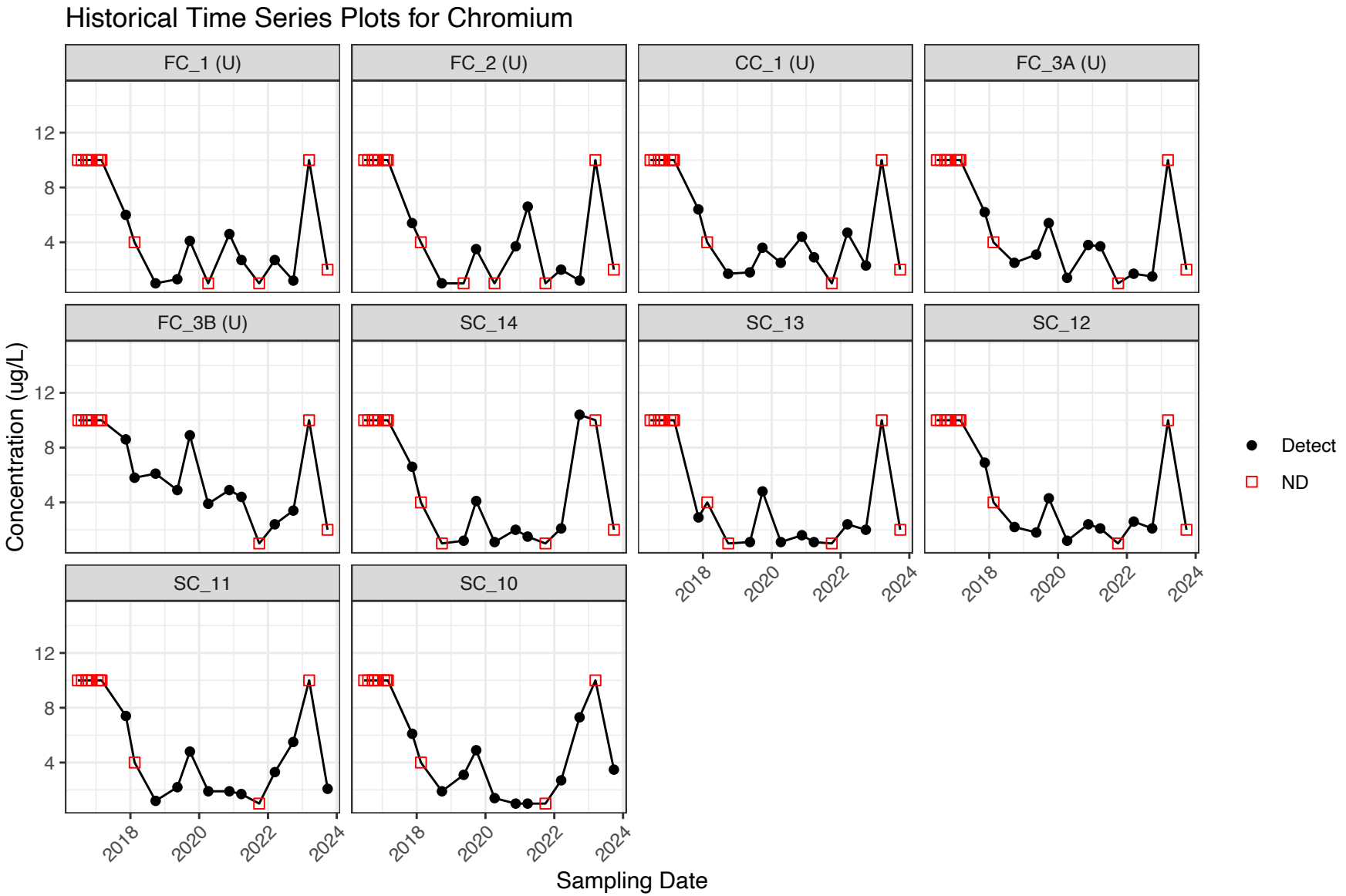


Figure 11: Time Series Plots

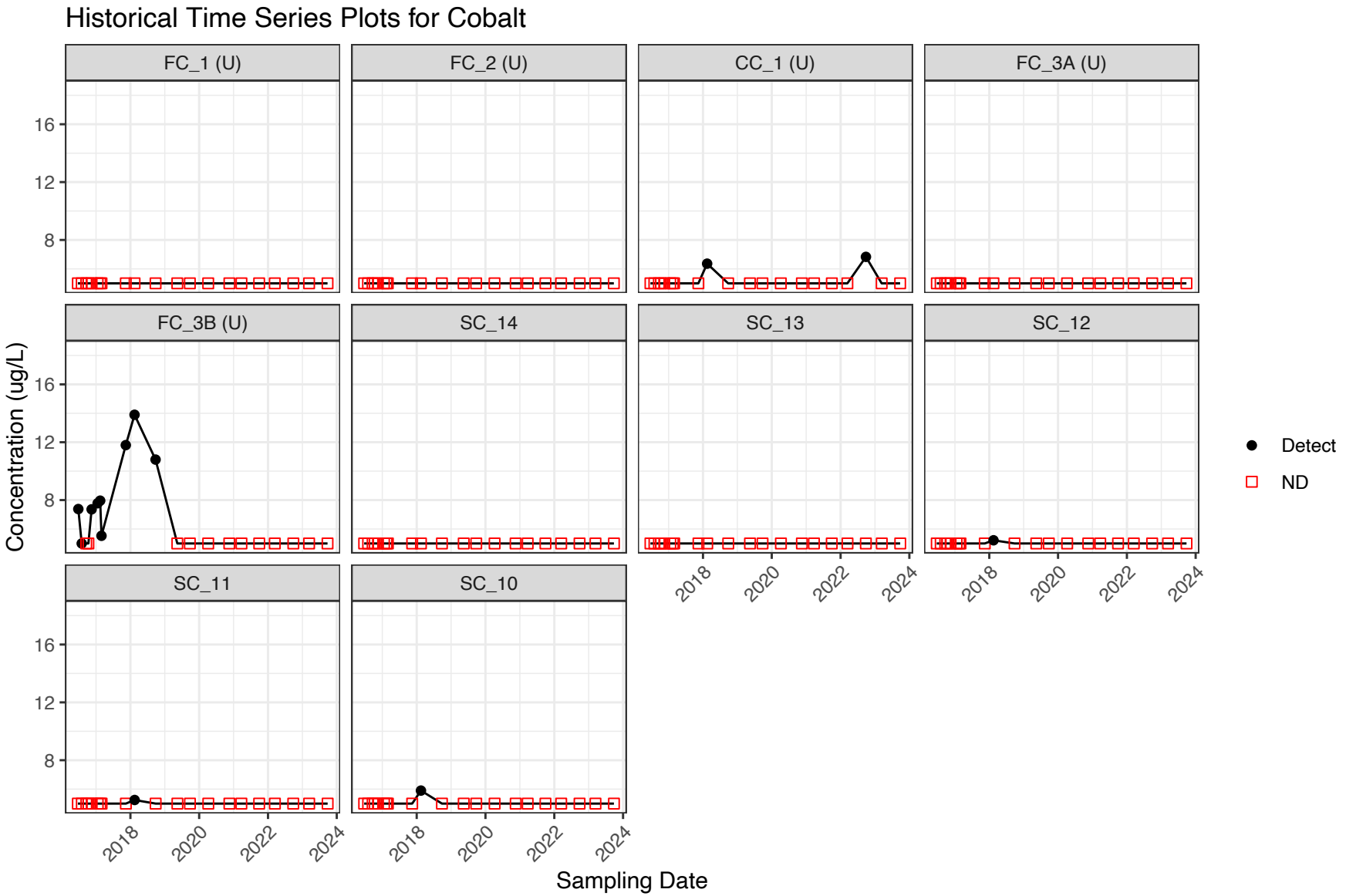


Figure 12: Time Series Plots

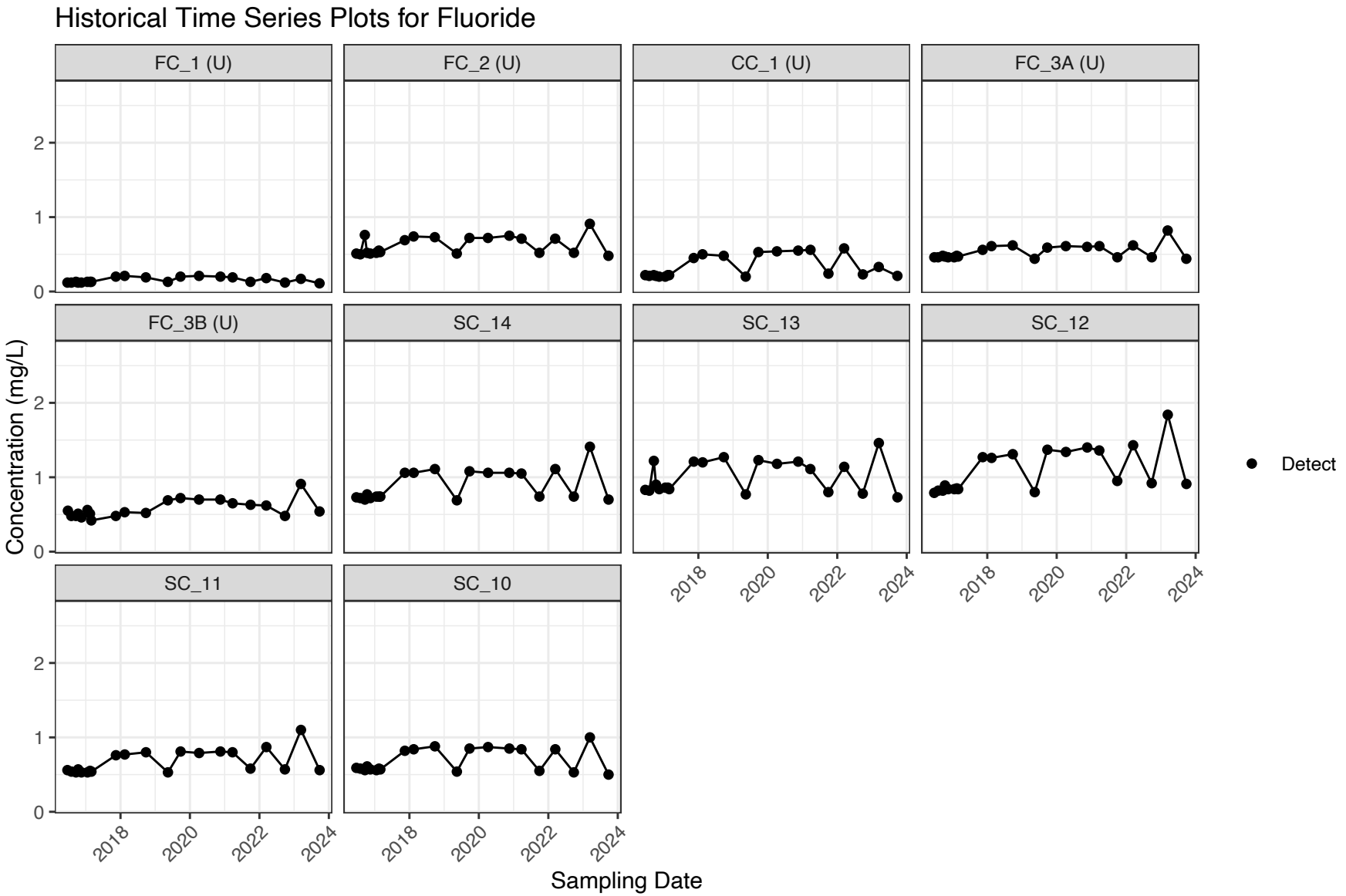


Figure 13: Time Series Plots

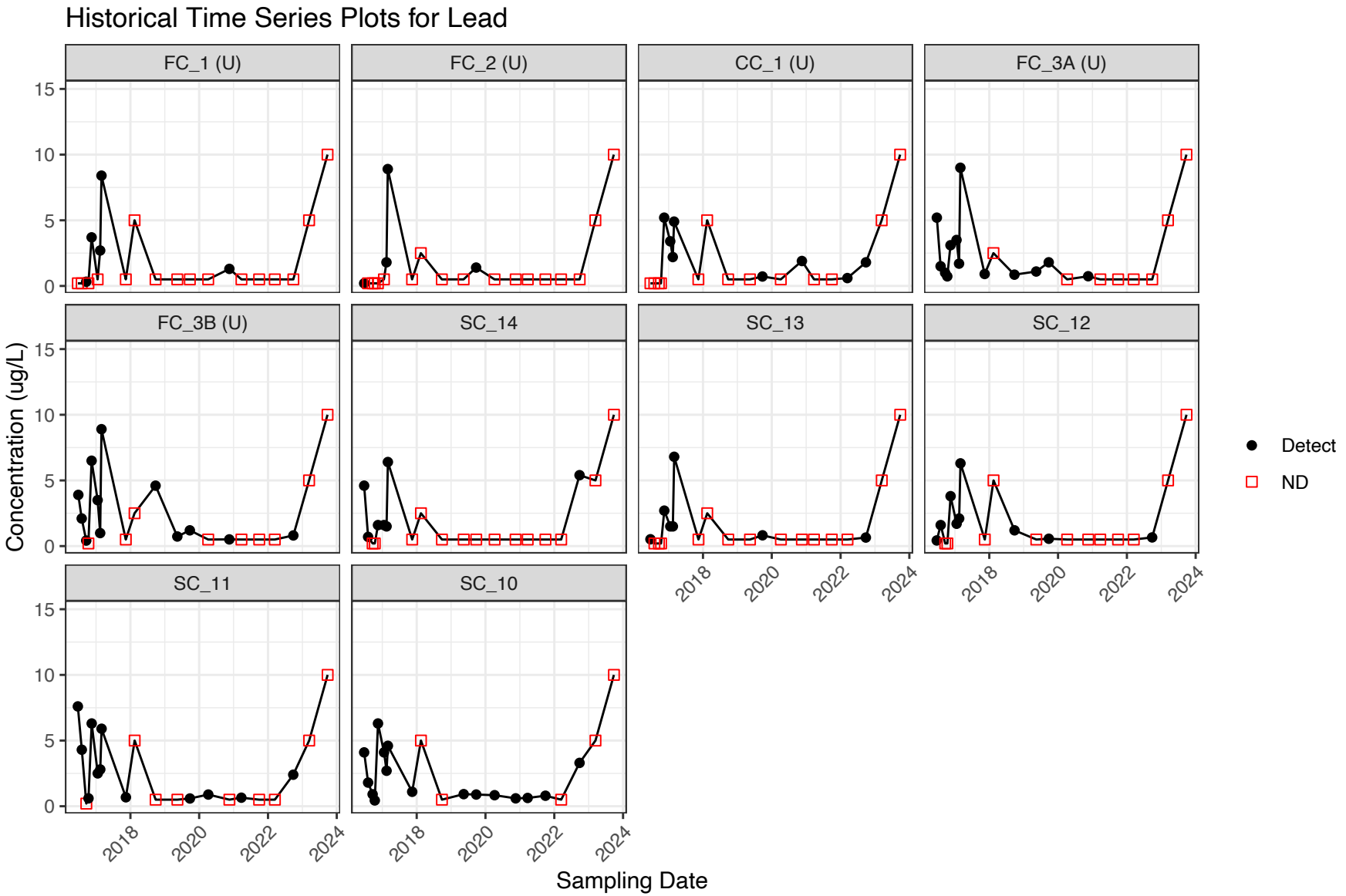
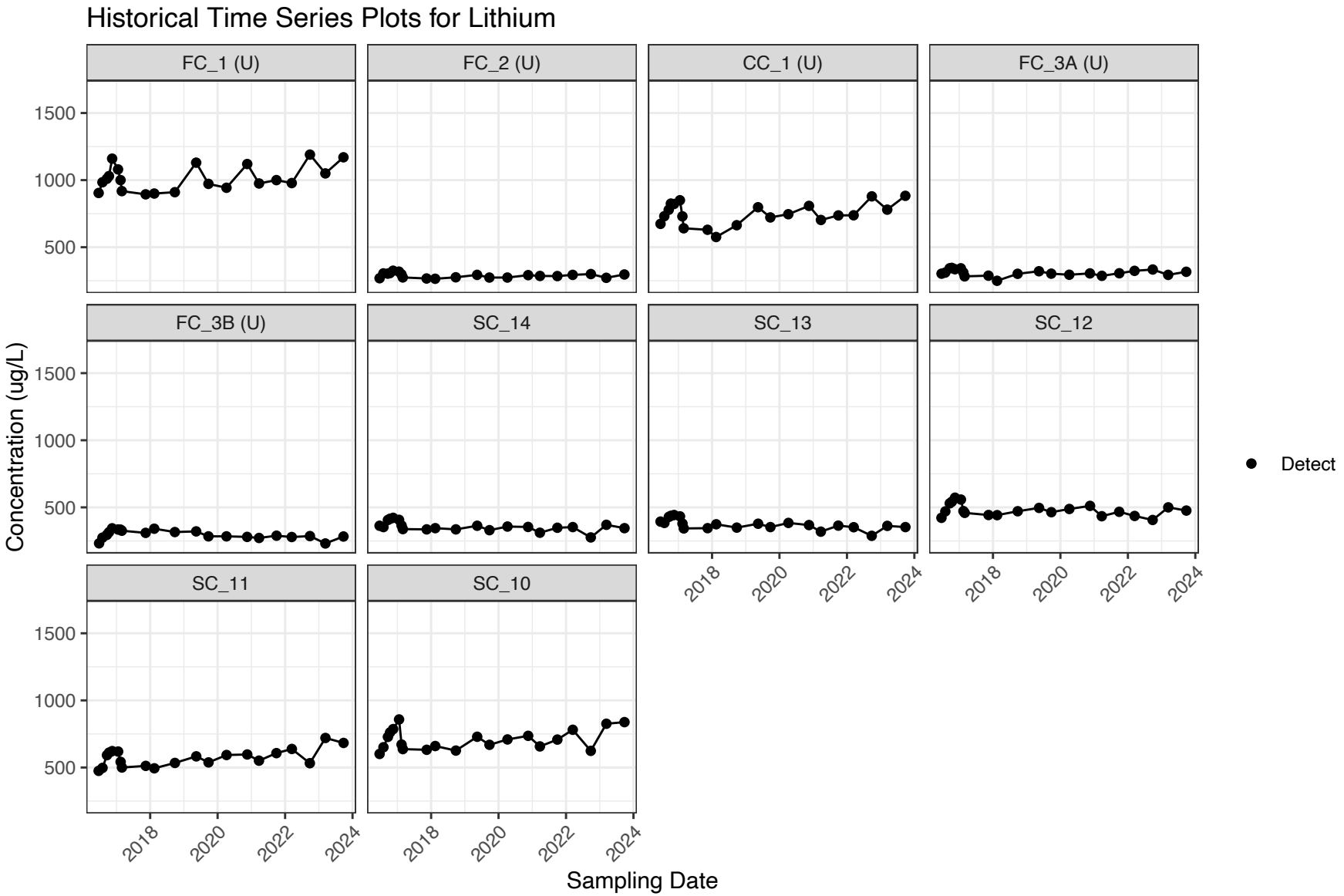


Figure 14: Time Series Plots



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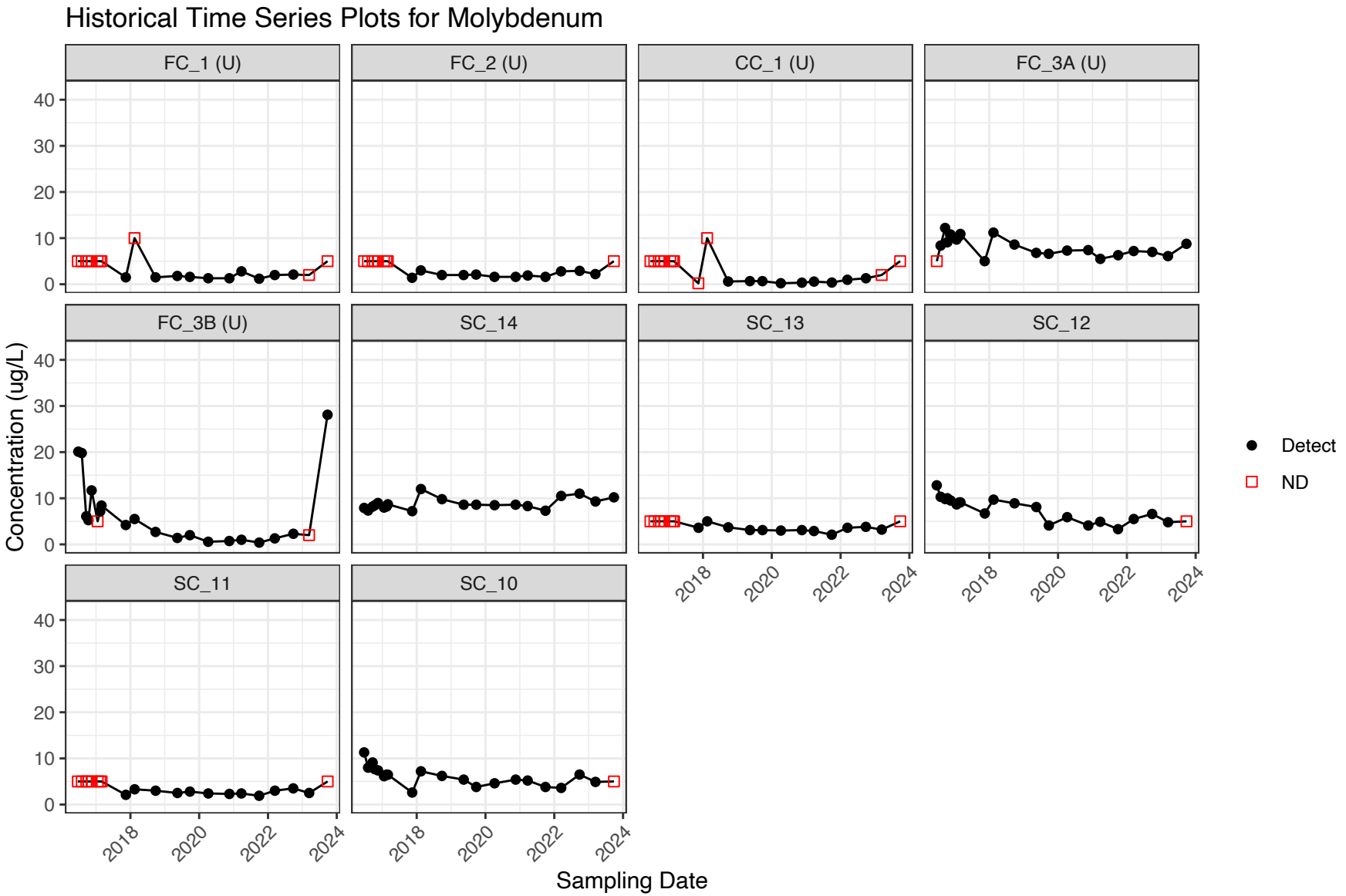


Figure 16: Time Series Plots

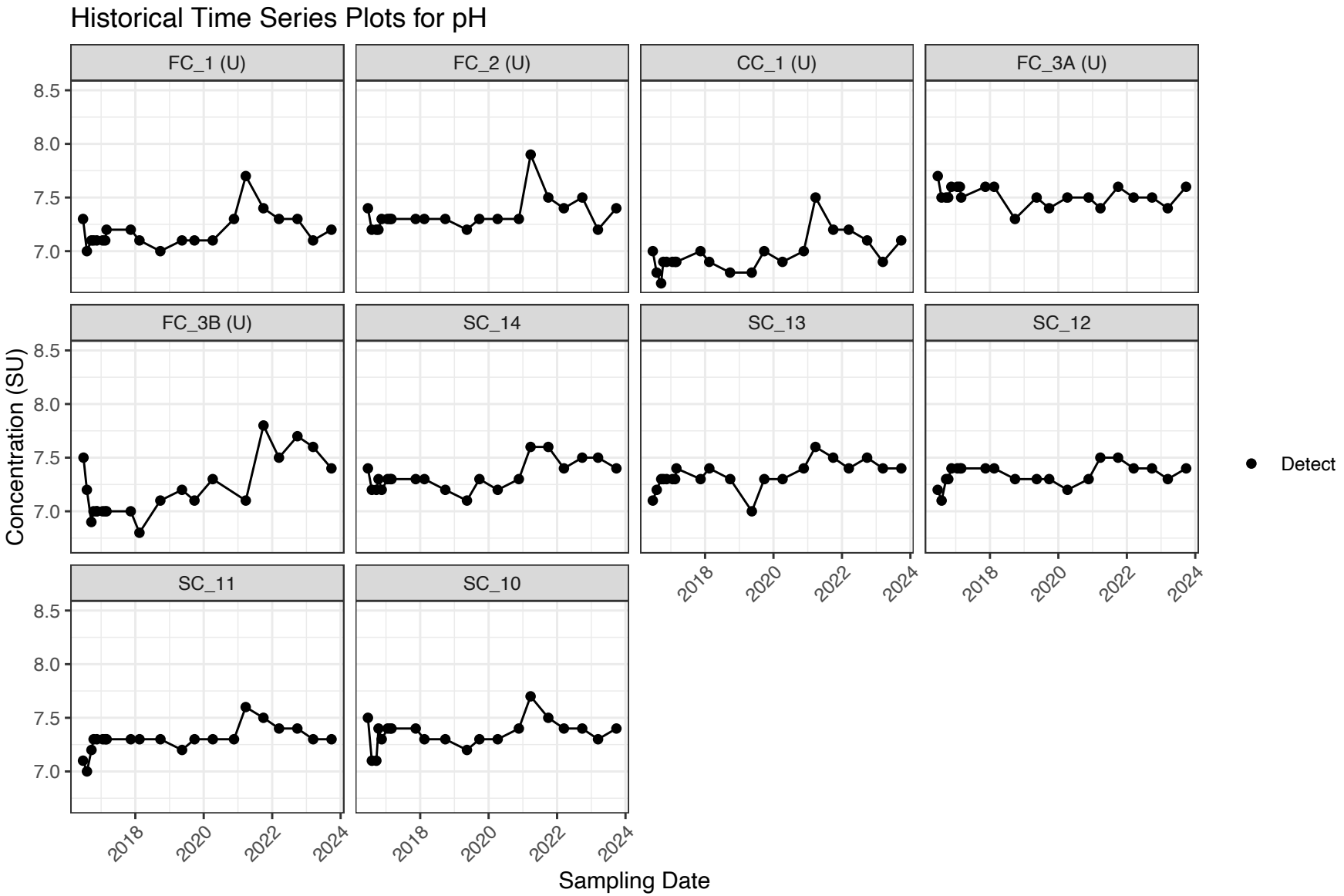


Figure 17: Time Series Plots

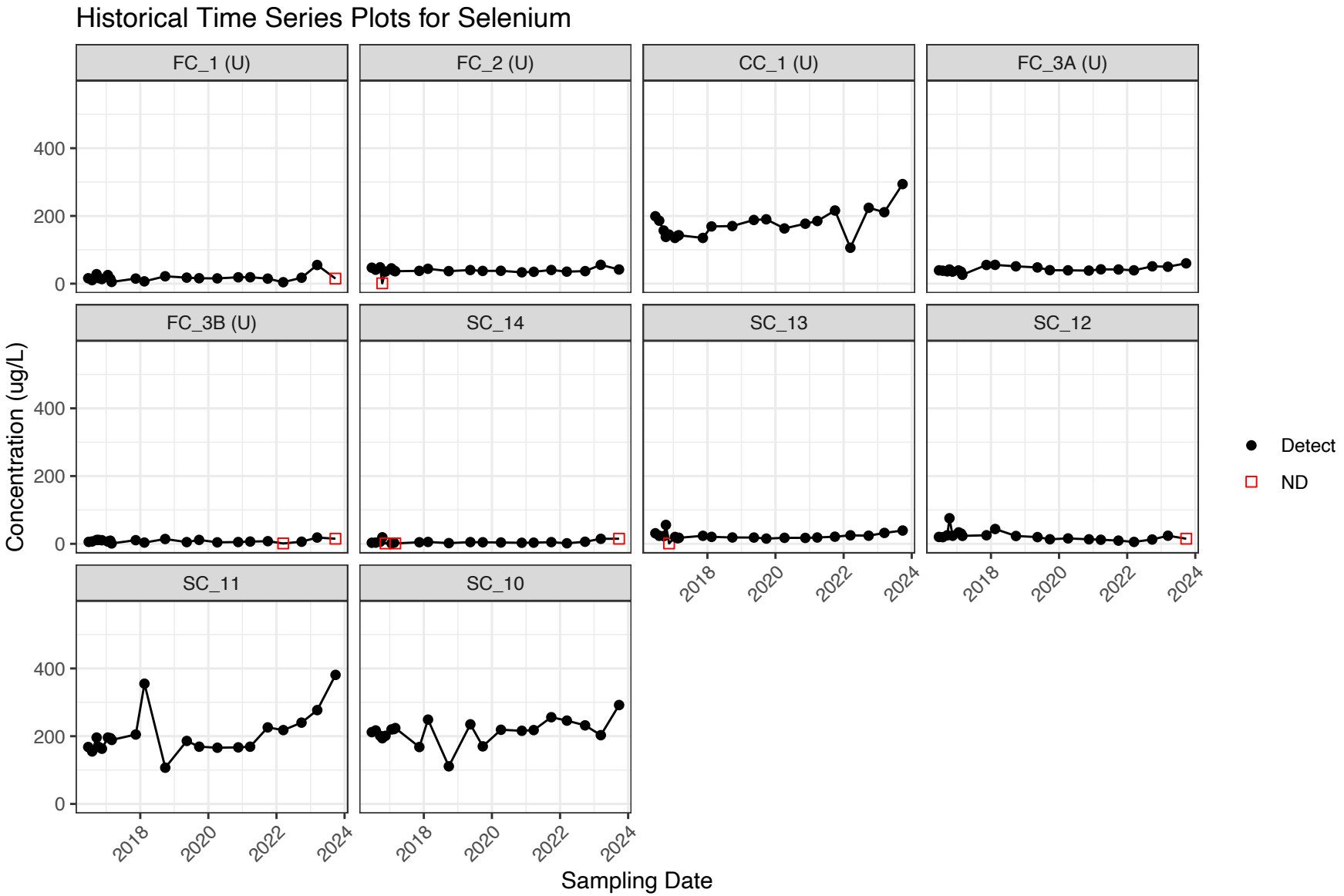


Figure 18: Time Series Plots

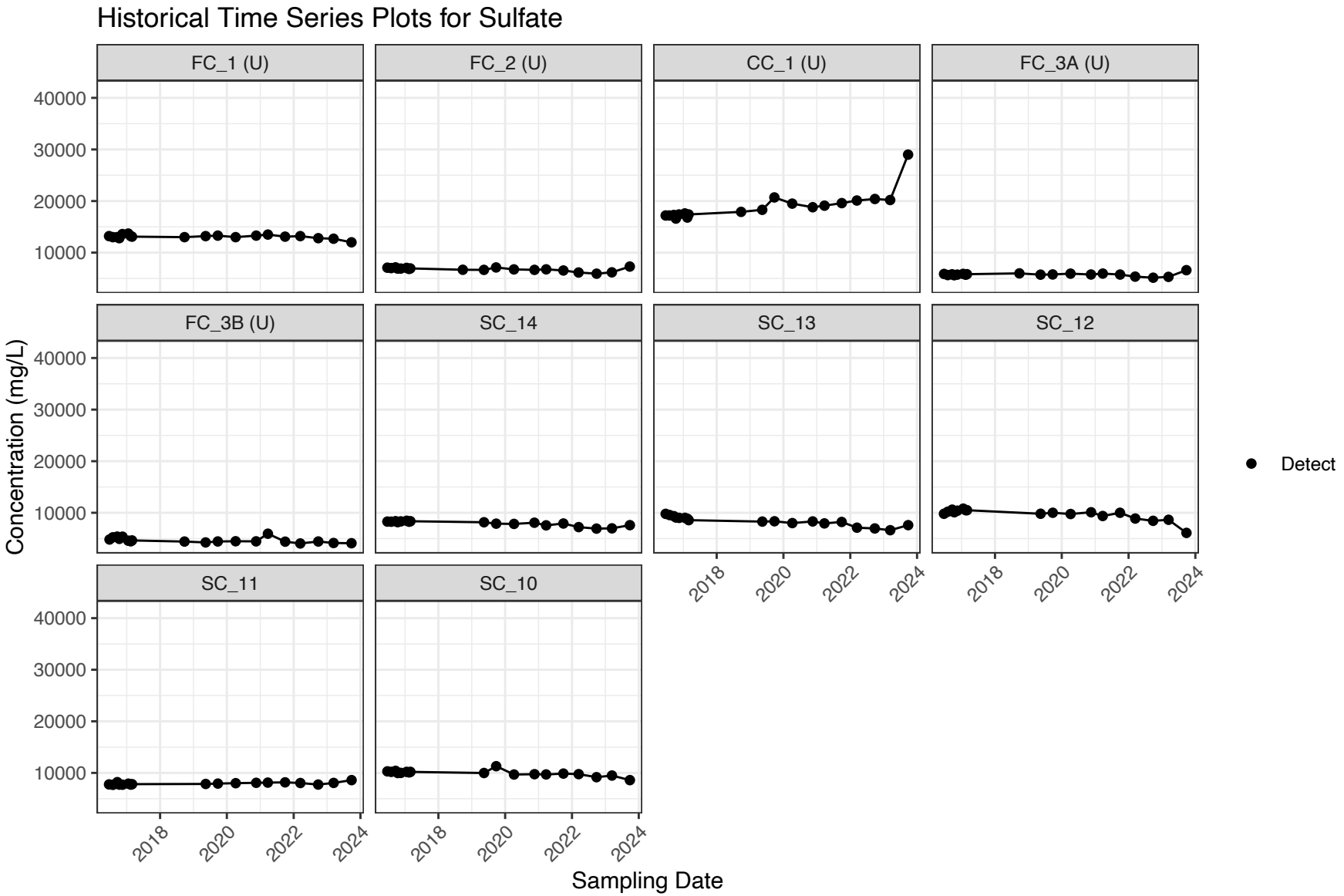


Figure 19: Time Series Plots

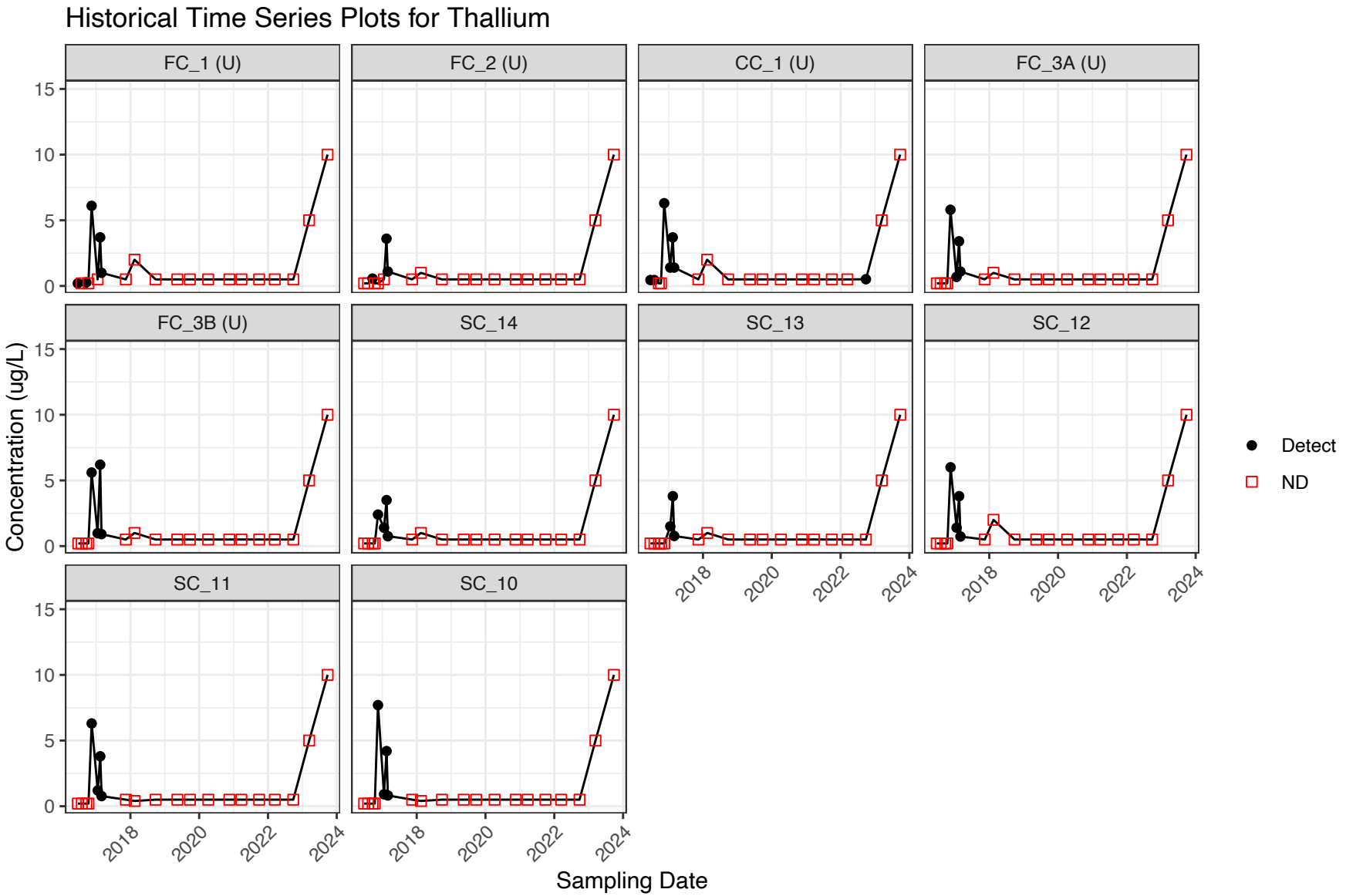


Figure 20: Time Series Plots

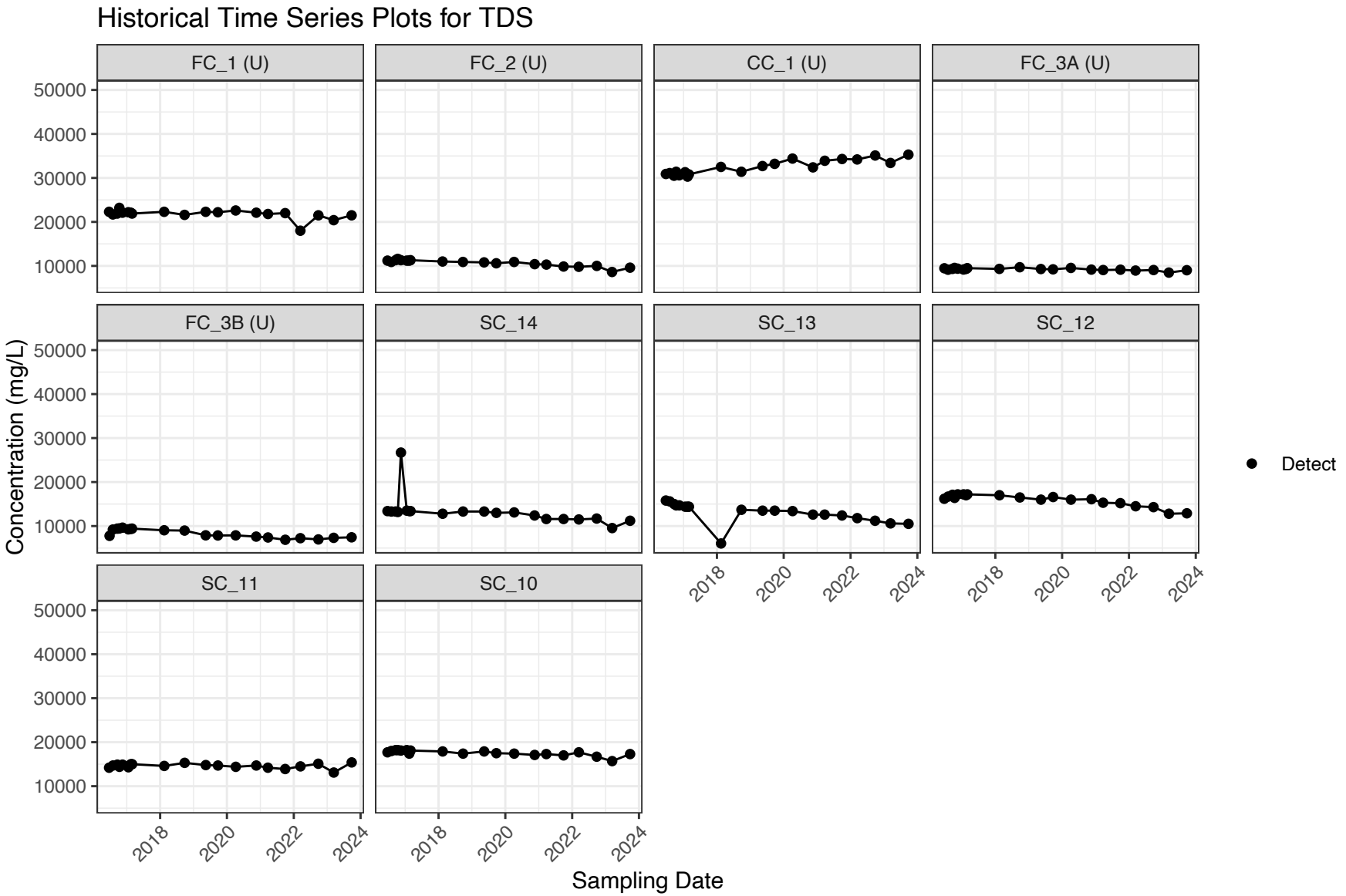


Figure 21: Time Series Plots

Box Plots

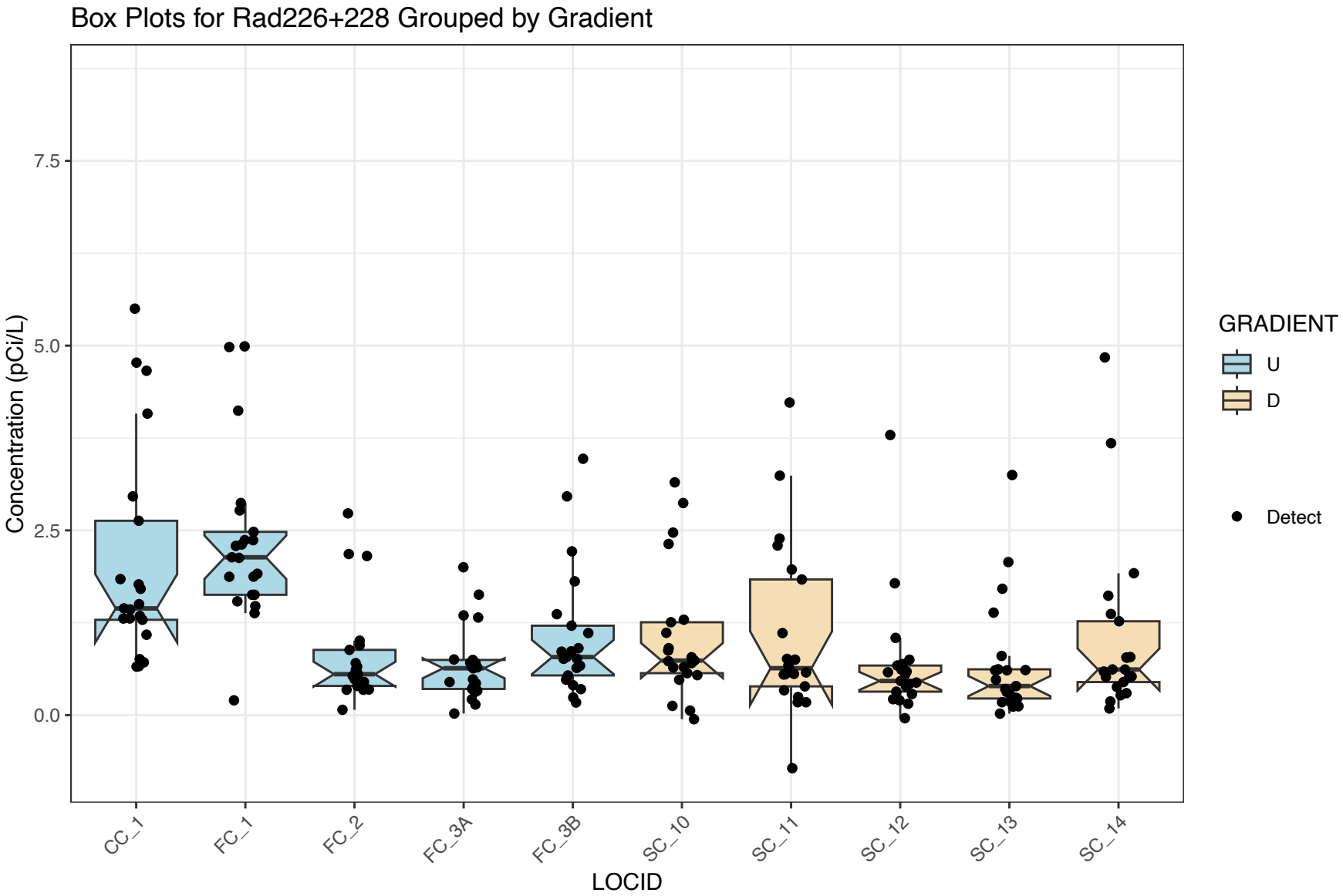


Figure 22: Box Plots

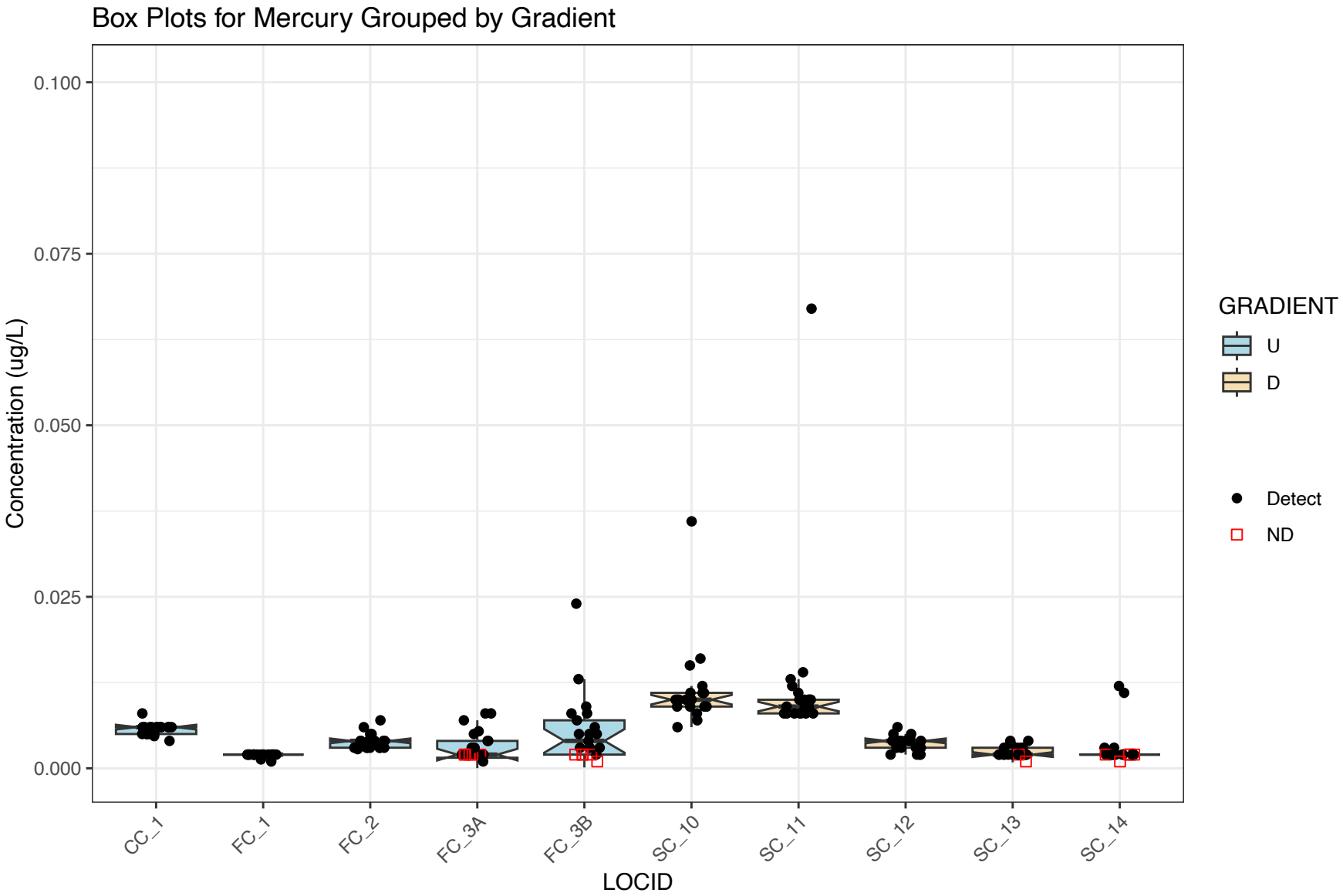


Figure 23: Box Plots

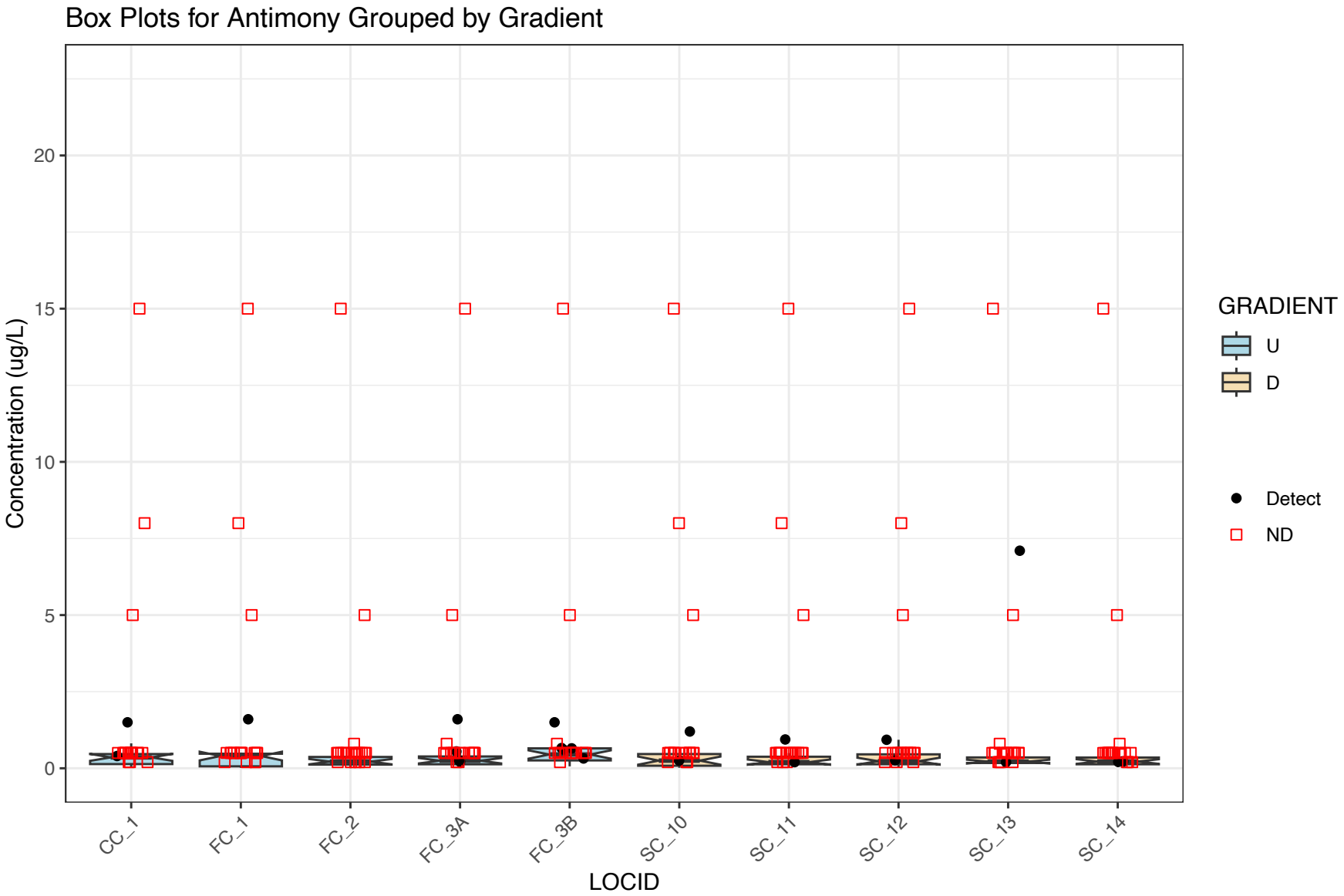


Figure 24: Box Plots

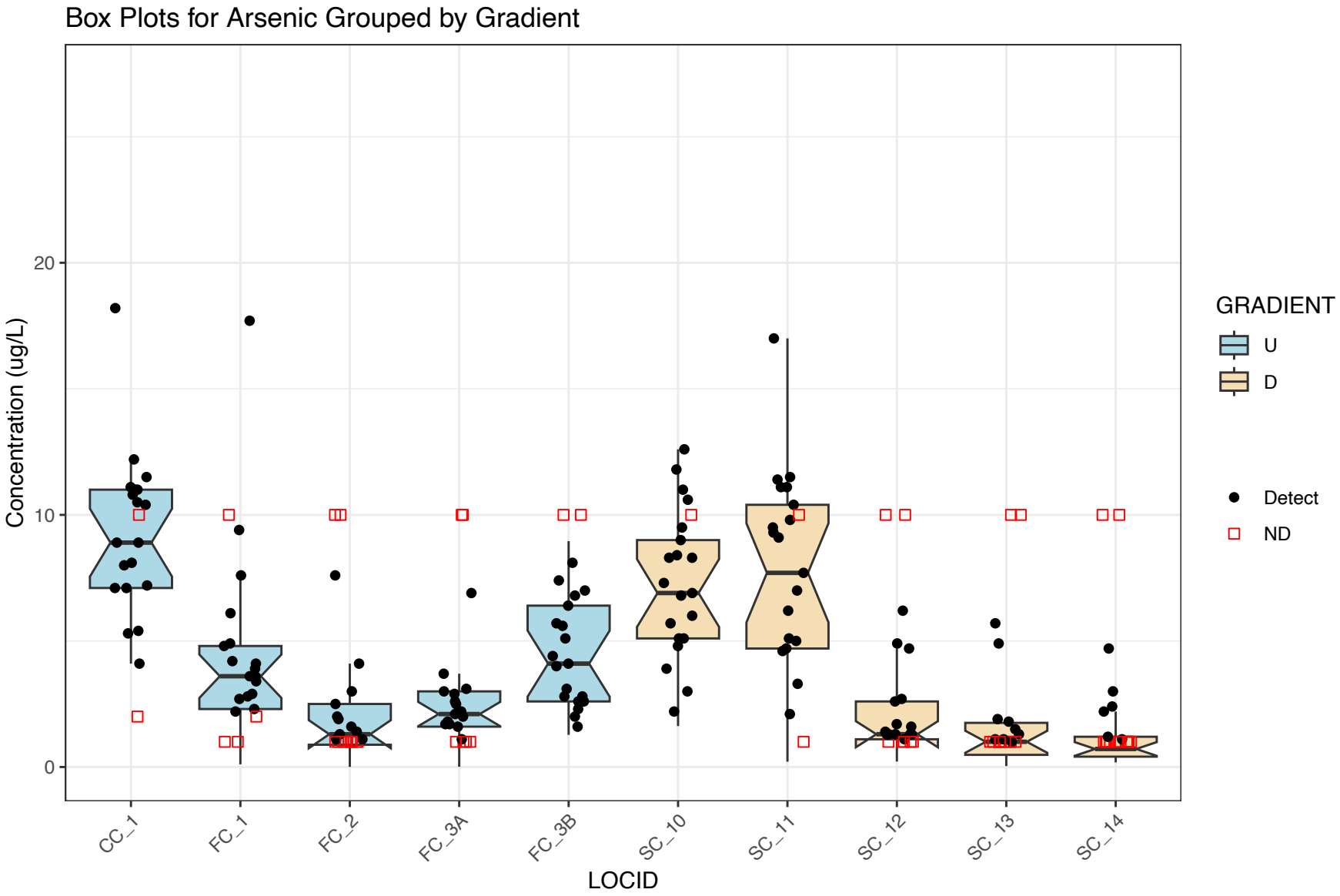


Figure 25: Box Plots

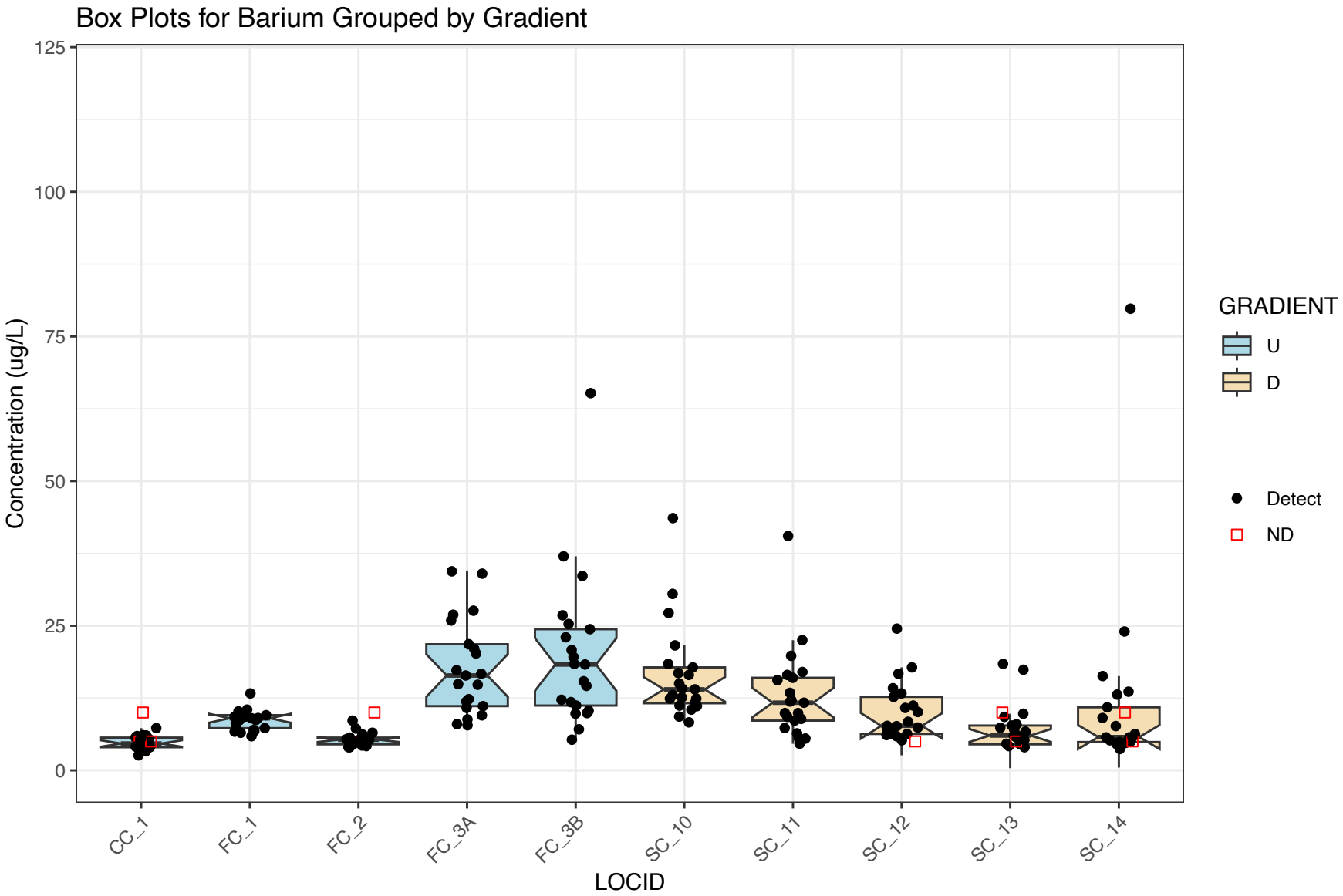


Figure 26: Box Plots

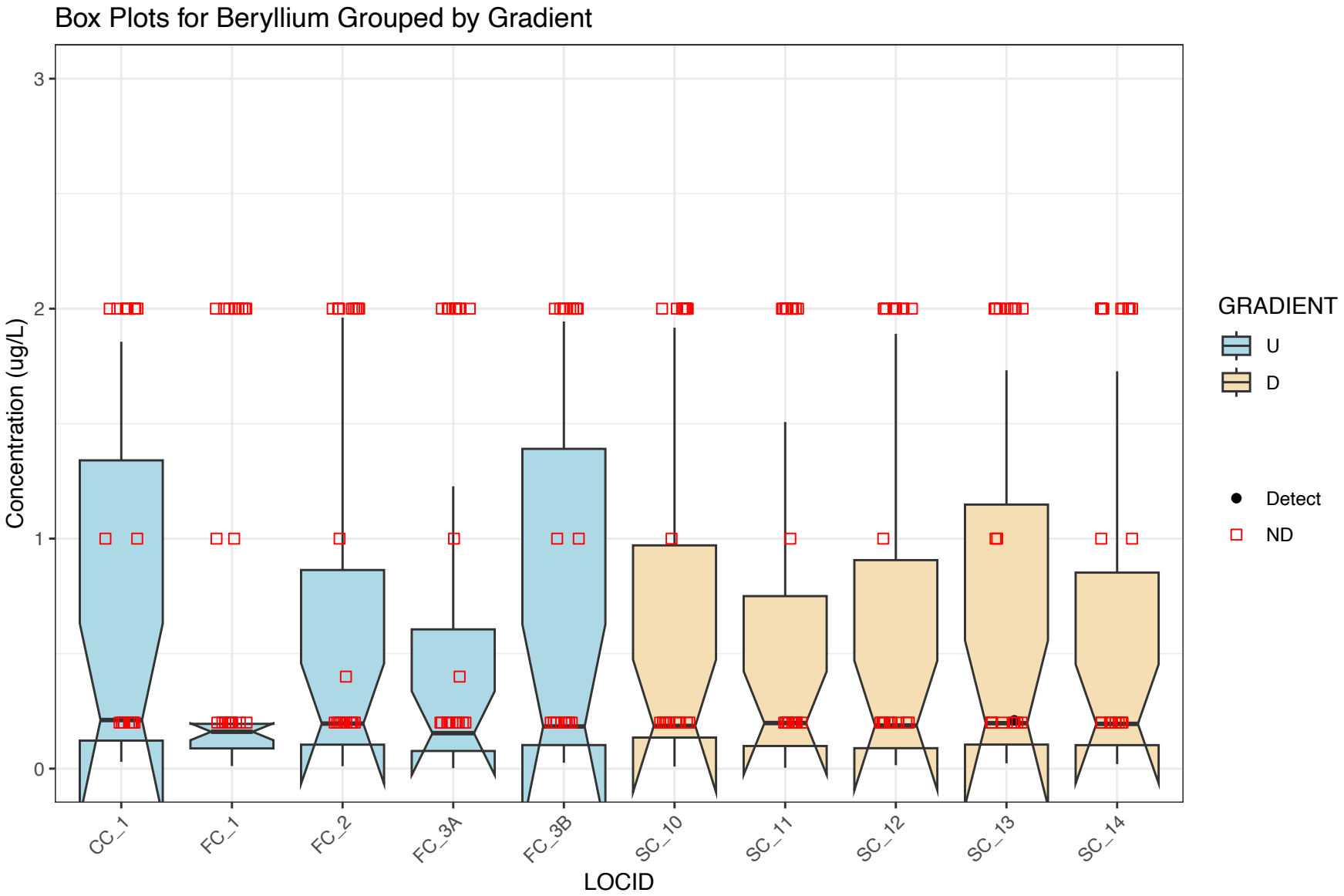


Figure 27: Box Plots

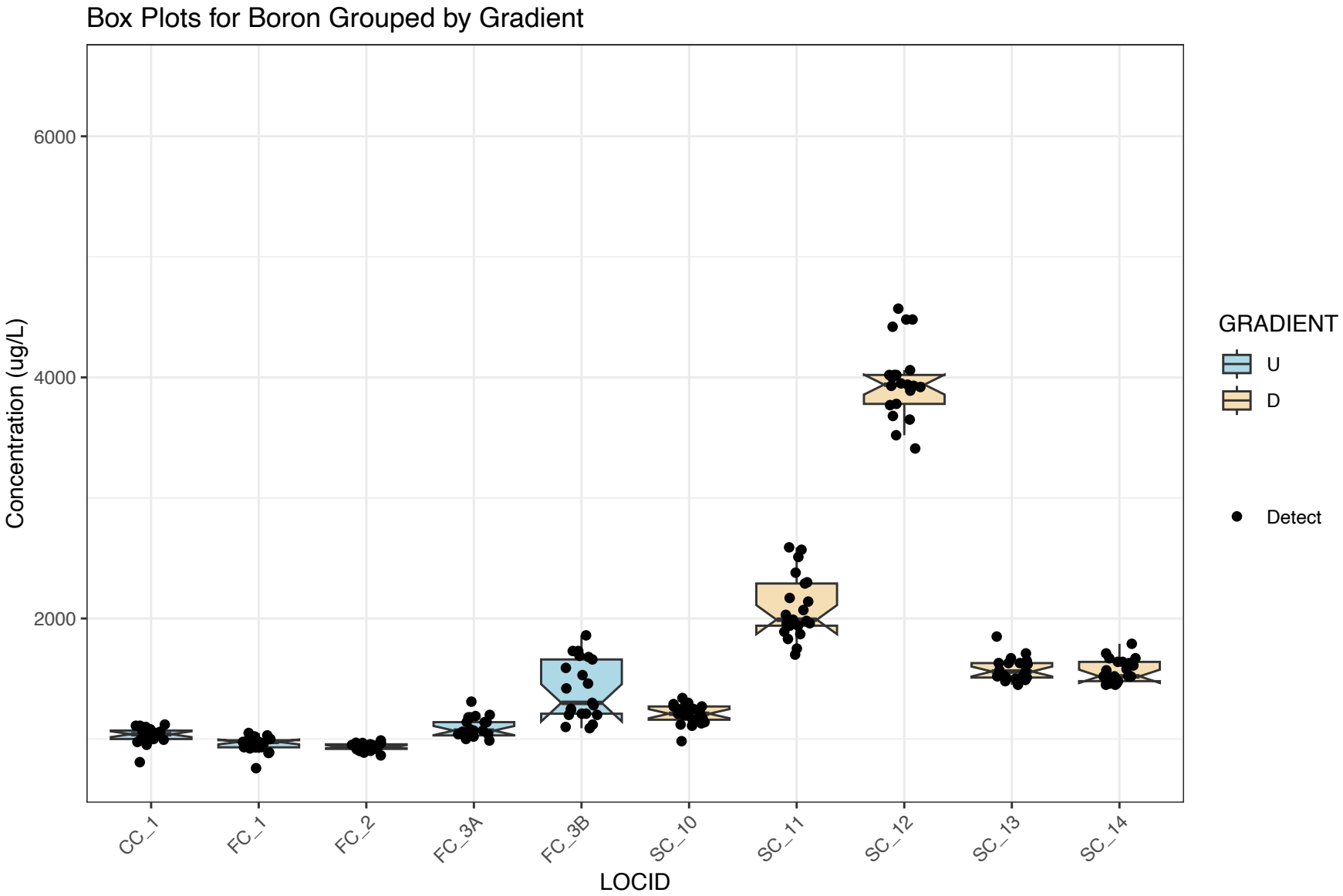


Figure 28: Box Plots

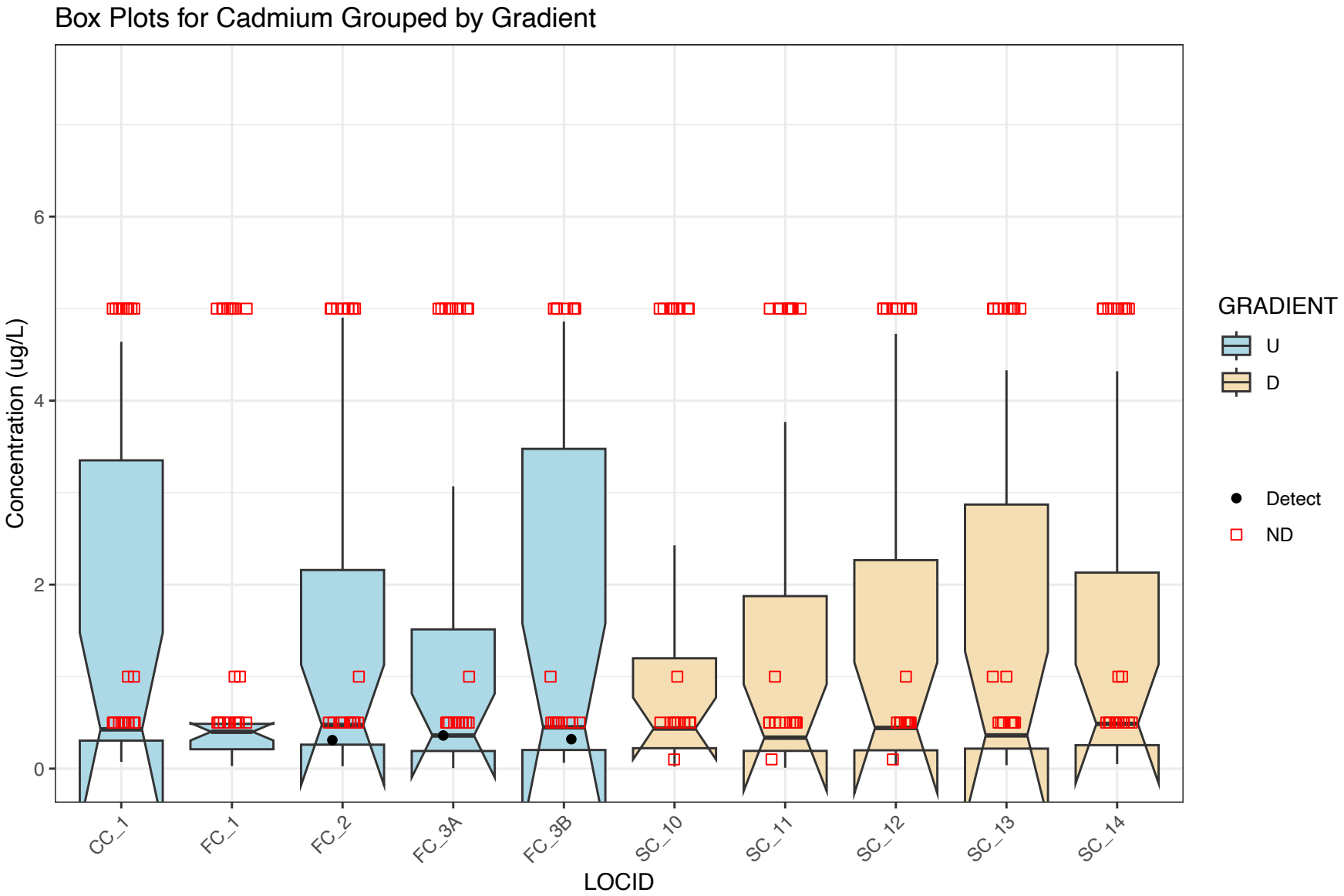


Figure 29: Box Plots

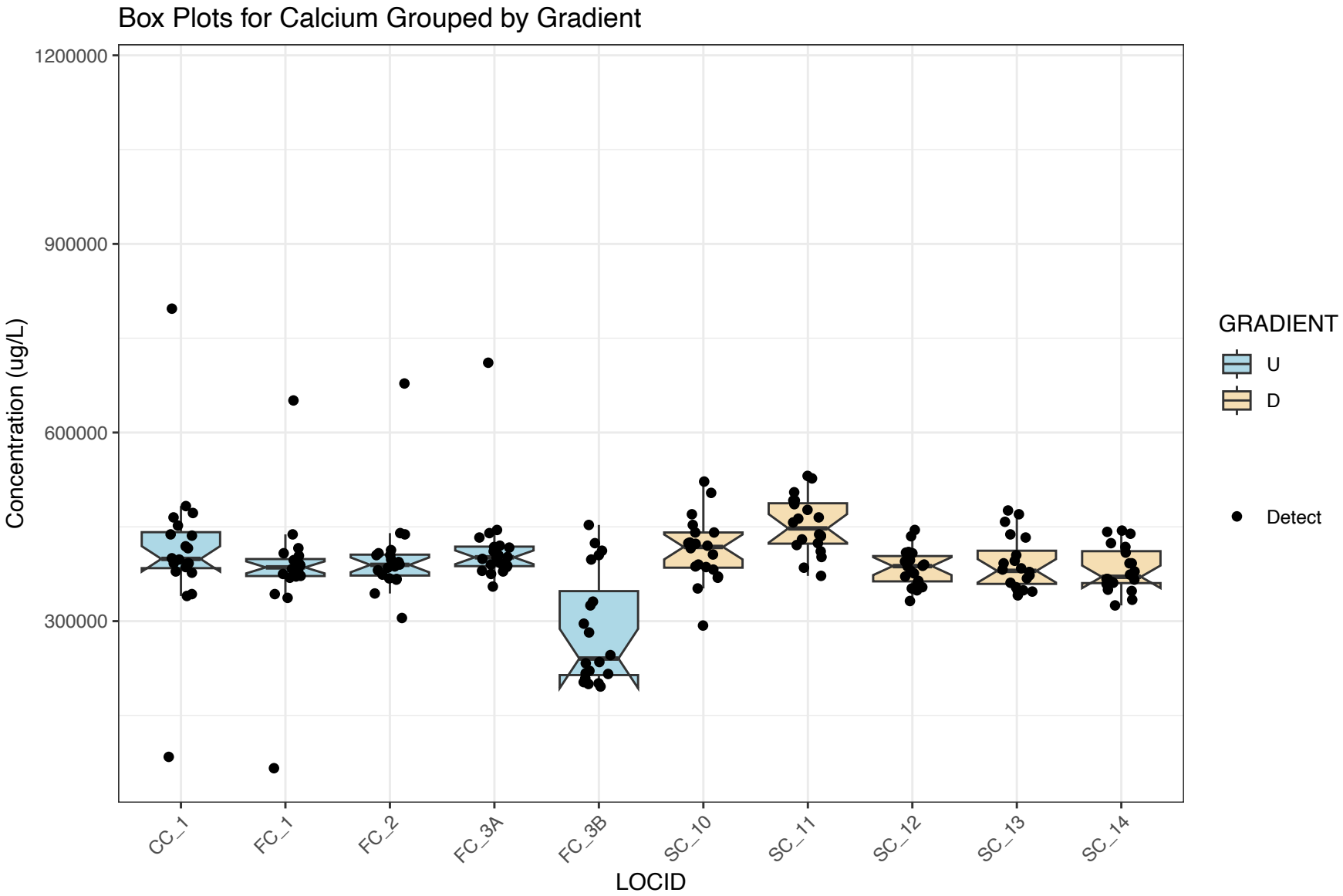


Figure 30: Box Plots

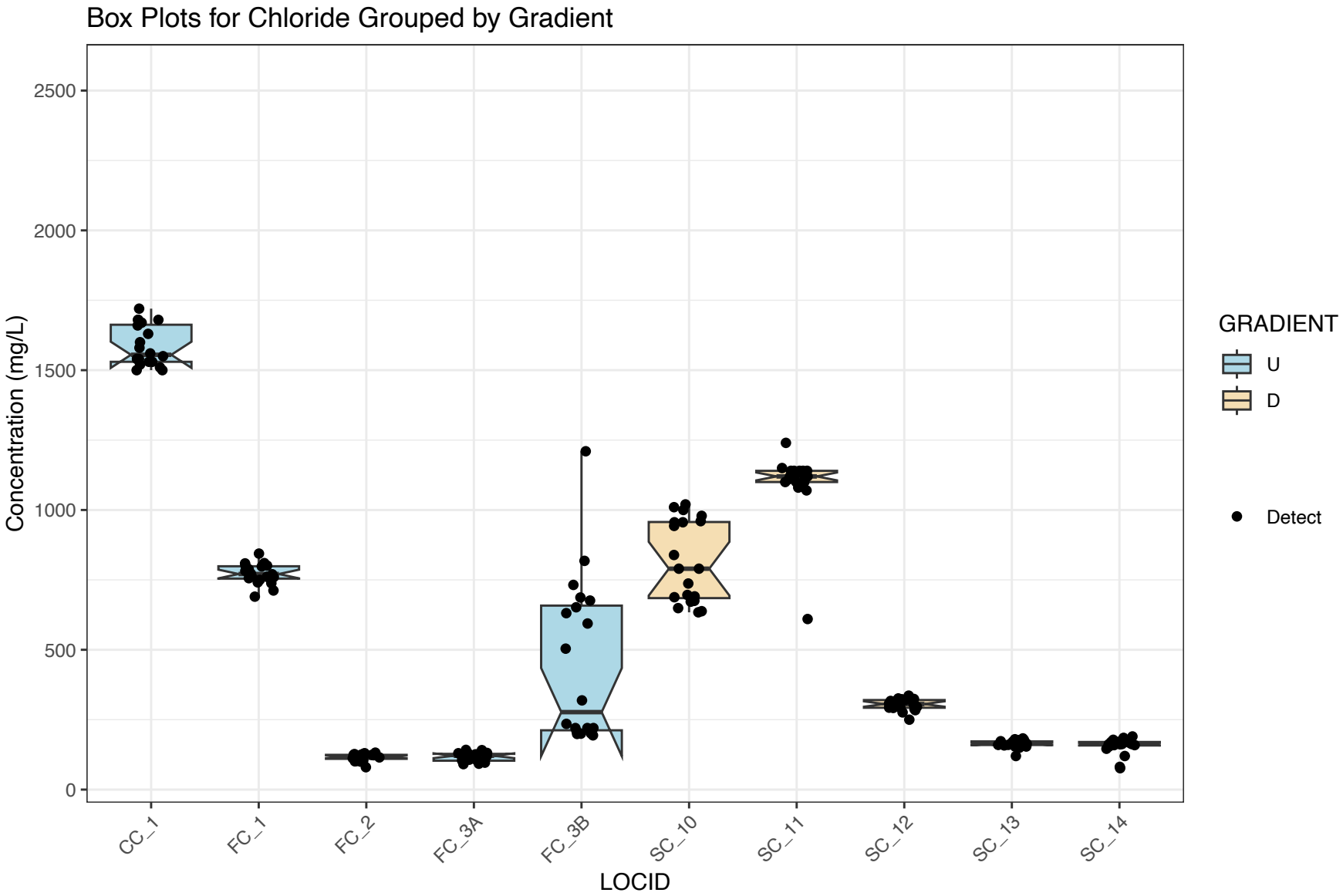


Figure 31: Box Plots

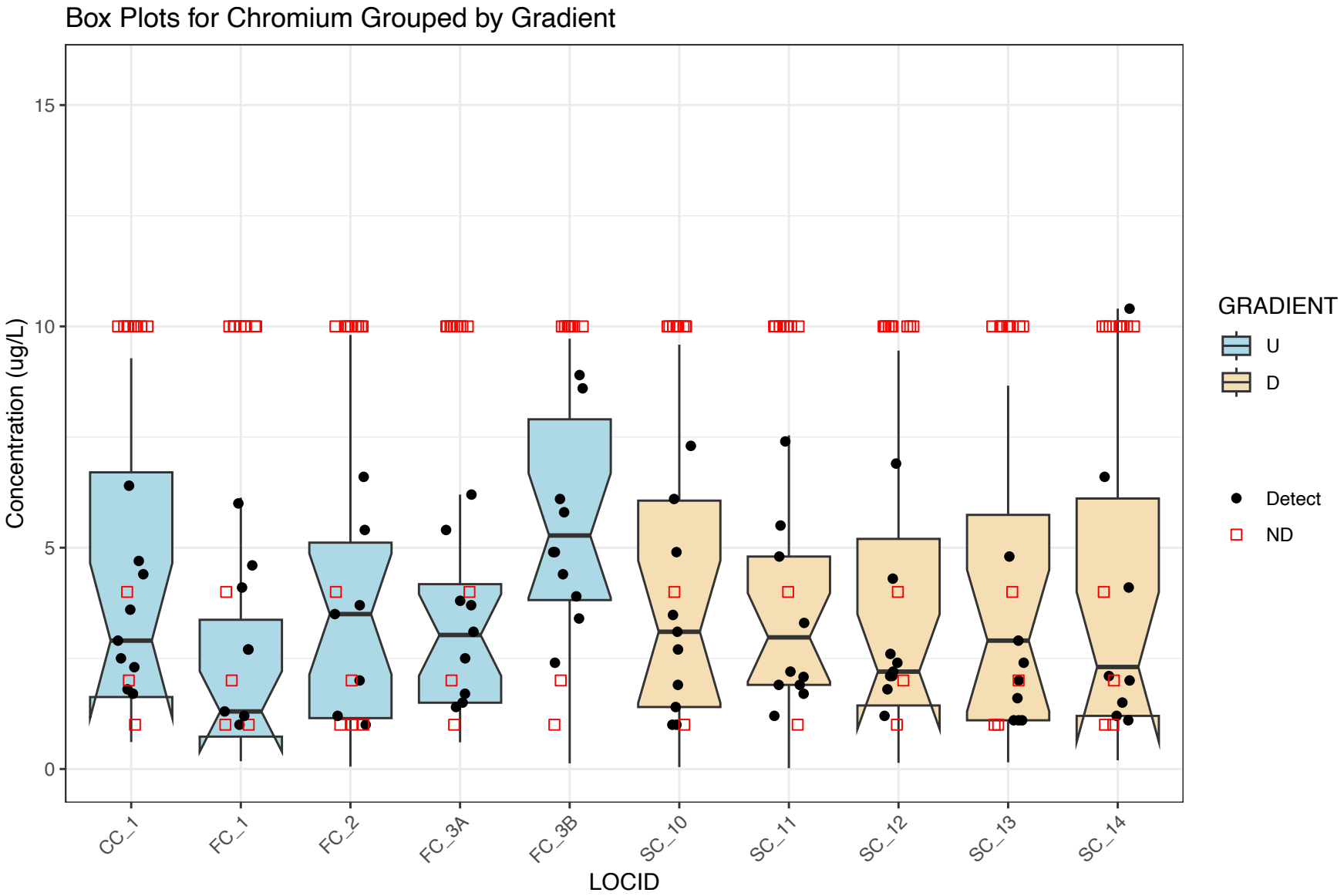


Figure 32: Box Plots

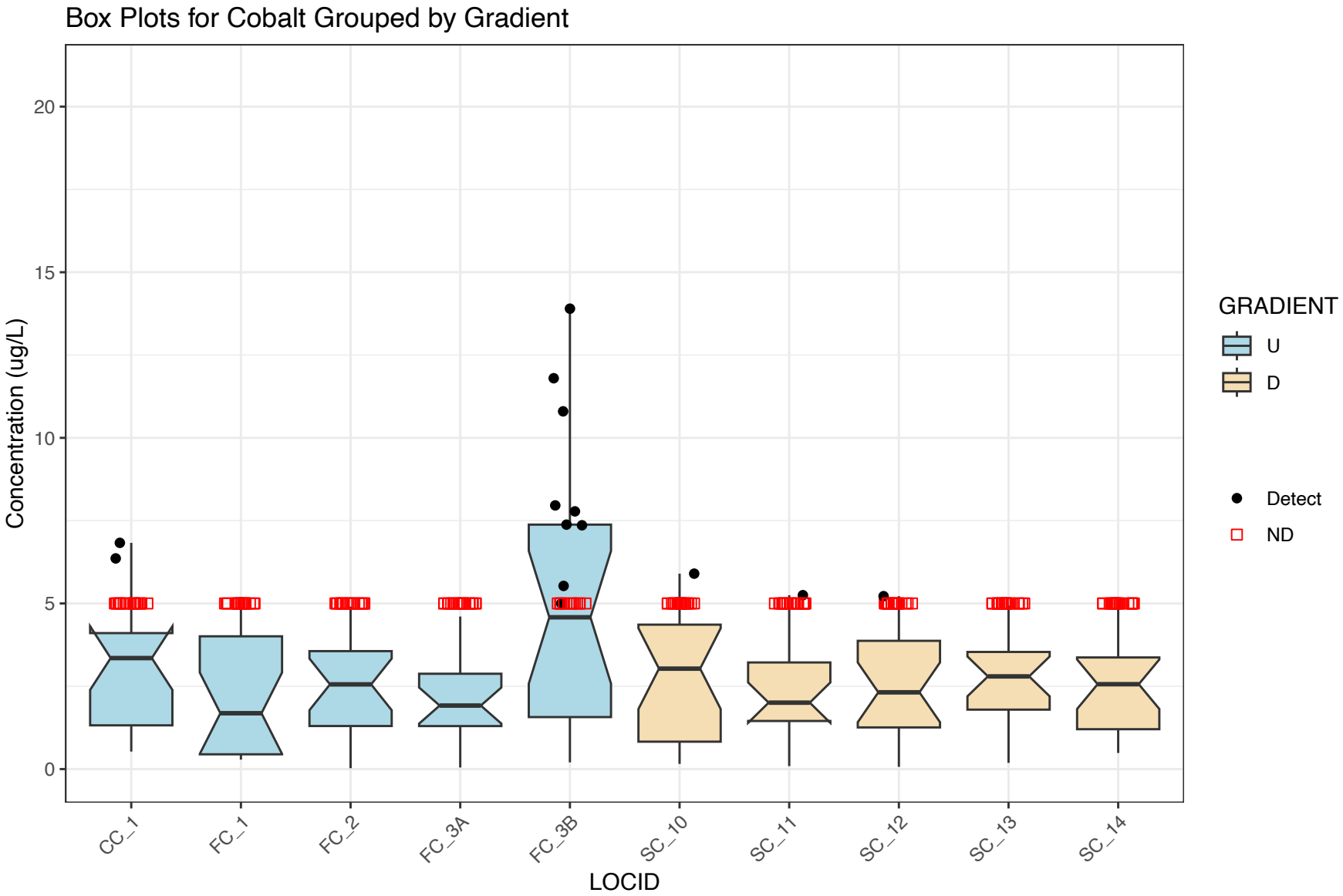


Figure 33: Box Plots

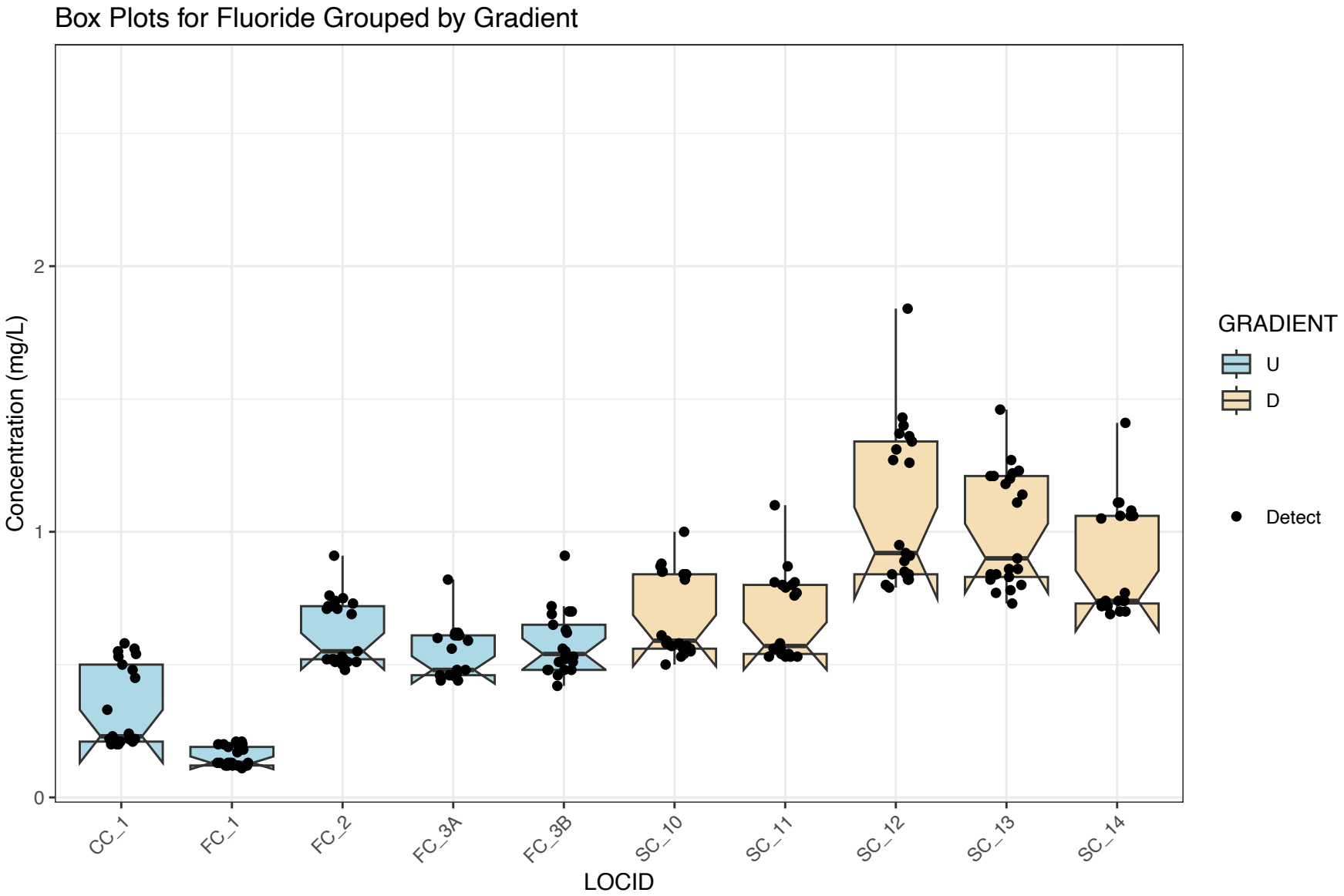


Figure 34: Box Plots

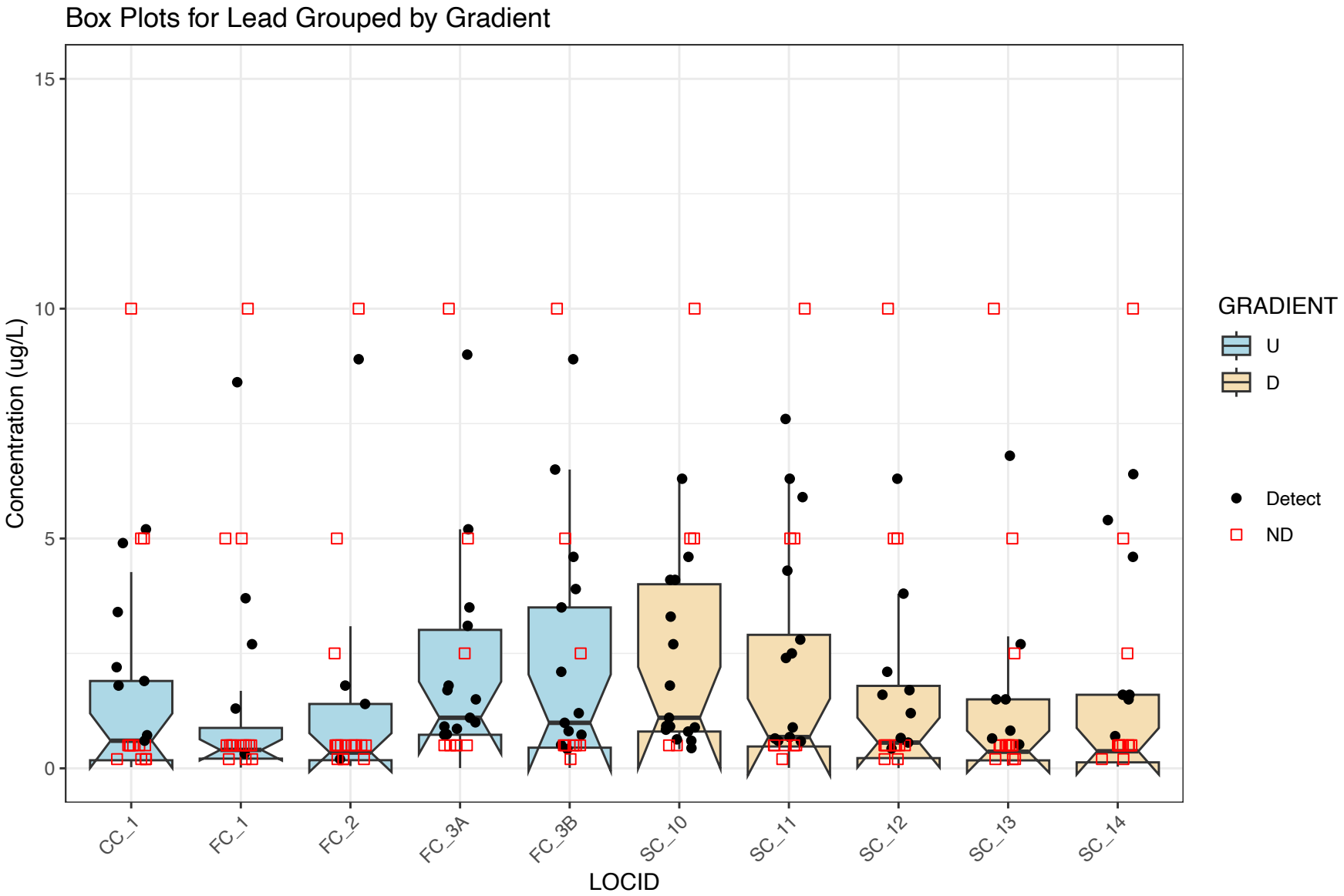


Figure 35: Box Plots

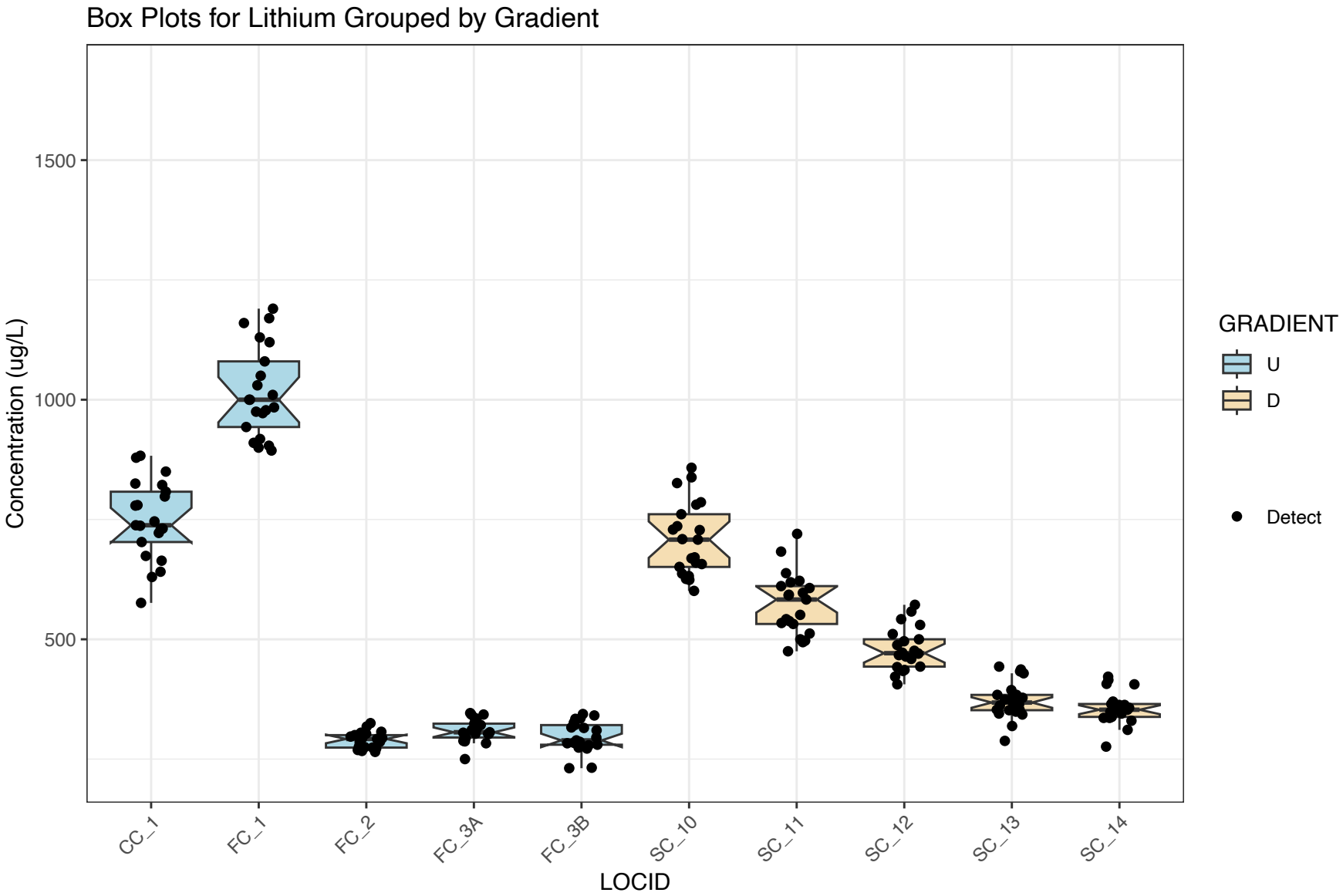


Figure 36: Box Plots

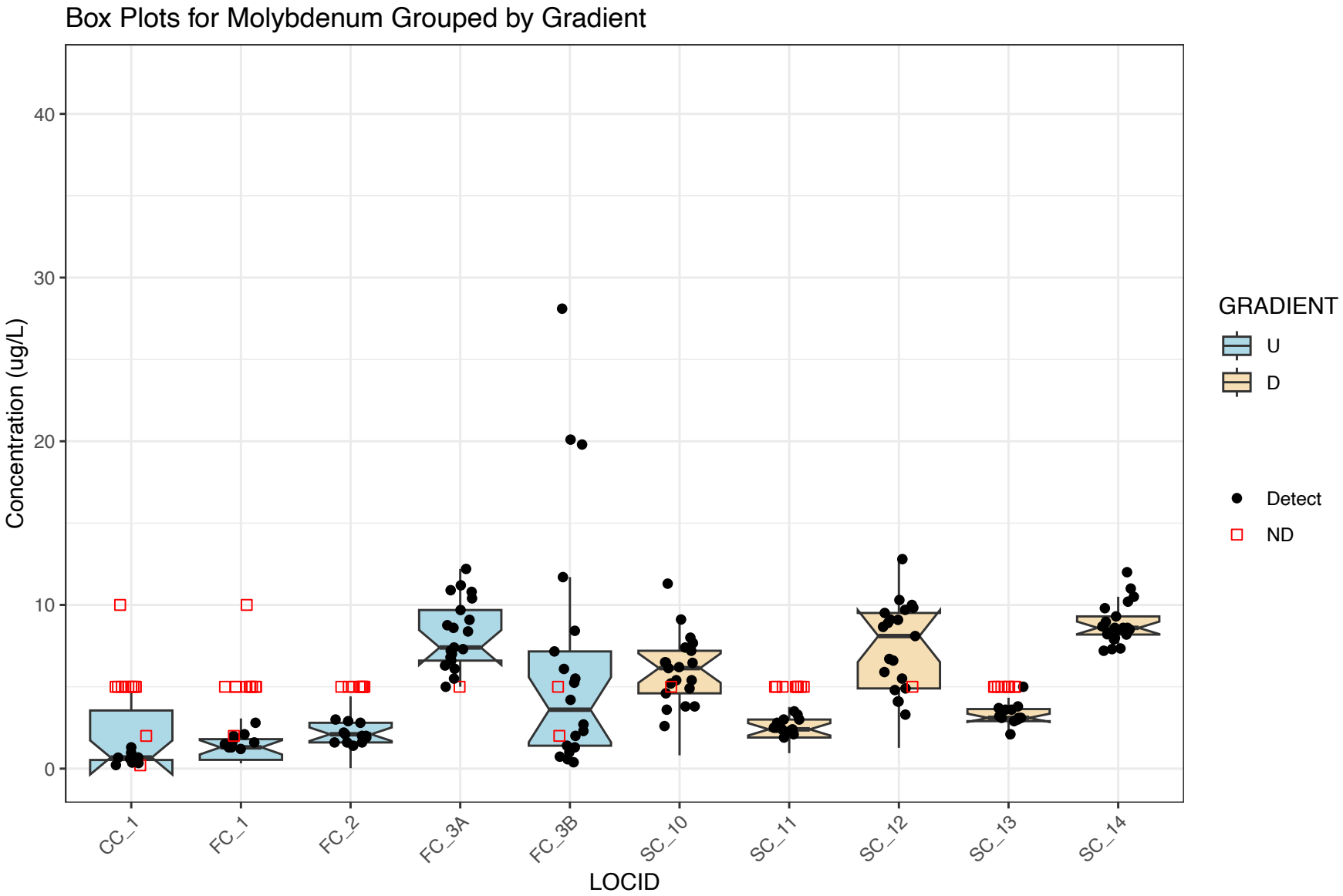


Figure 37: Box Plots

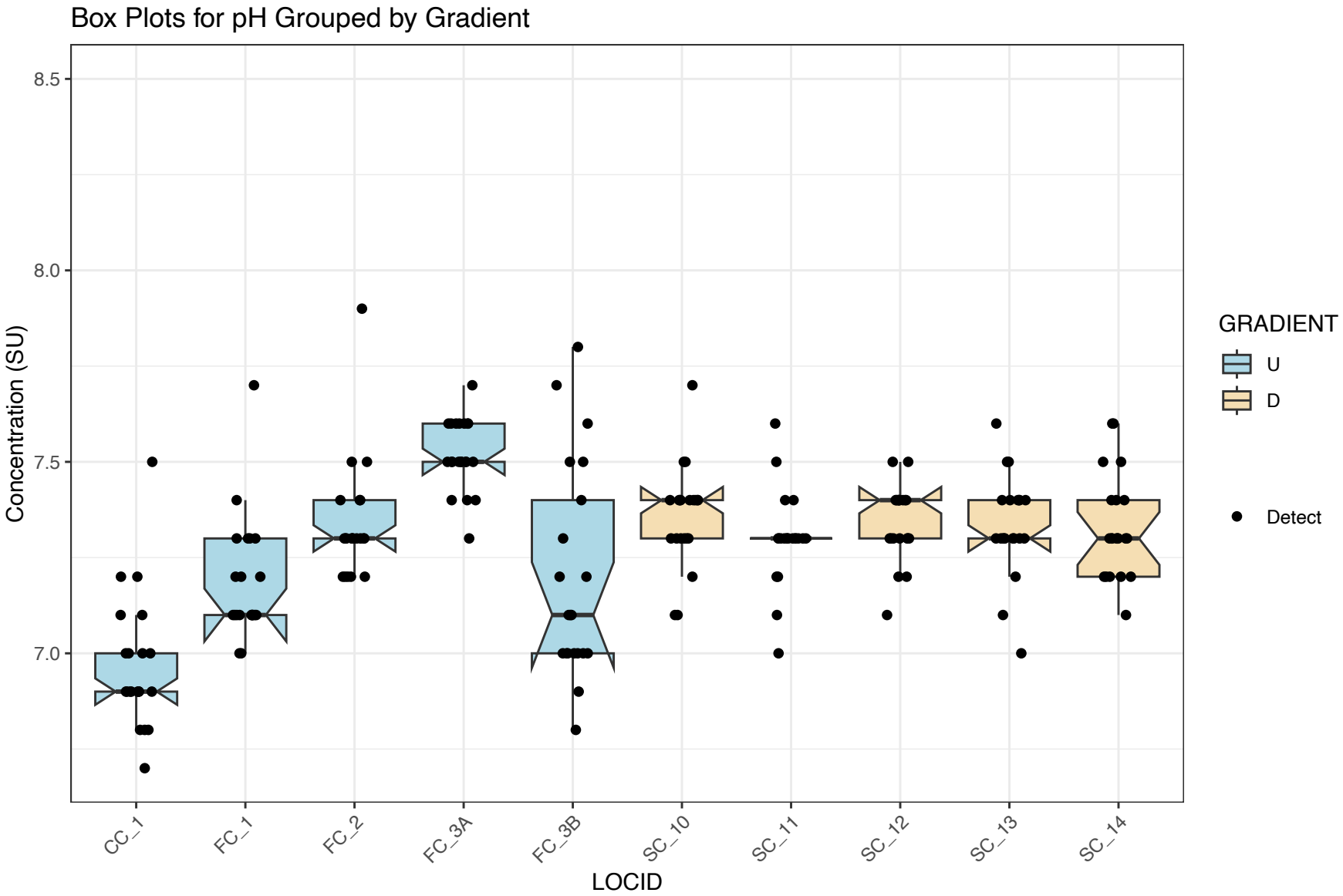


Figure 38: Box Plots

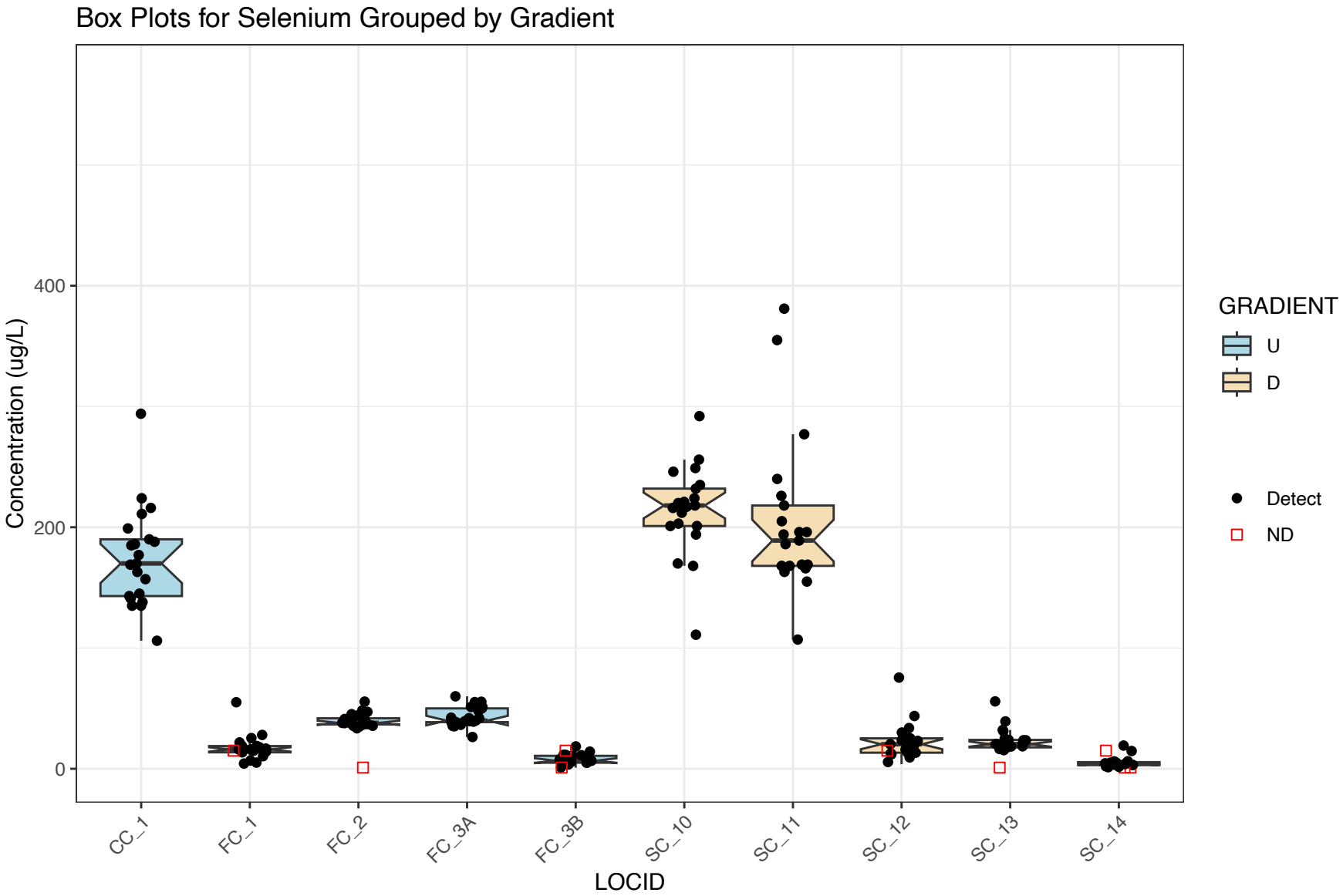


Figure 39: Box Plots

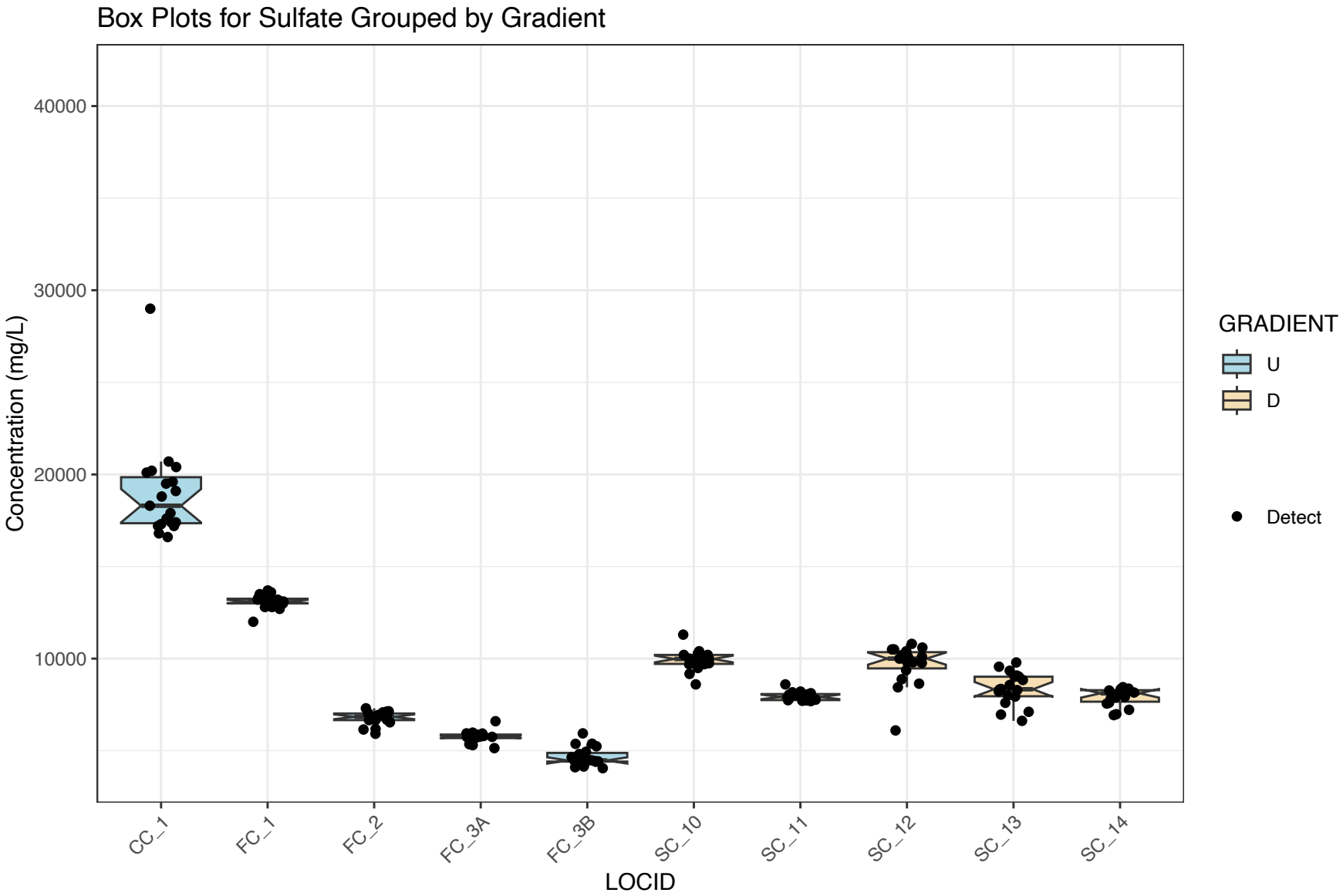


Figure 40: Box Plots

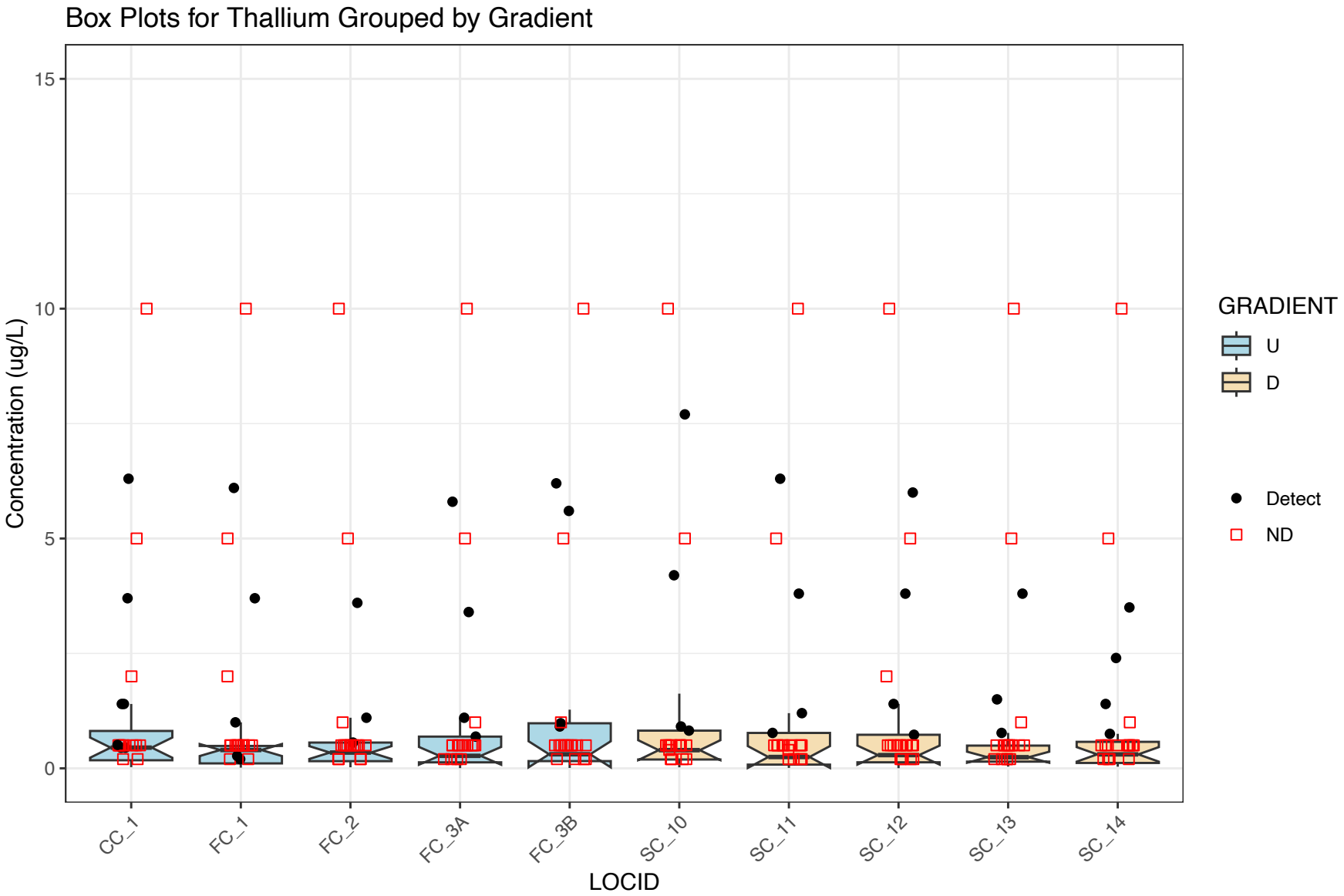


Figure 41: Box Plots

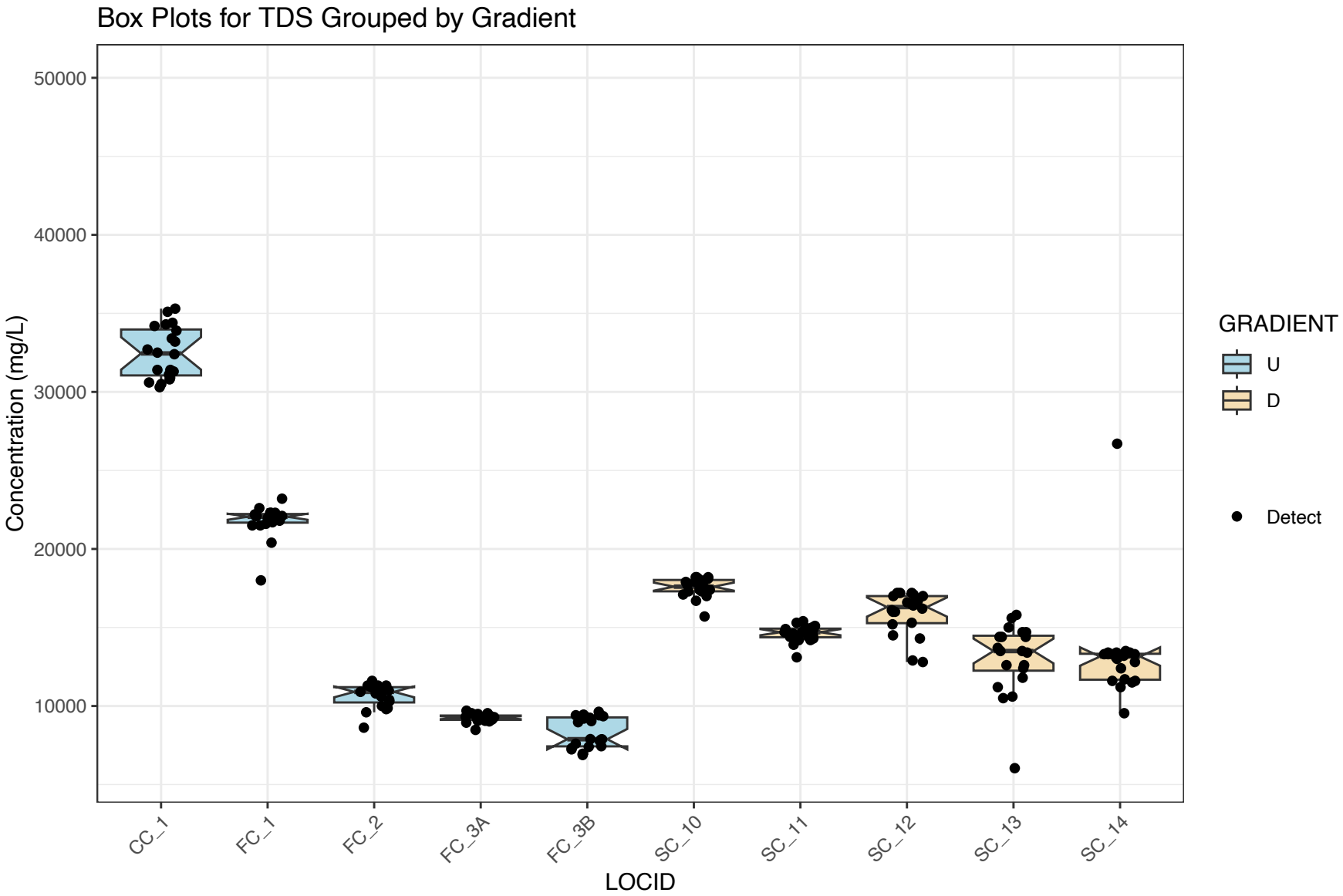


Figure 42: Box Plots

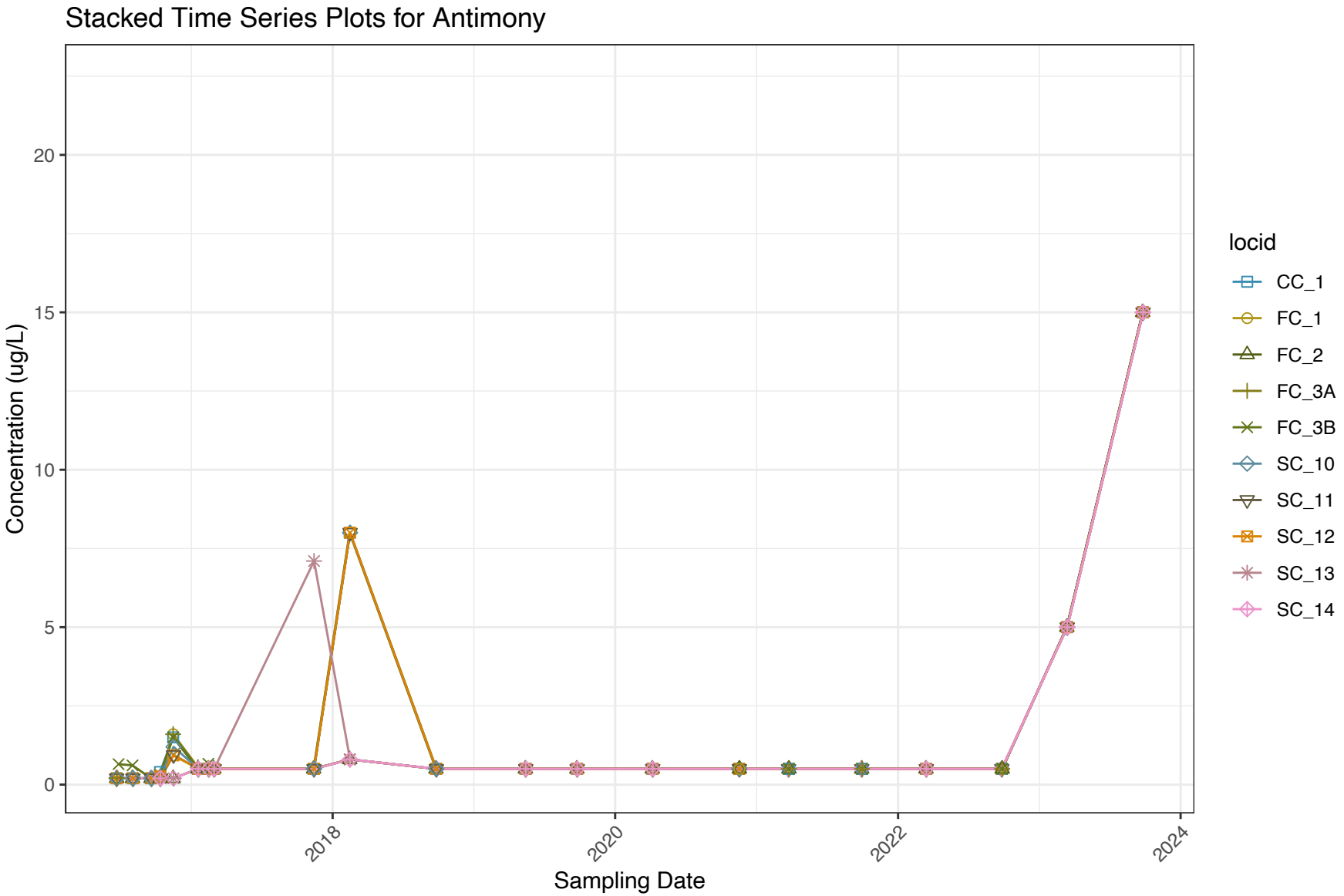


Figure 43: Stacked Time Series Plots

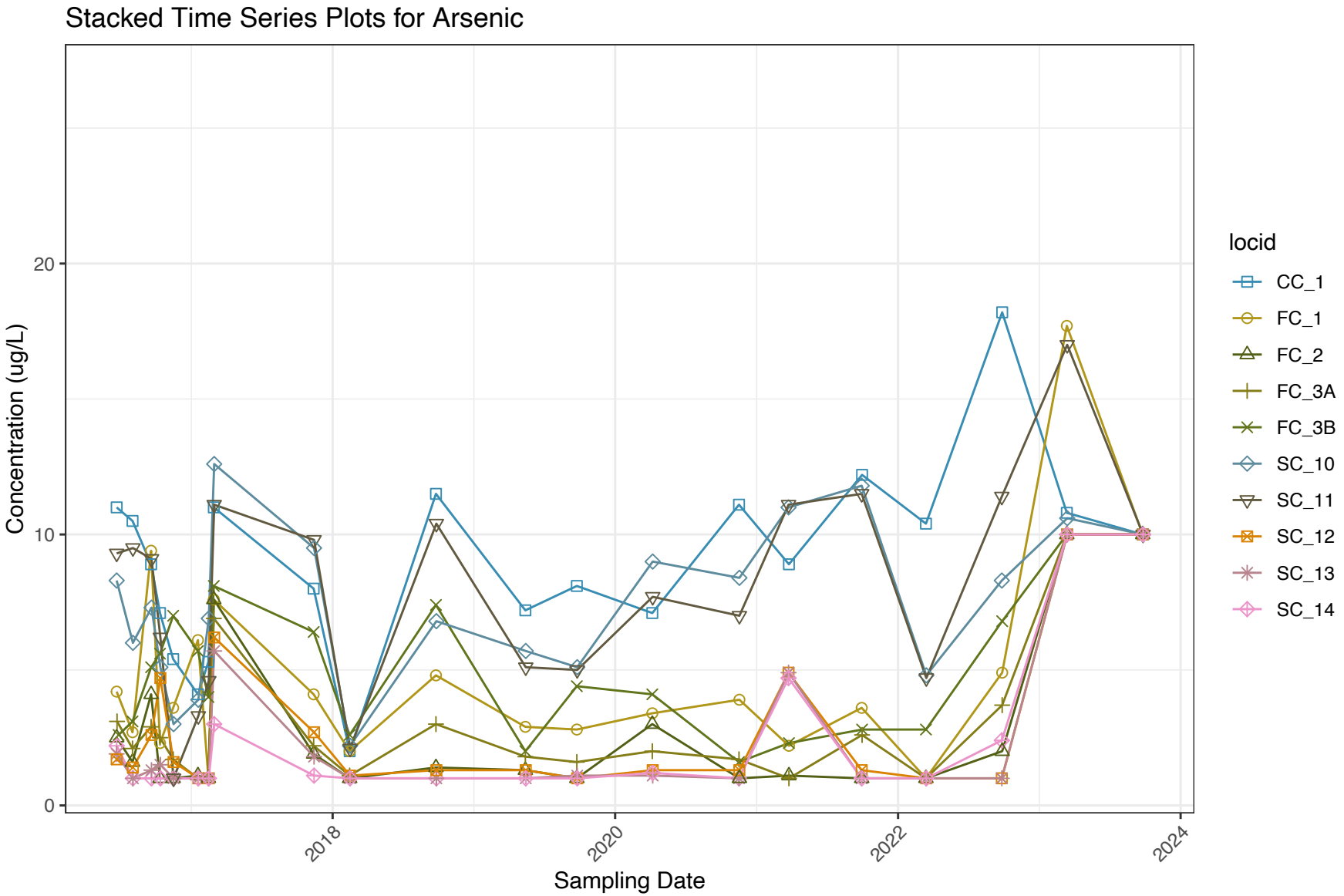


Figure 44: Stacked Time Series Plots

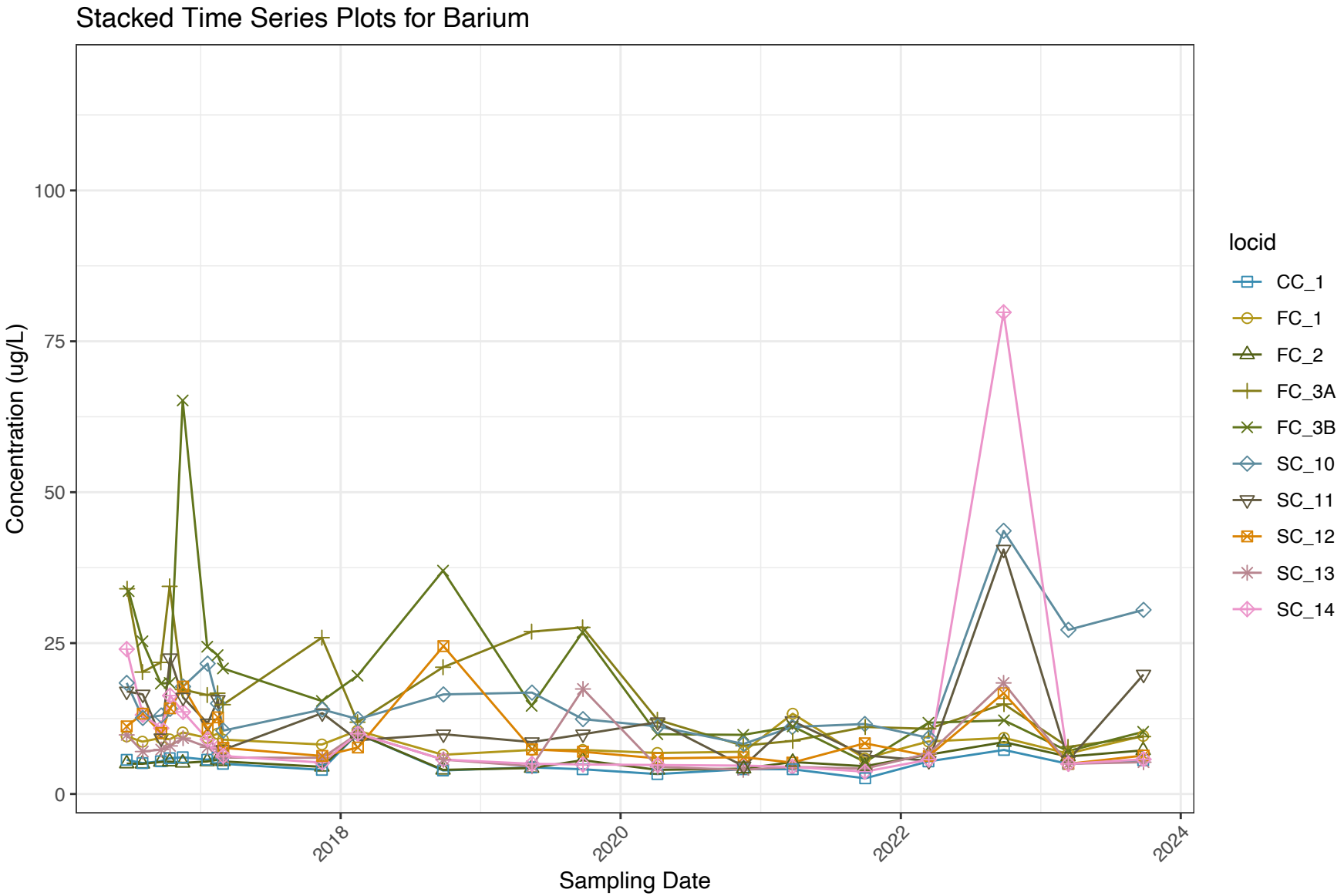


Figure 45: Stacked Time Series Plots

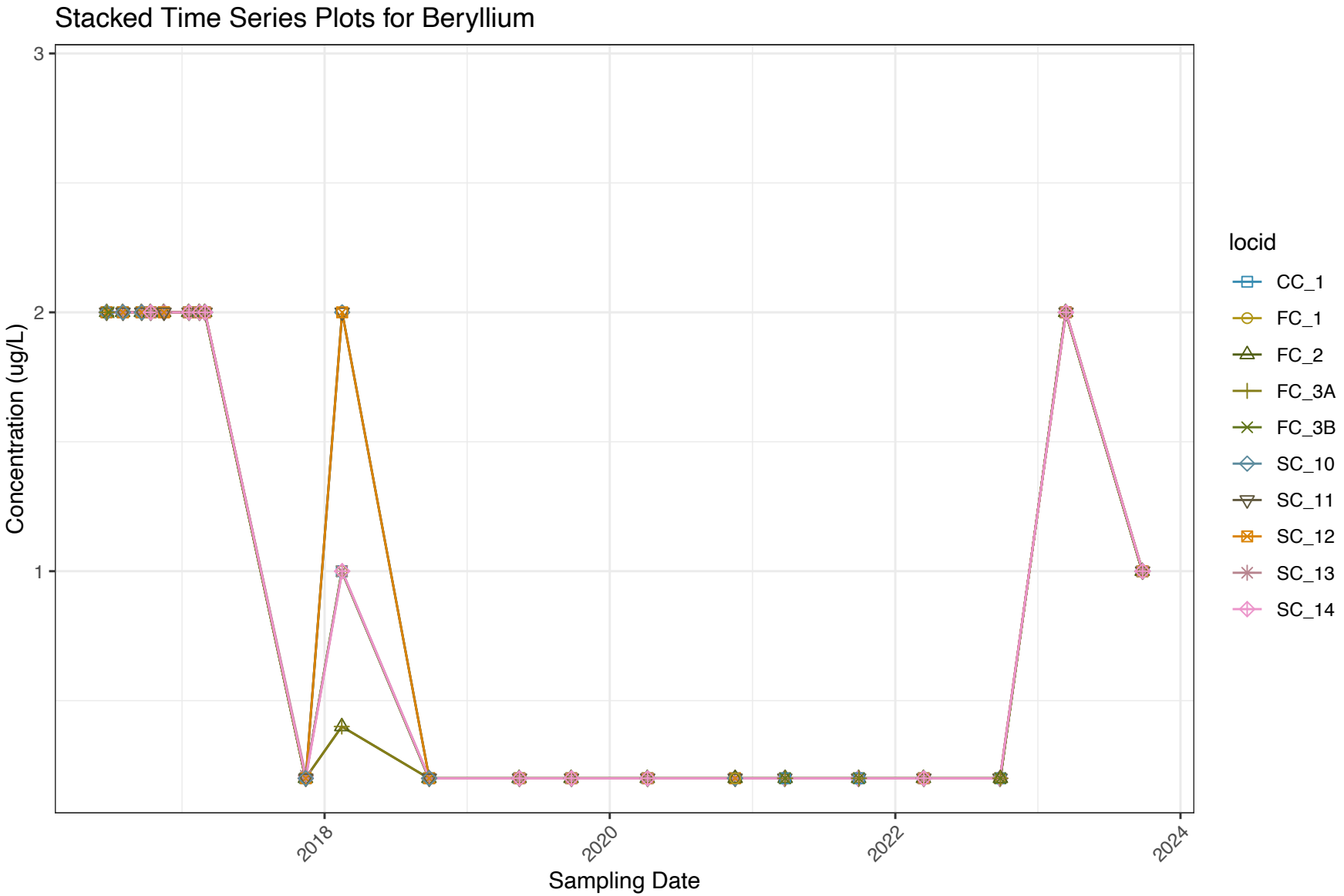


Figure 46: Stacked Time Series Plots

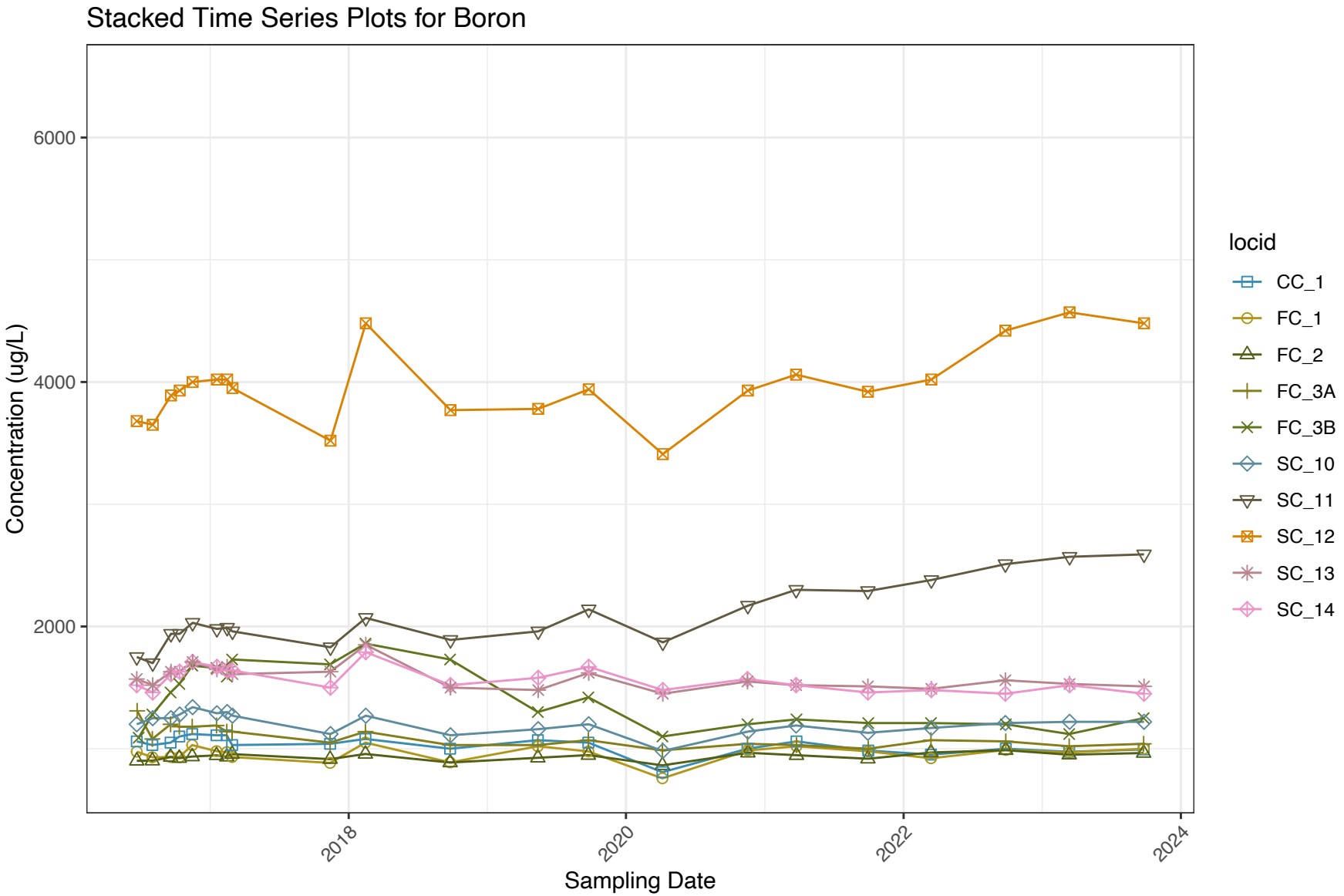


Figure 47: Stacked Time Series Plots

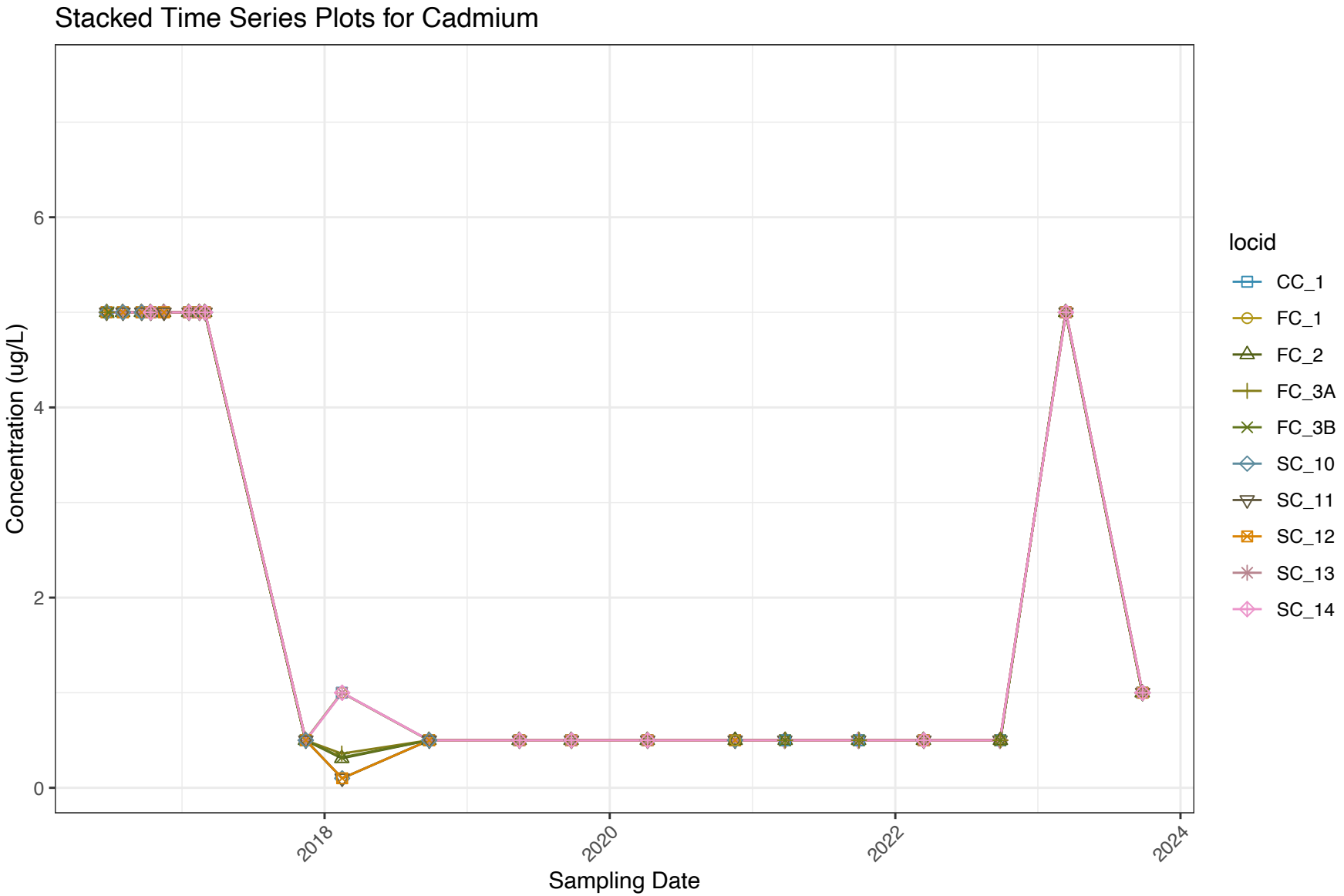


Figure 48: Stacked Time Series Plots

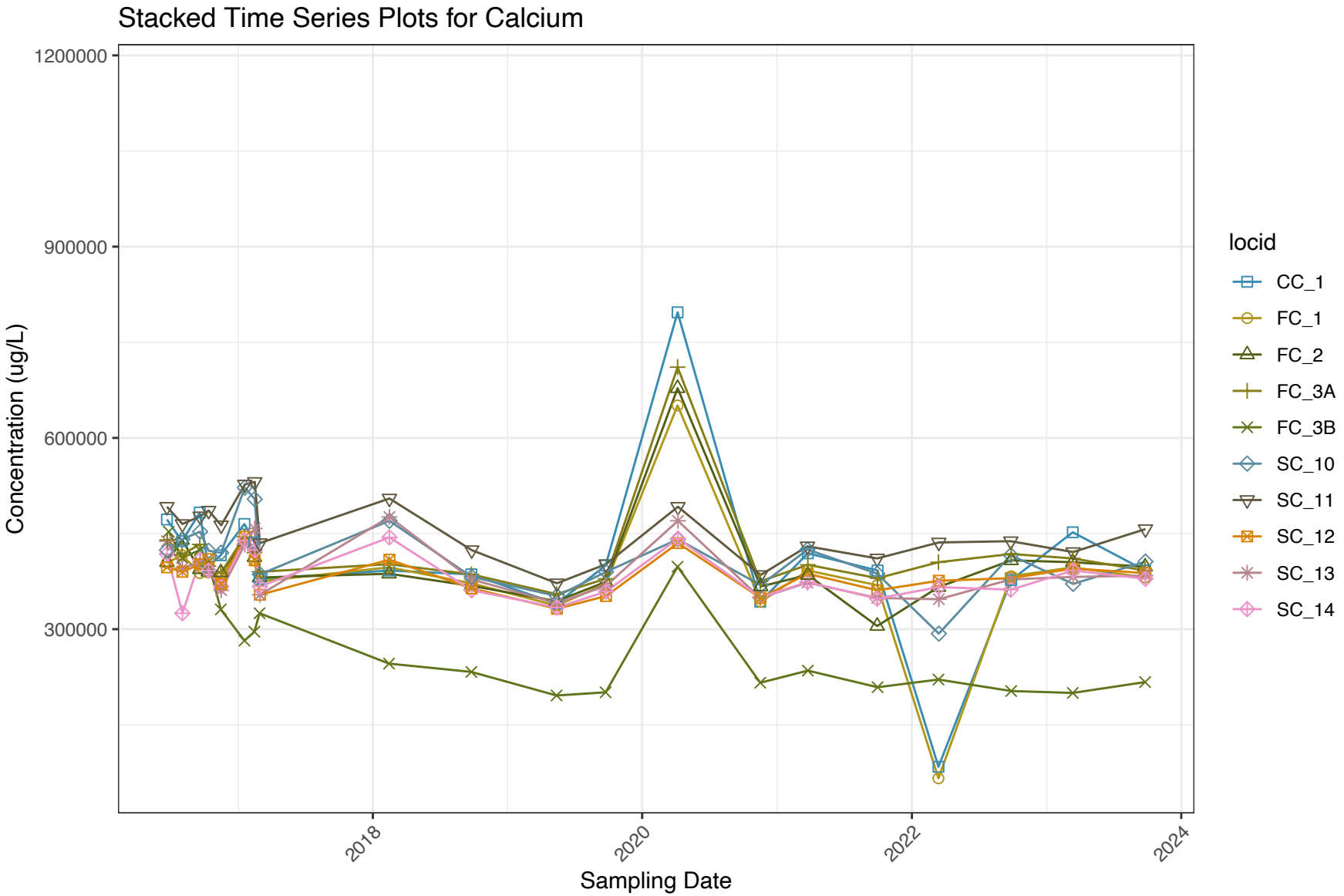


Figure 49: Stacked Time Series Plots

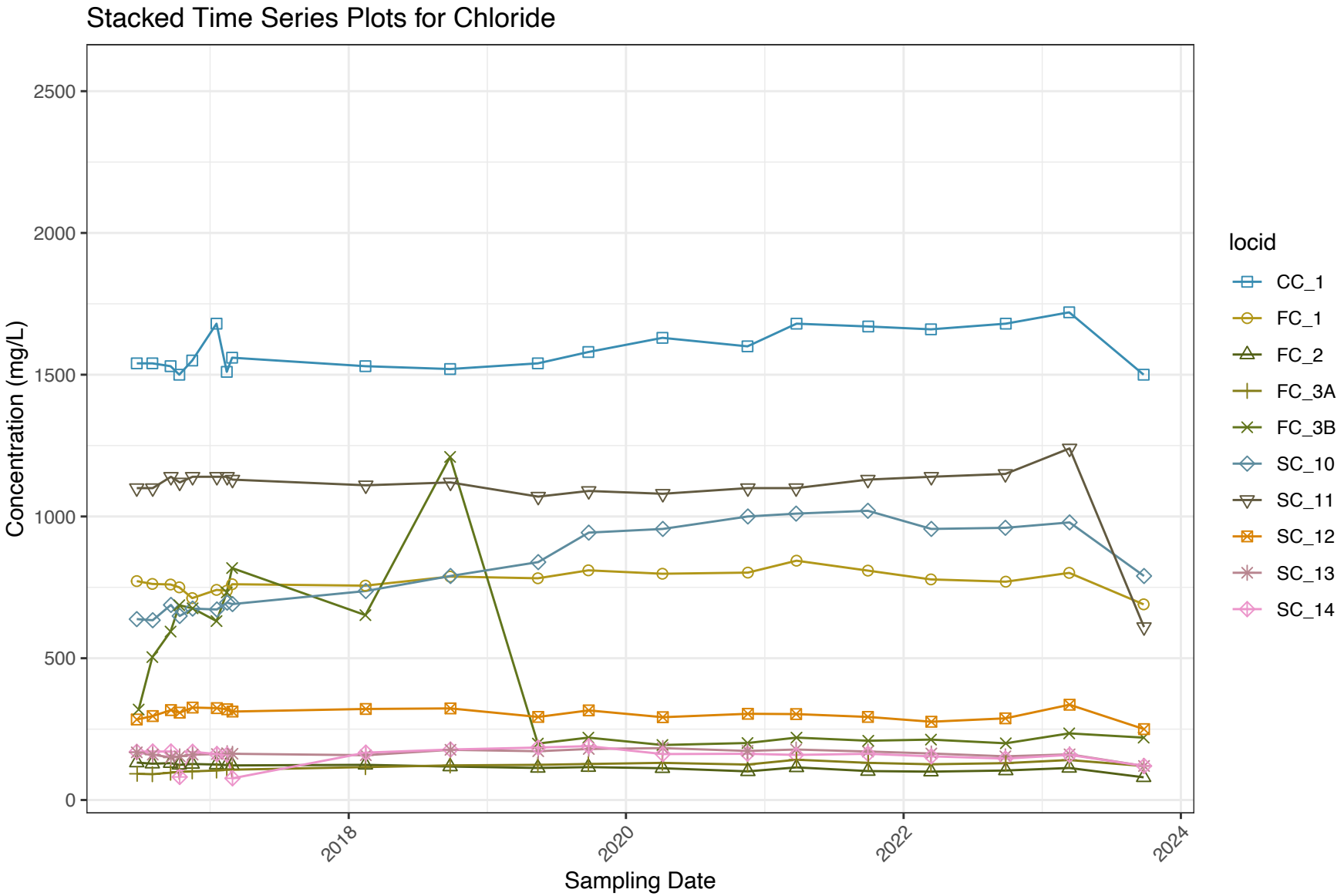


Figure 50: Stacked Time Series Plots

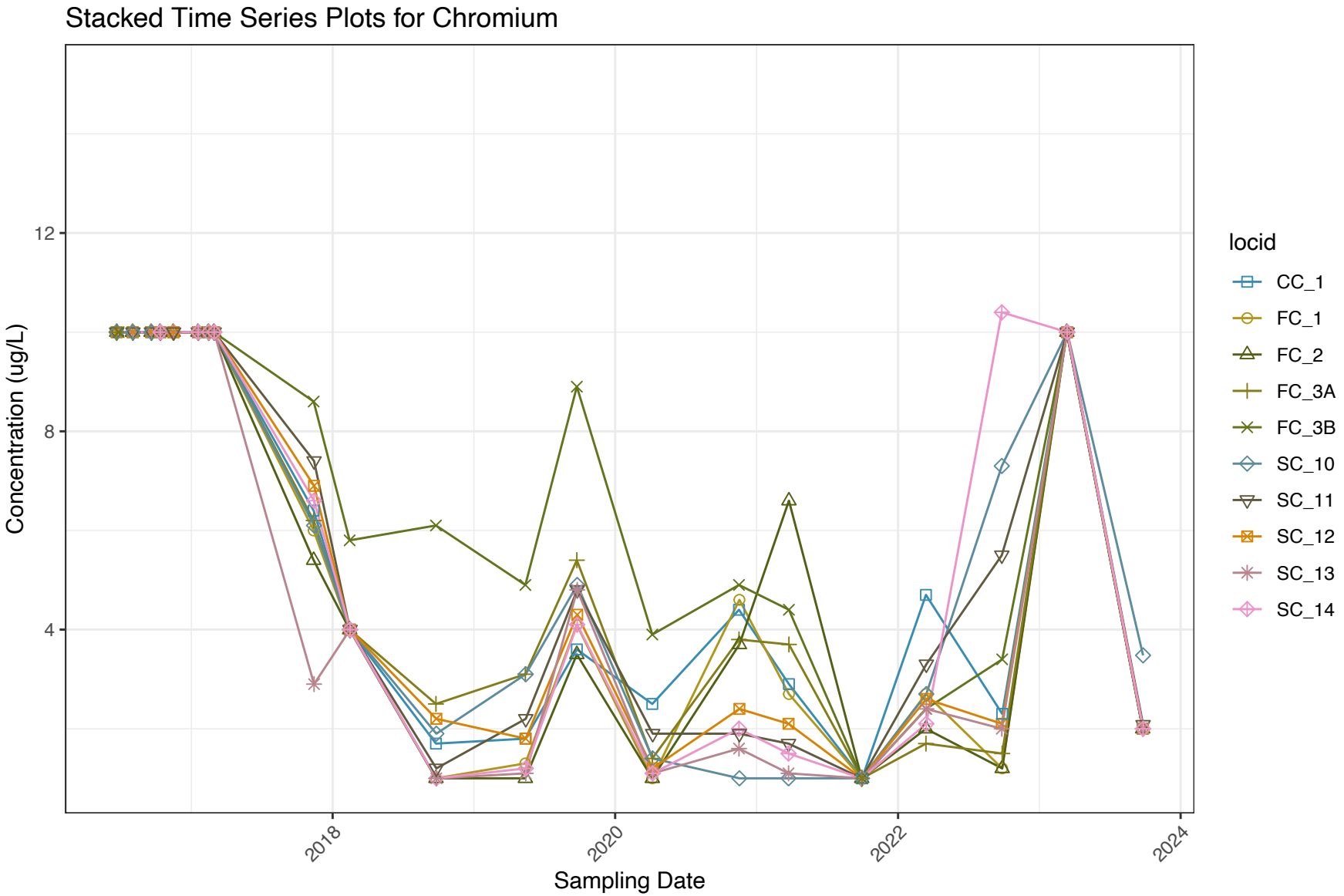


Figure 51: Stacked Time Series Plots

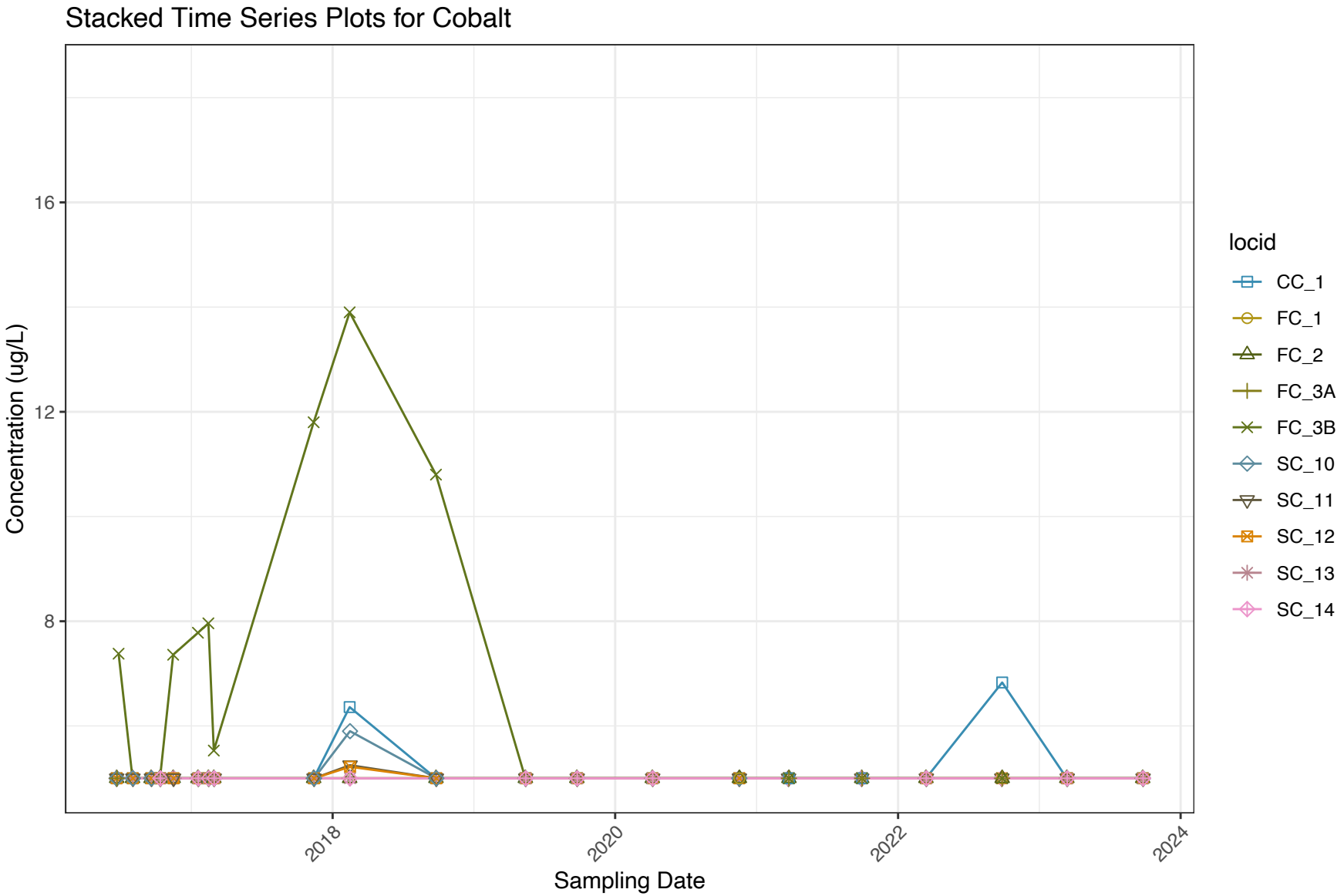


Figure 52: Stacked Time Series Plots

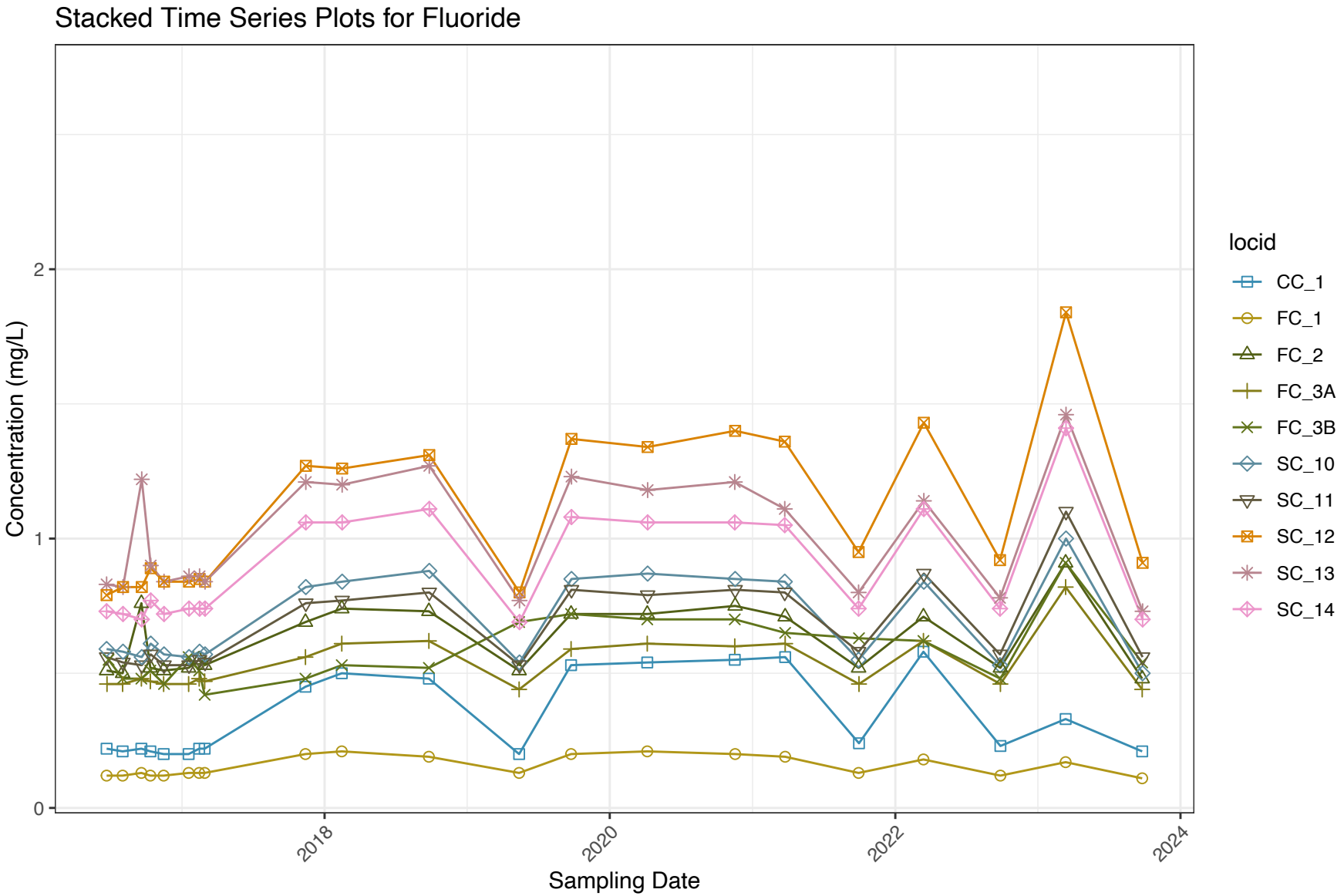


Figure 53: Stacked Time Series Plots

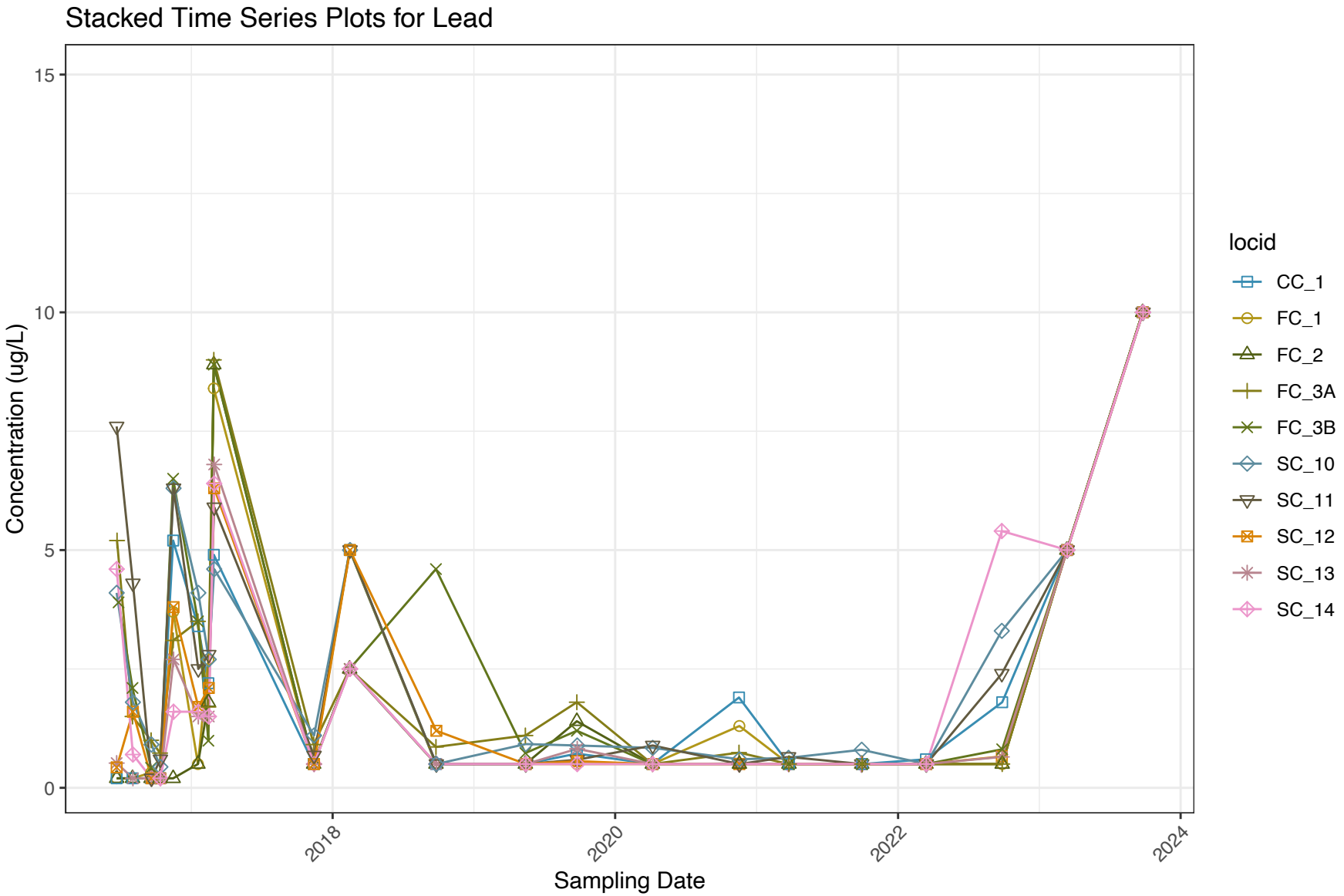


Figure 54: Stacked Time Series Plots

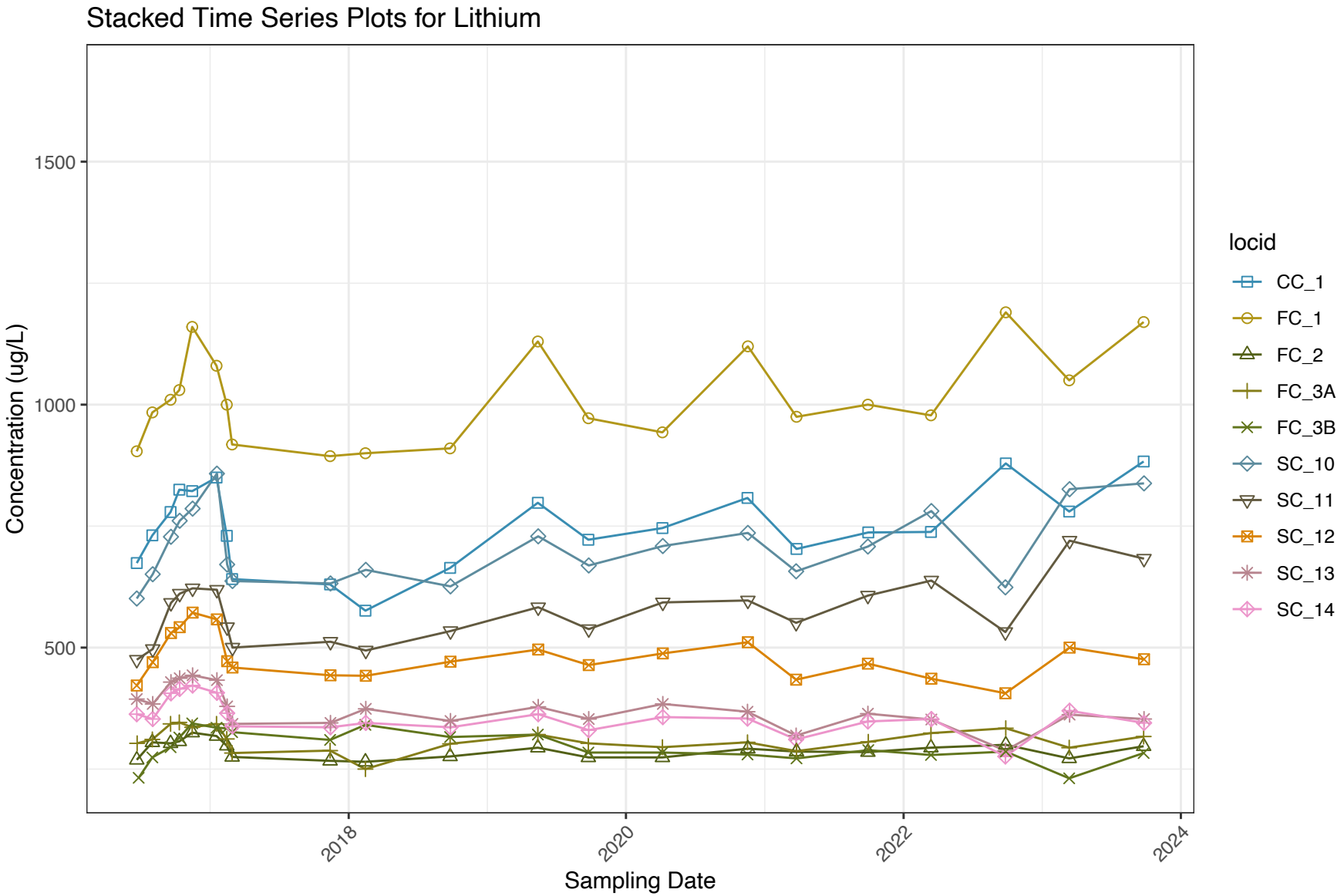


Figure 55: Stacked Time Series Plots

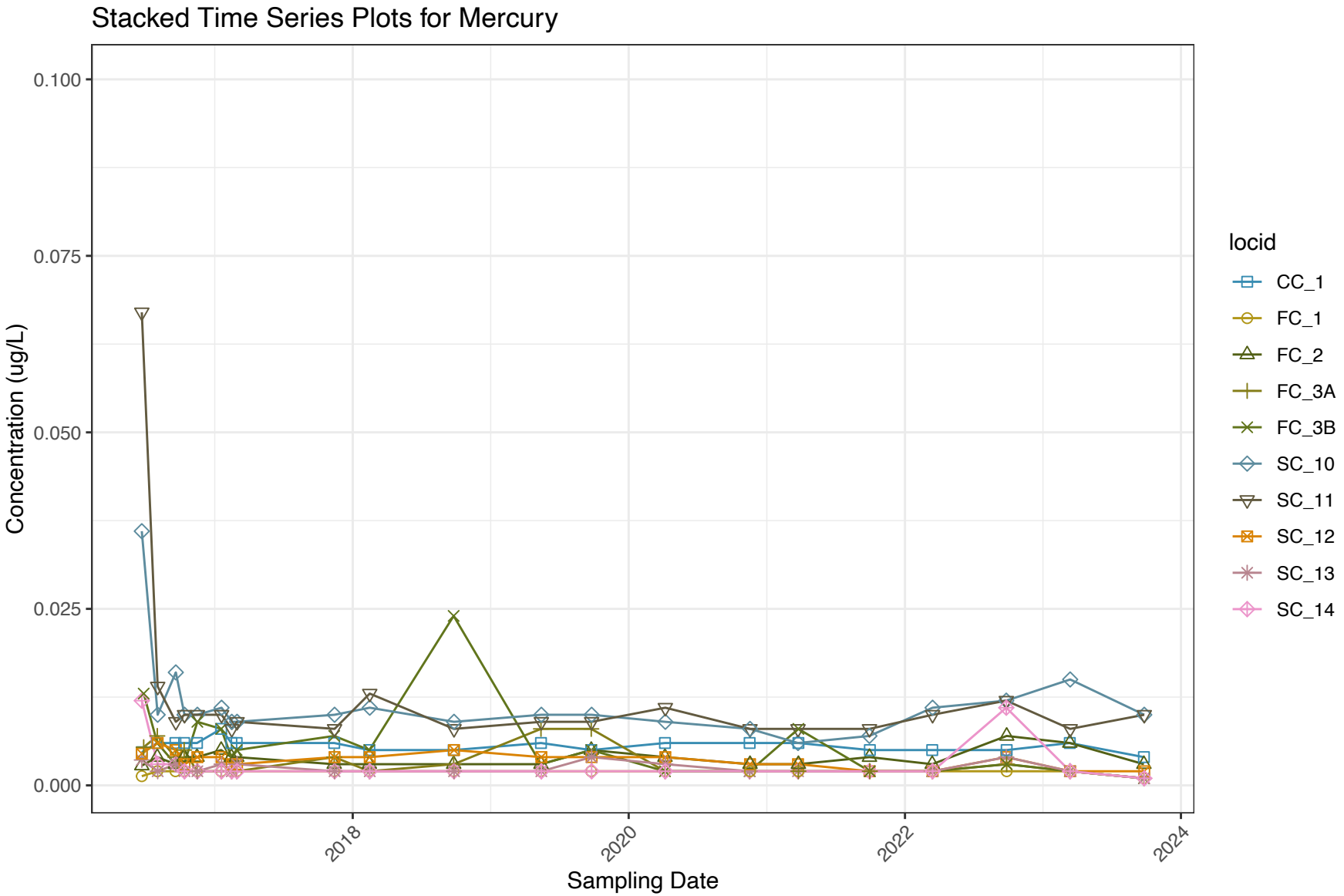


Figure 56: Stacked Time Series Plots

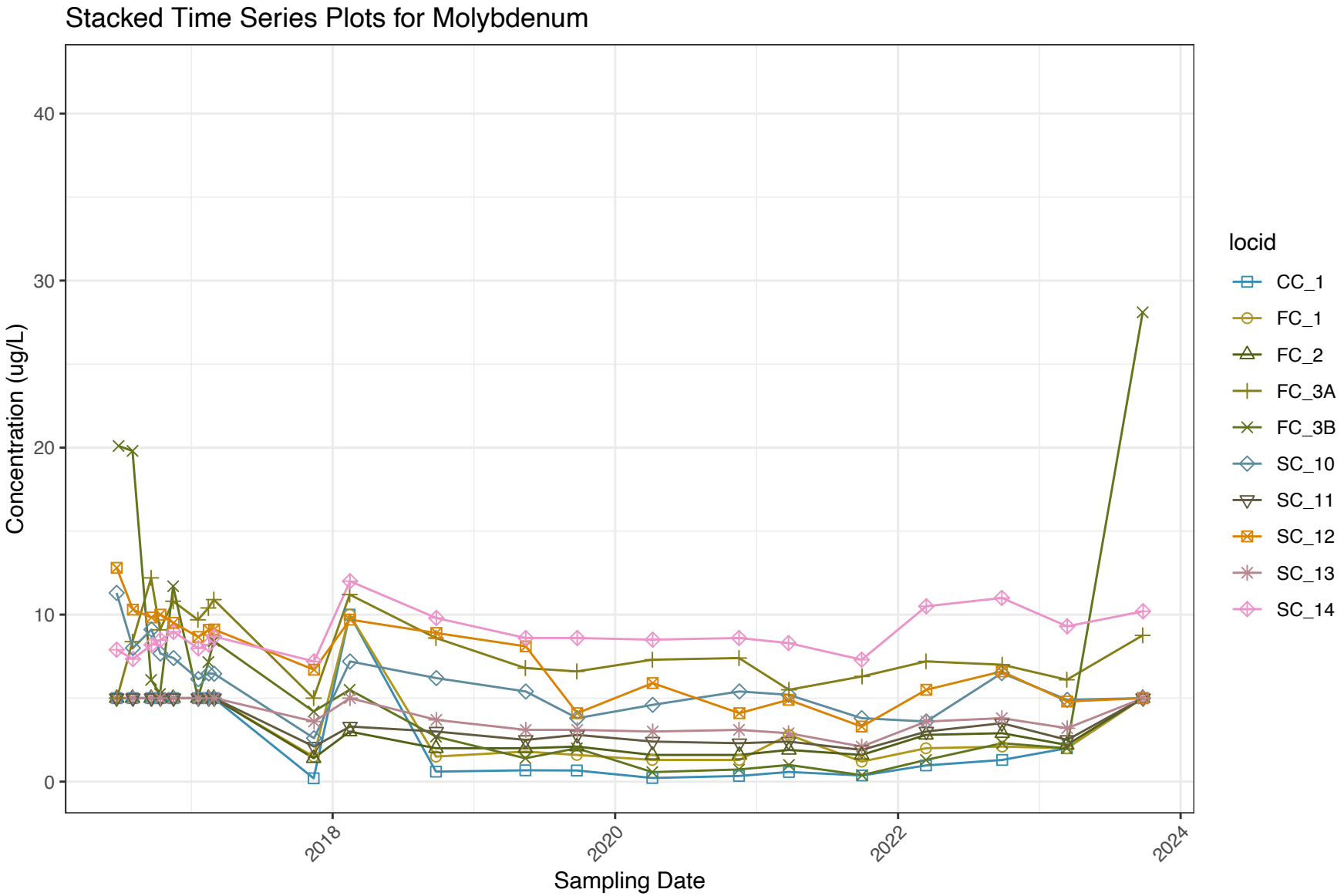


Figure 57: Stacked Time Series Plots

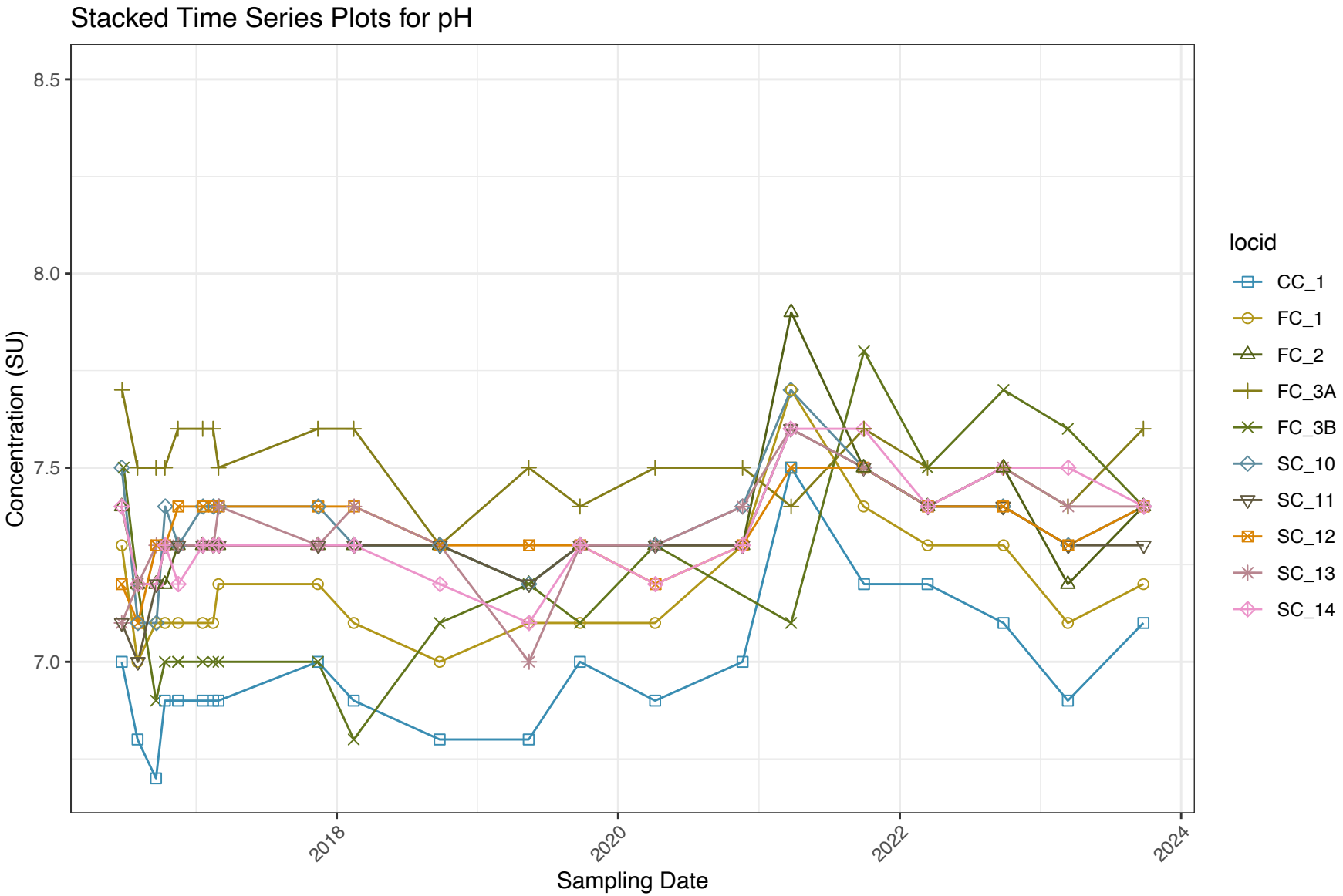


Figure 58: Stacked Time Series Plots

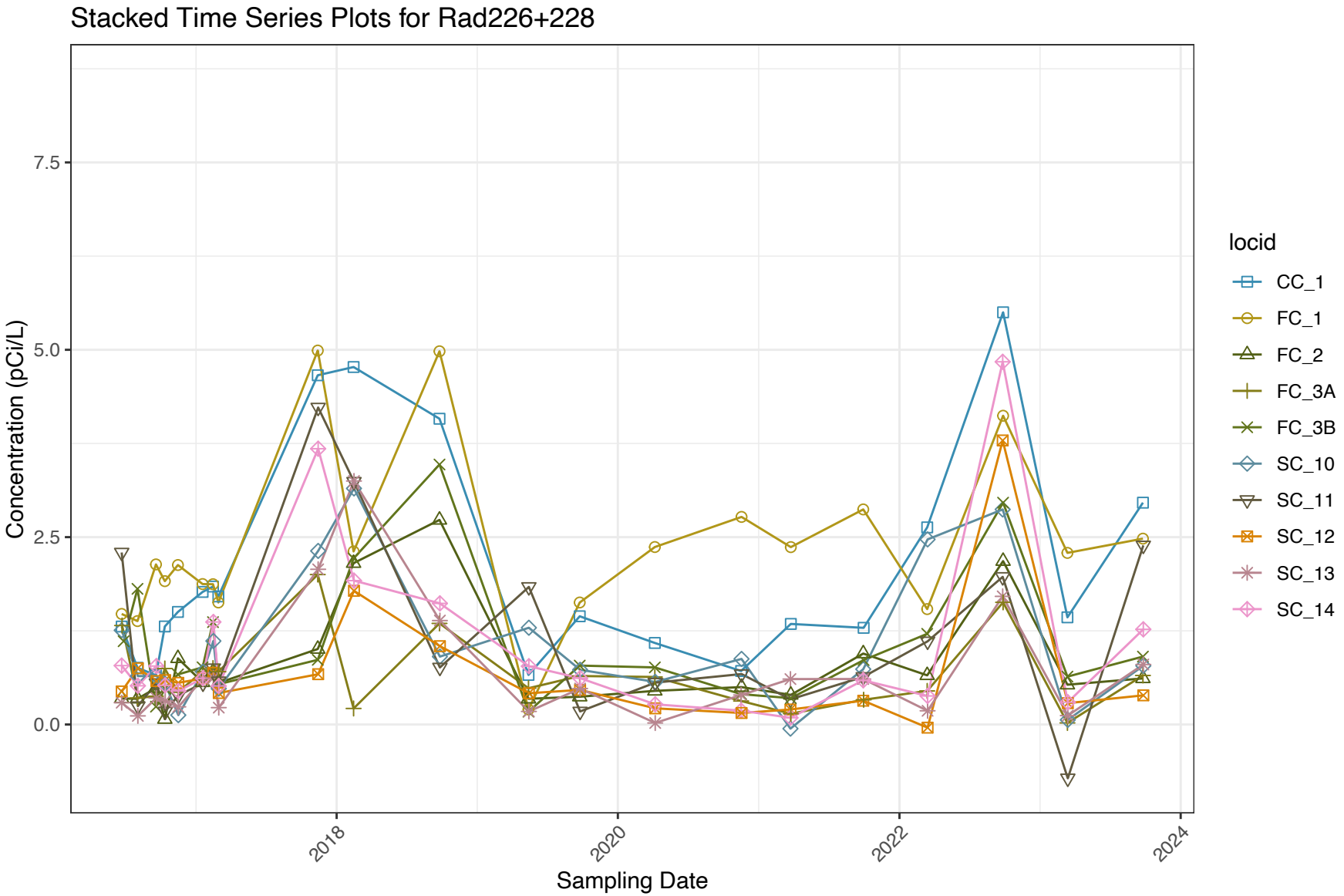


Figure 59: Stacked Time Series Plots

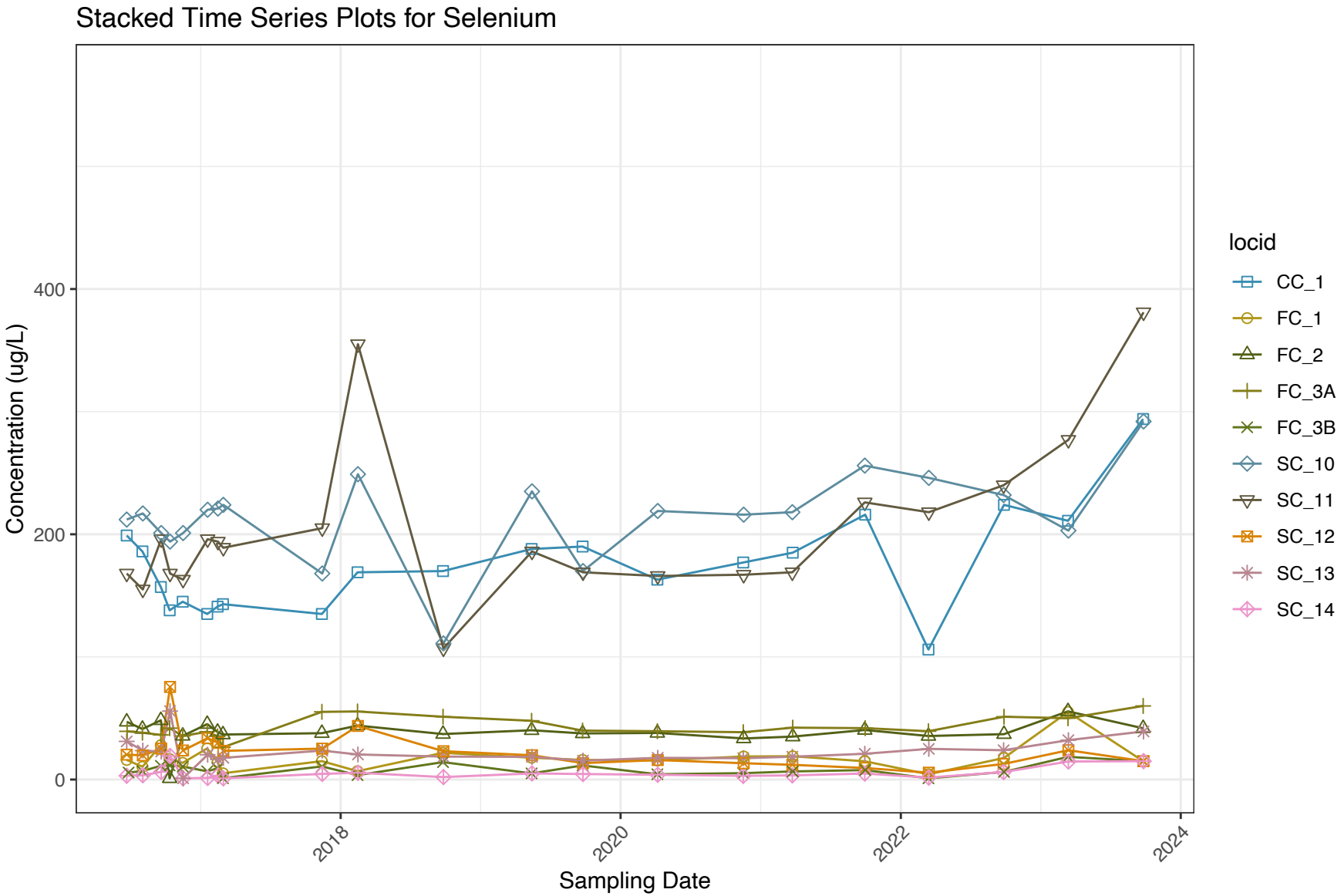


Figure 60: Stacked Time Series Plots

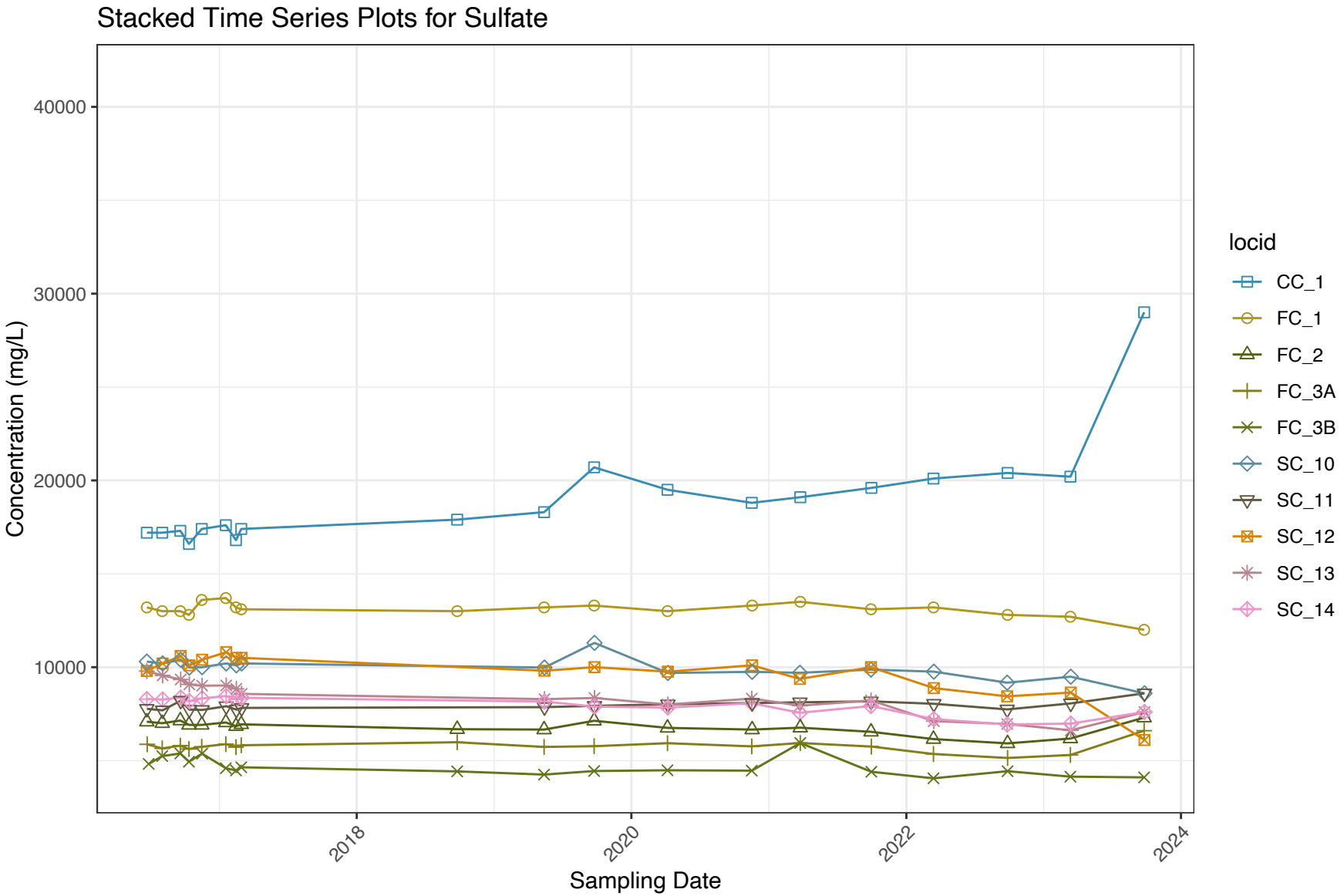


Figure 61: Stacked Time Series Plots

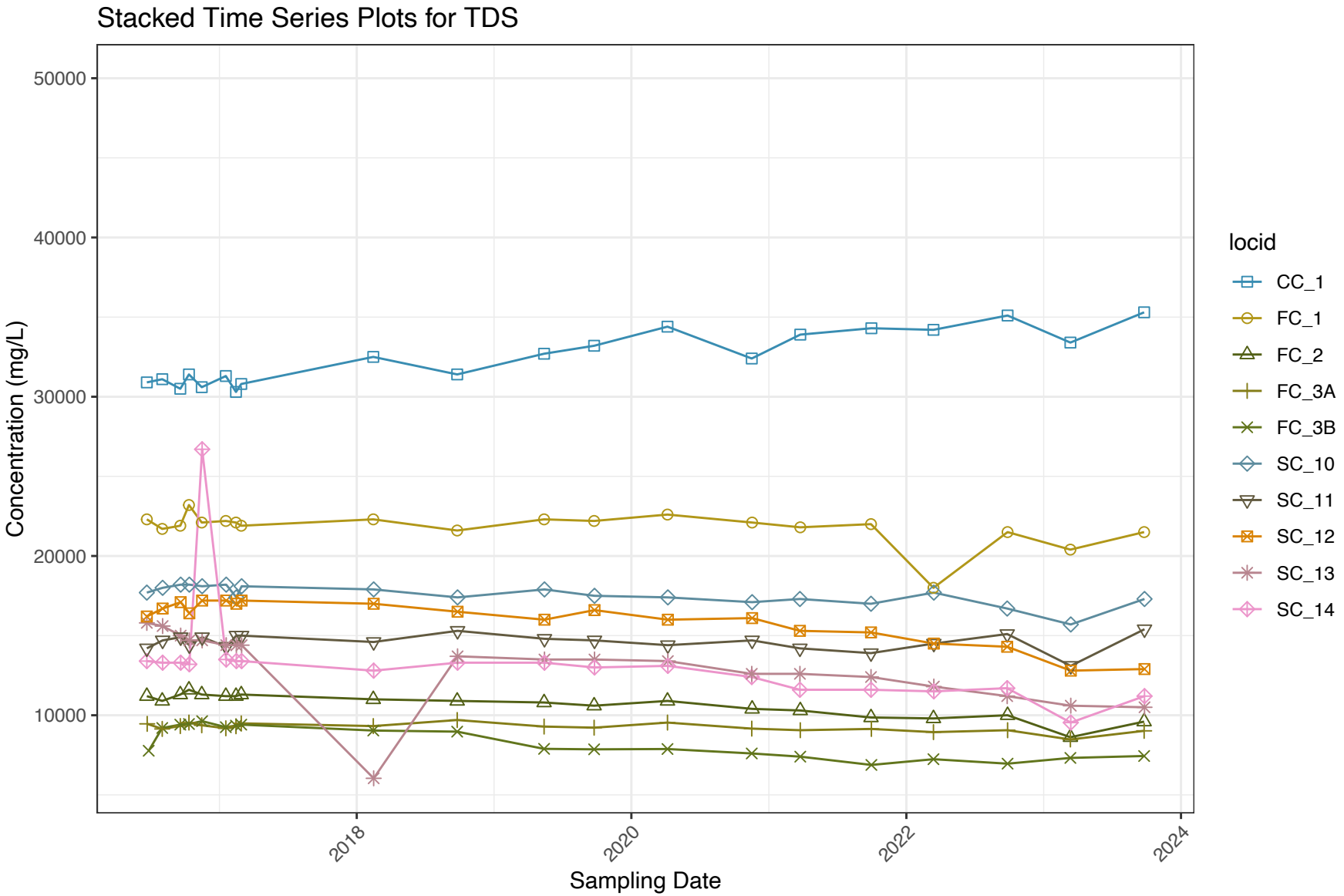


Figure 62: Stacked Time Series Plots

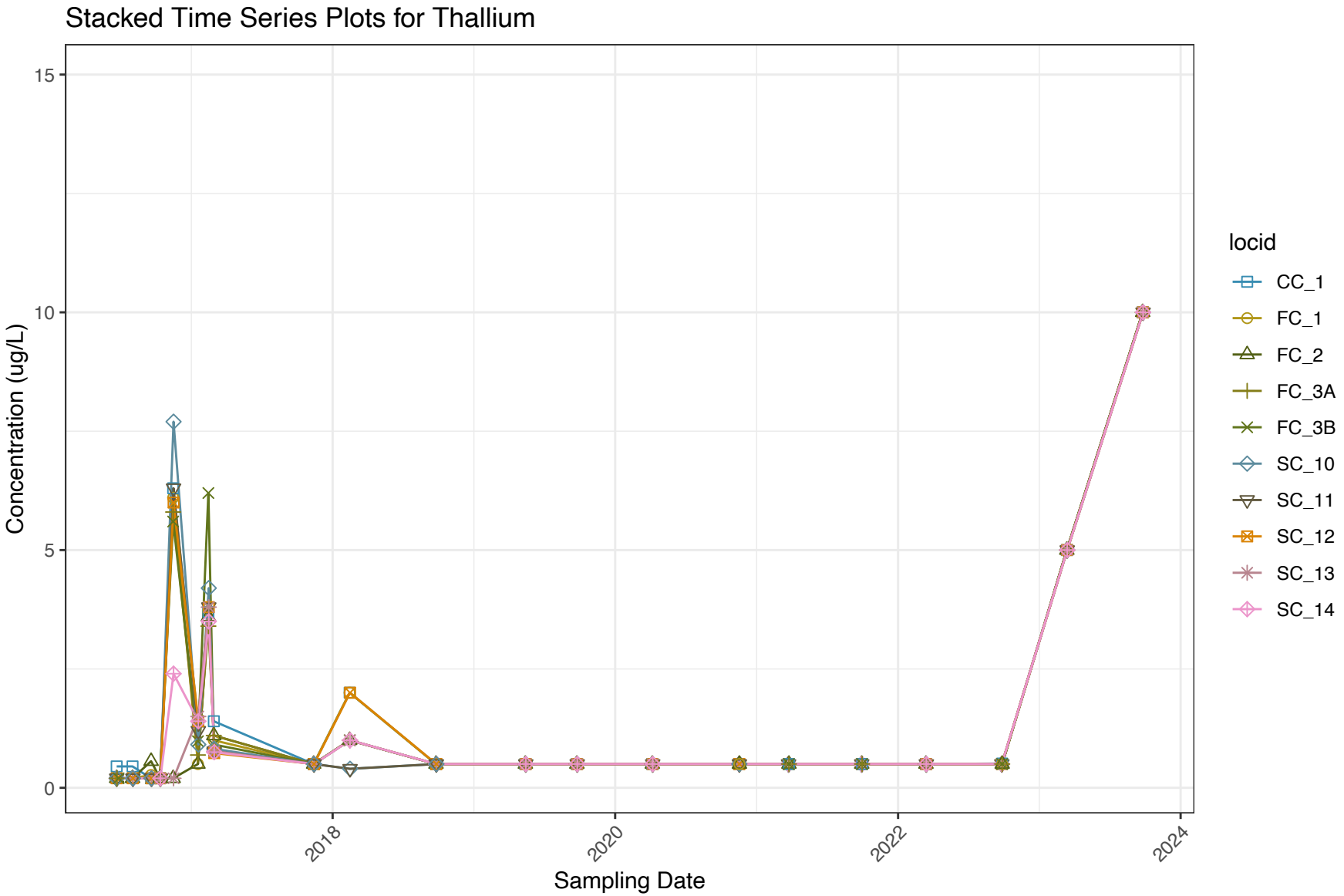


Figure 63: Stacked Time Series Plots

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

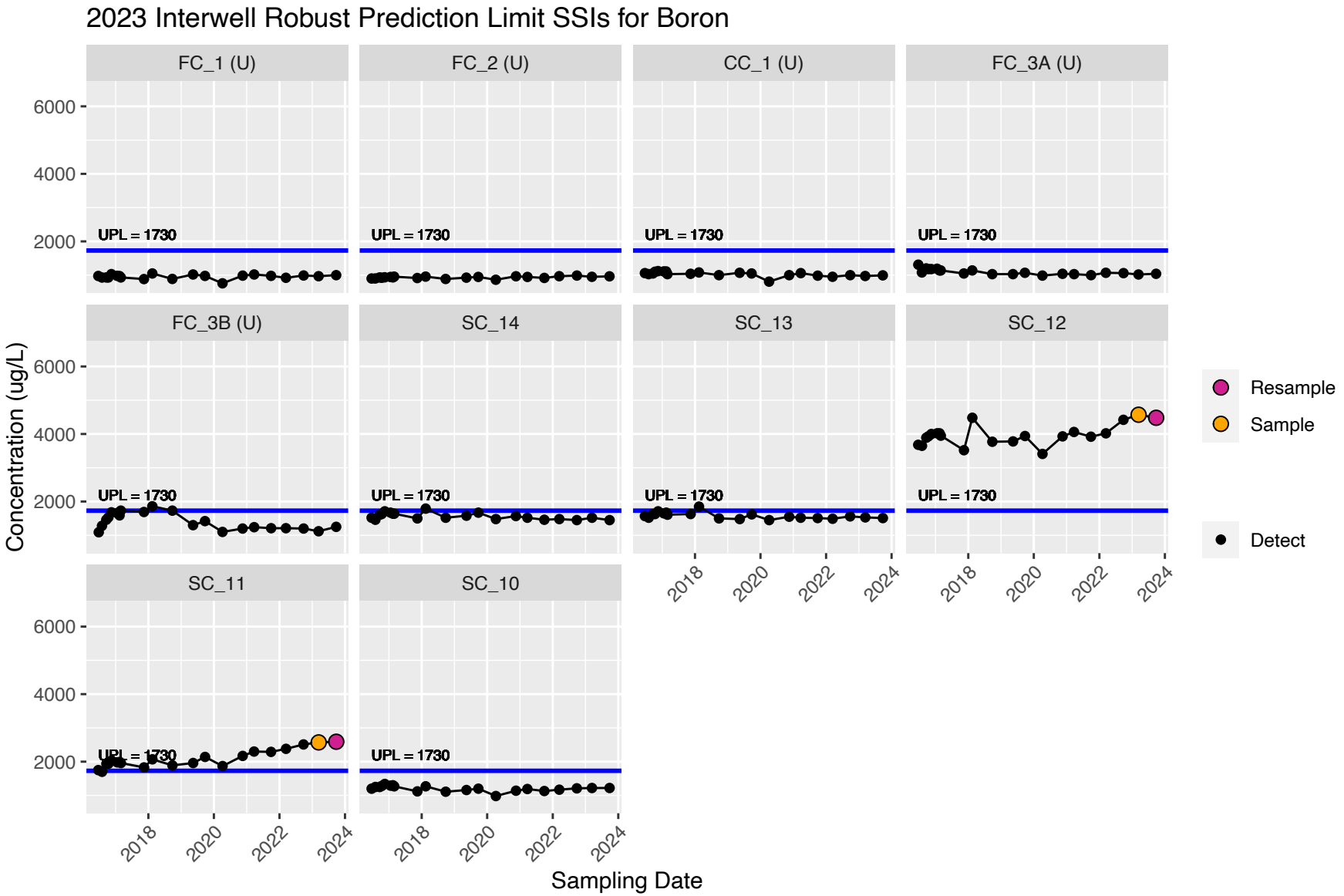


Figure 64: Prediction Limit Outcome Plots

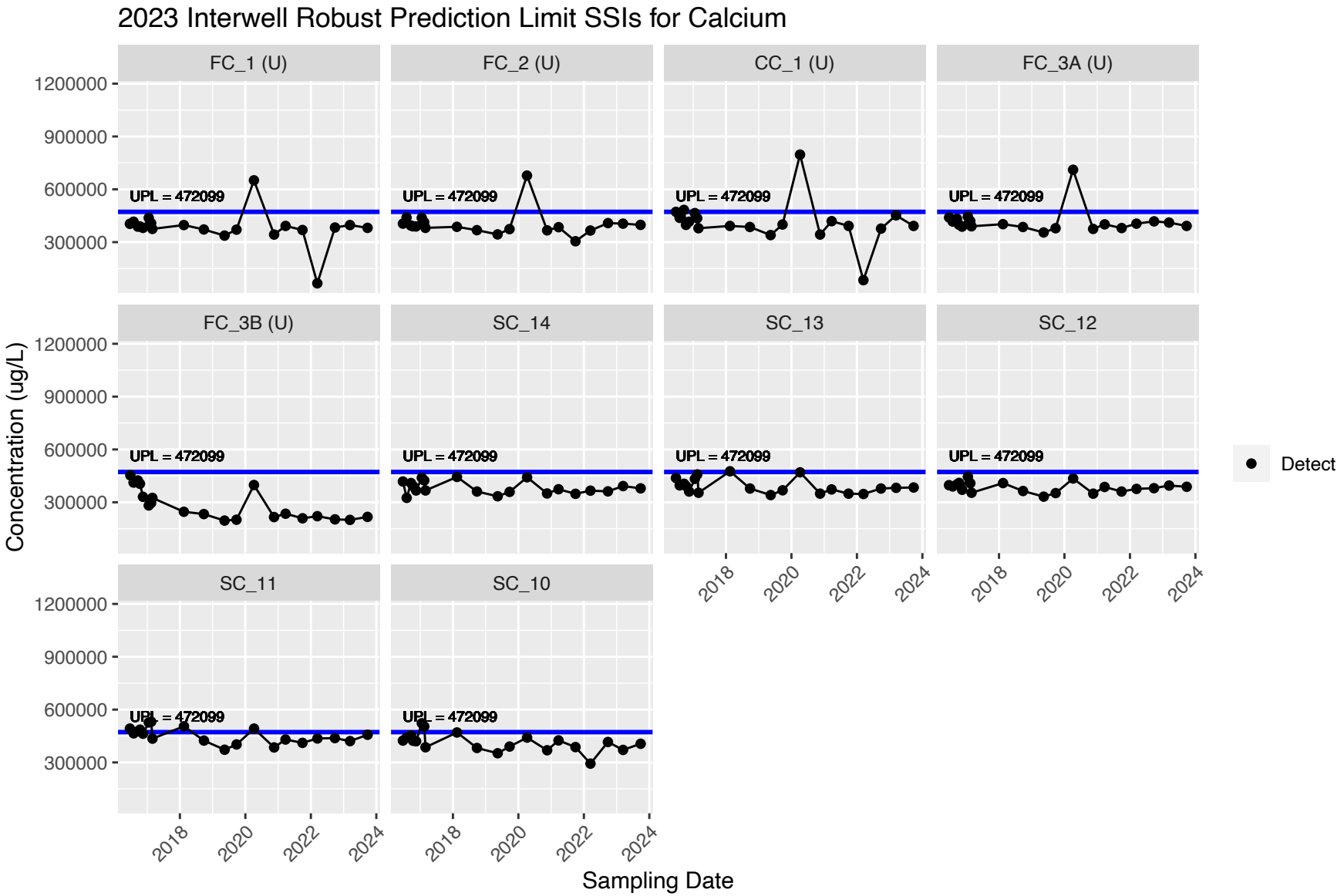


Figure 65: Prediction Limit Outcome Plots

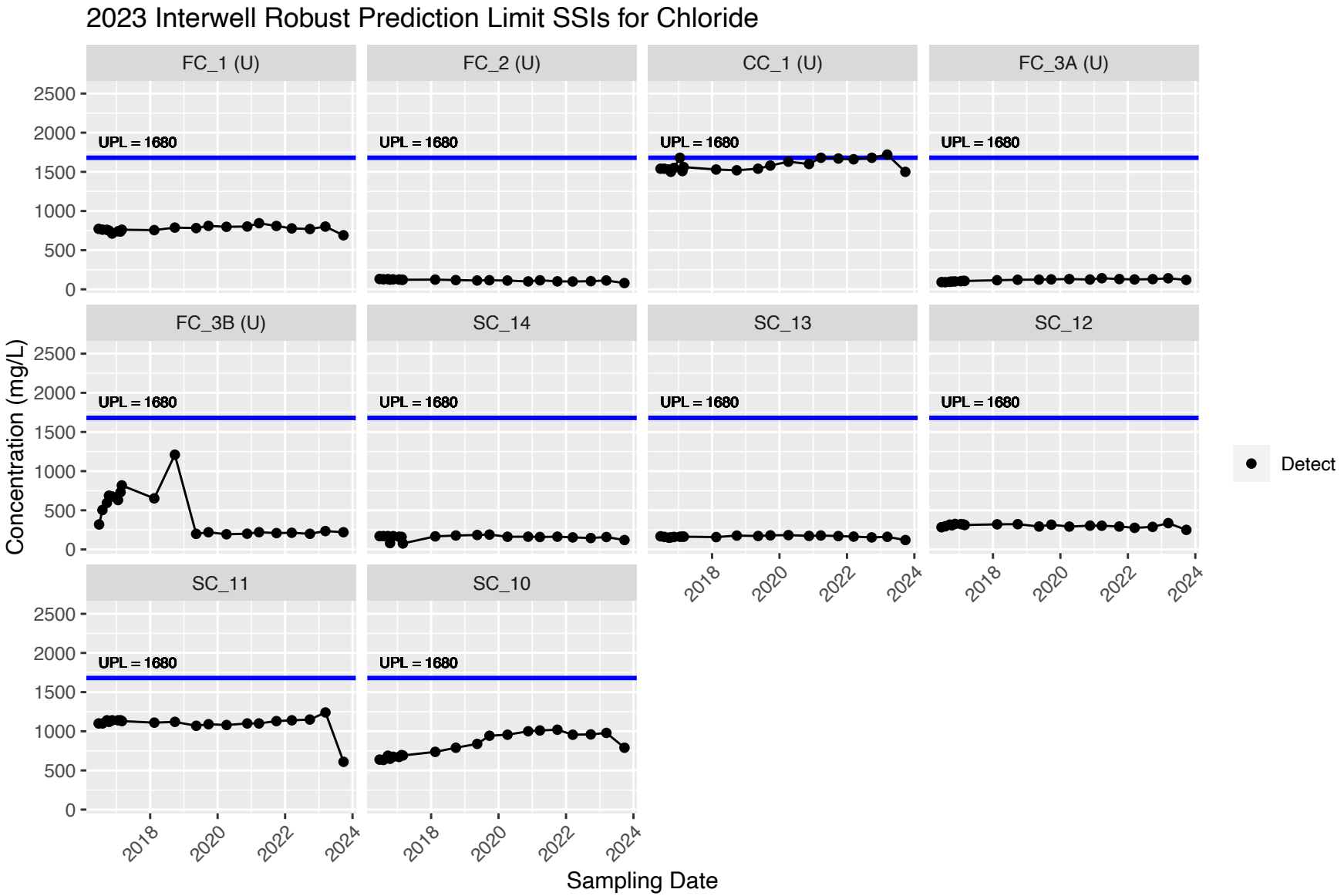


Figure 66: Prediction Limit Outcome Plots

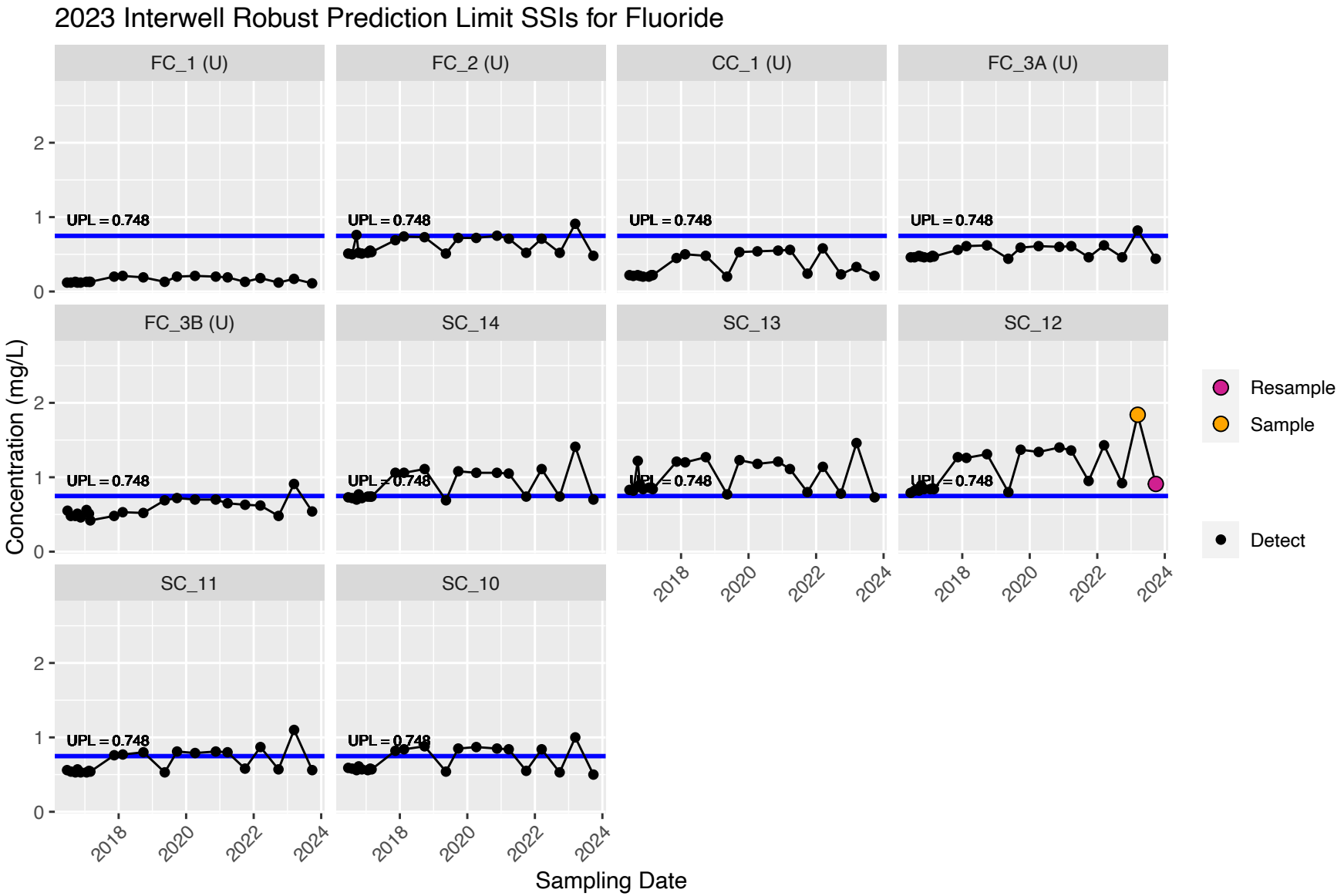


Figure 67: Prediction Limit Outcome Plots

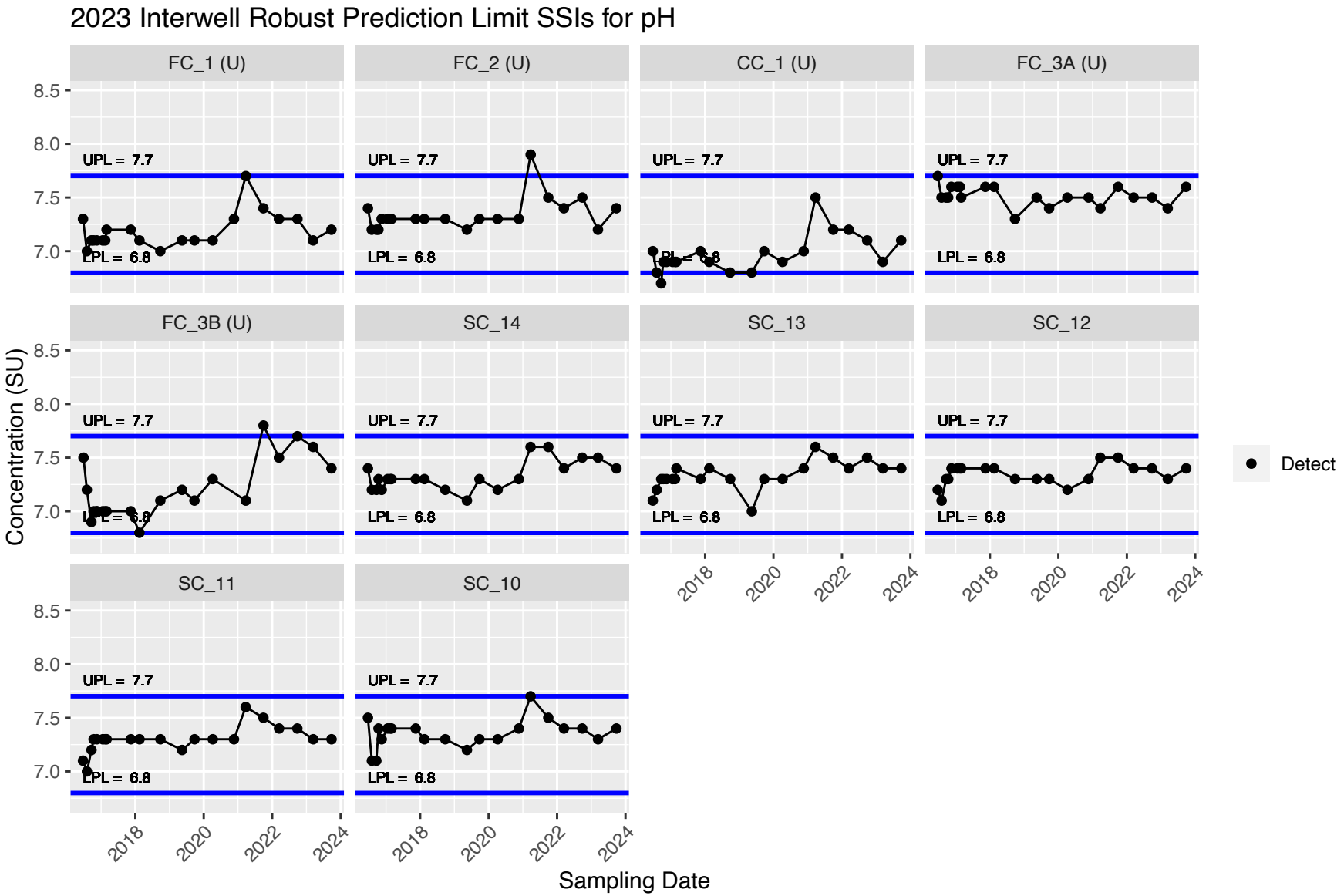


Figure 68: Prediction Limit Outcome Plots

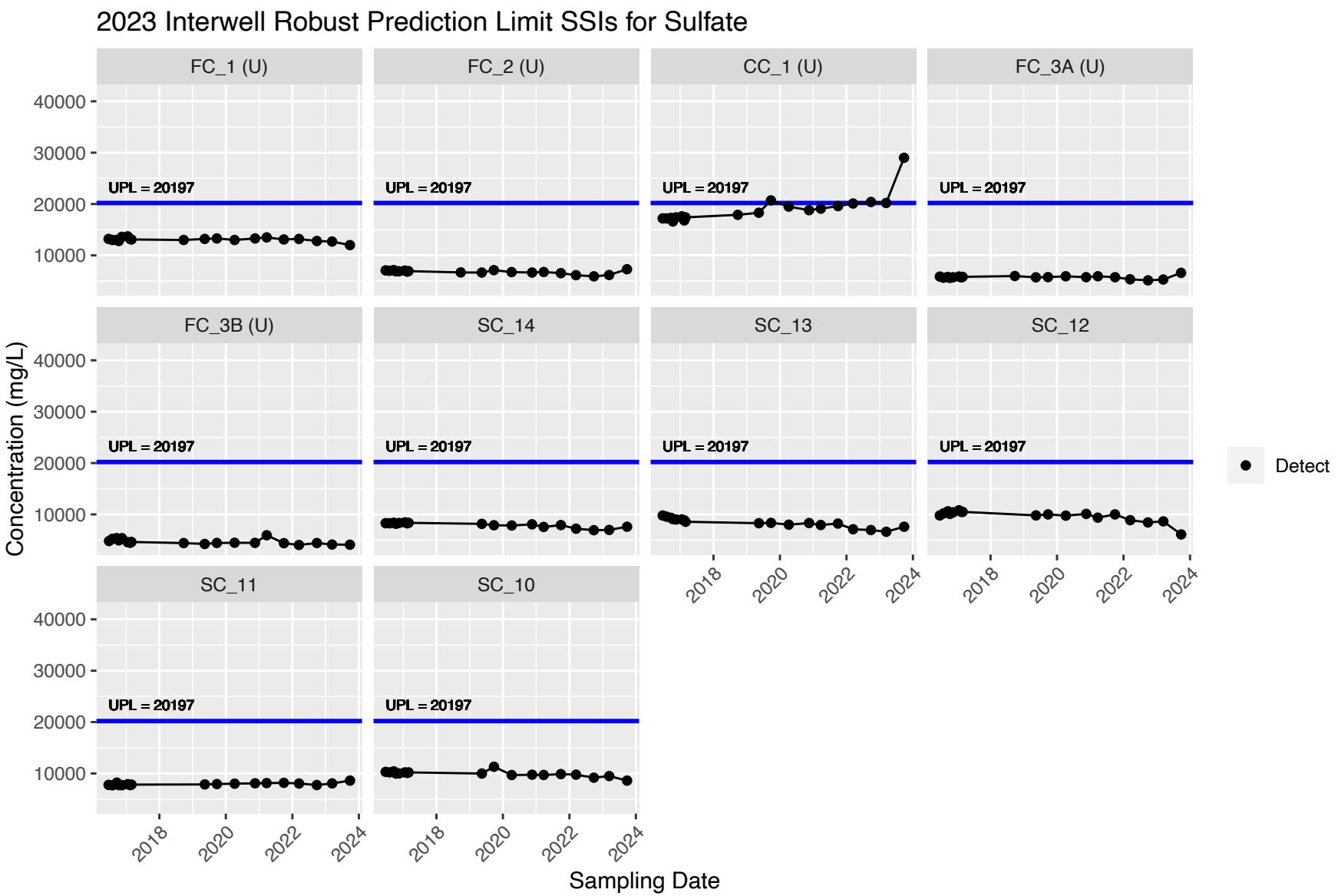


Figure 69: Prediction Limit Outcome Plots

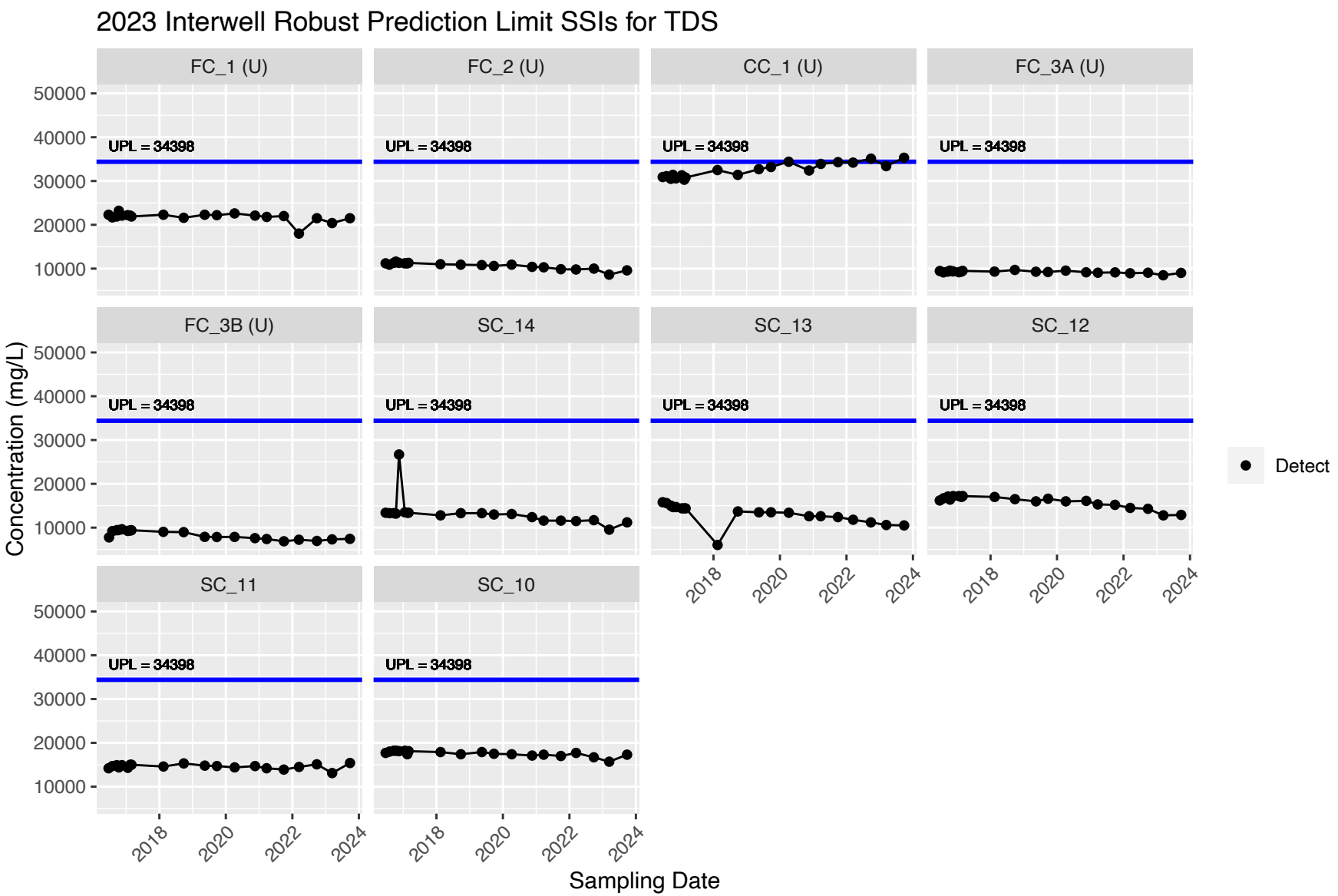


Figure 70: Prediction Limit Outcome Plots

Confidence Interval Band Plots, Appendix IV Parameters

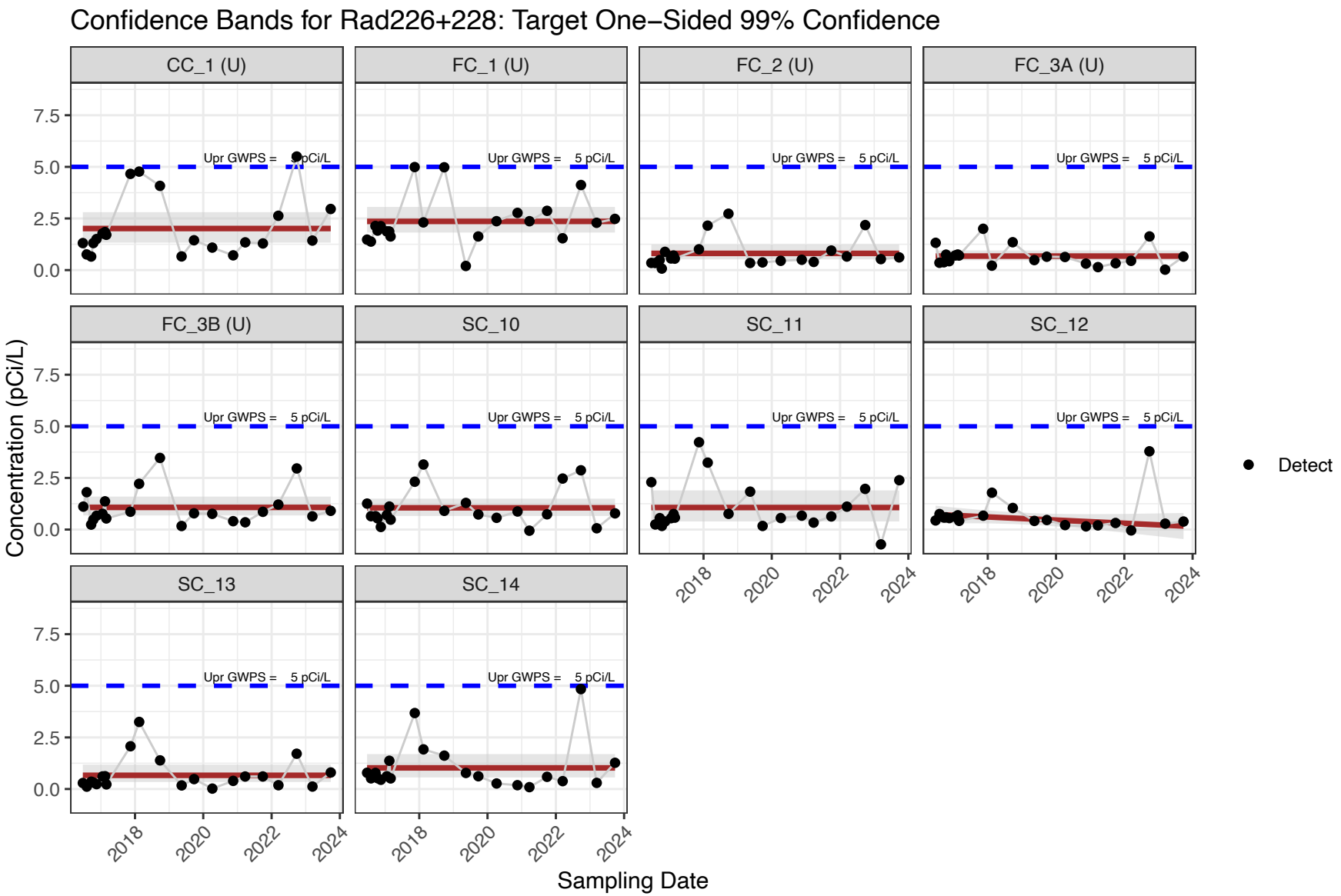


Figure 71: Confidence Band Plots

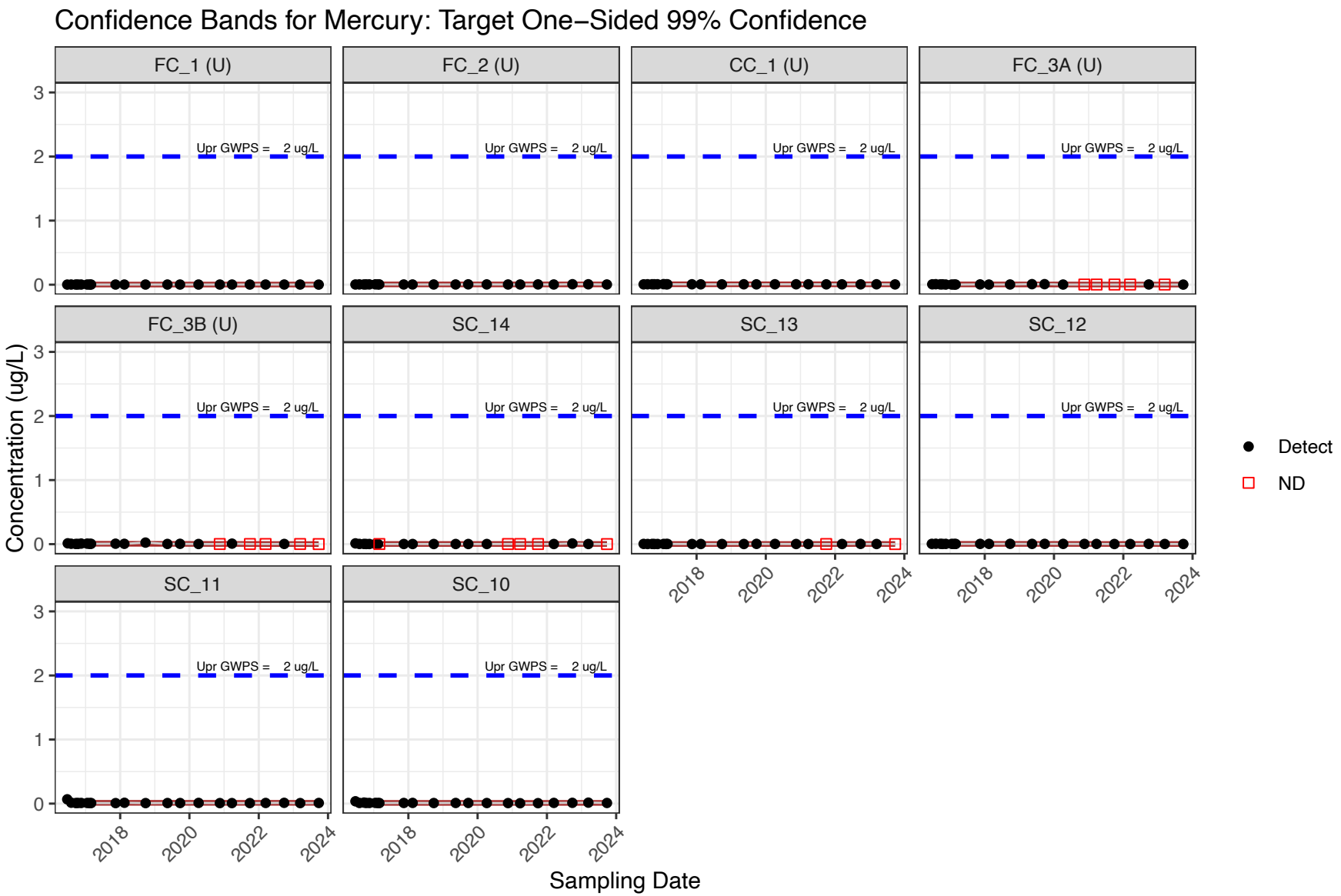


Figure 72: Confidence Band Plots

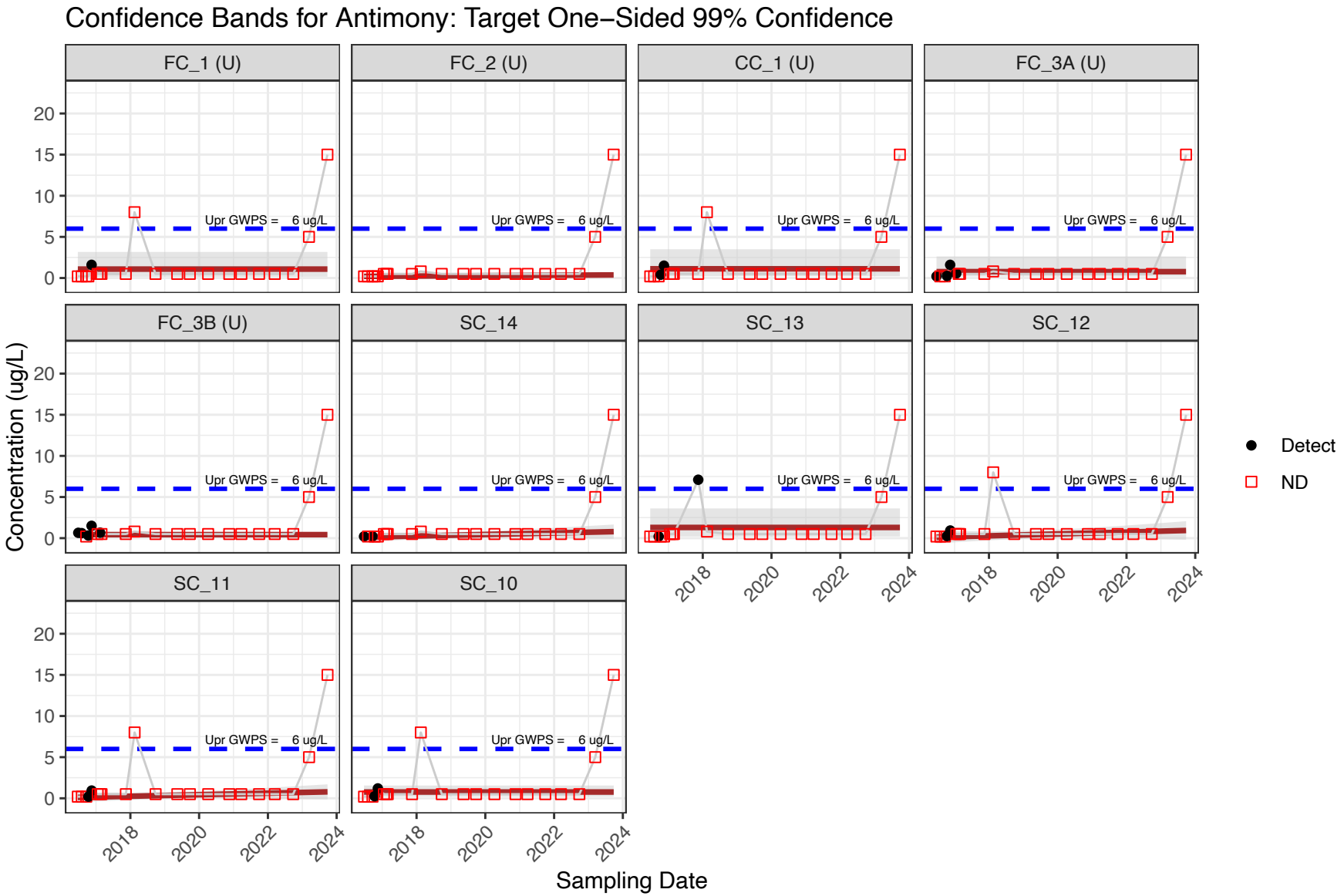


Figure 73: Confidence Band Plots

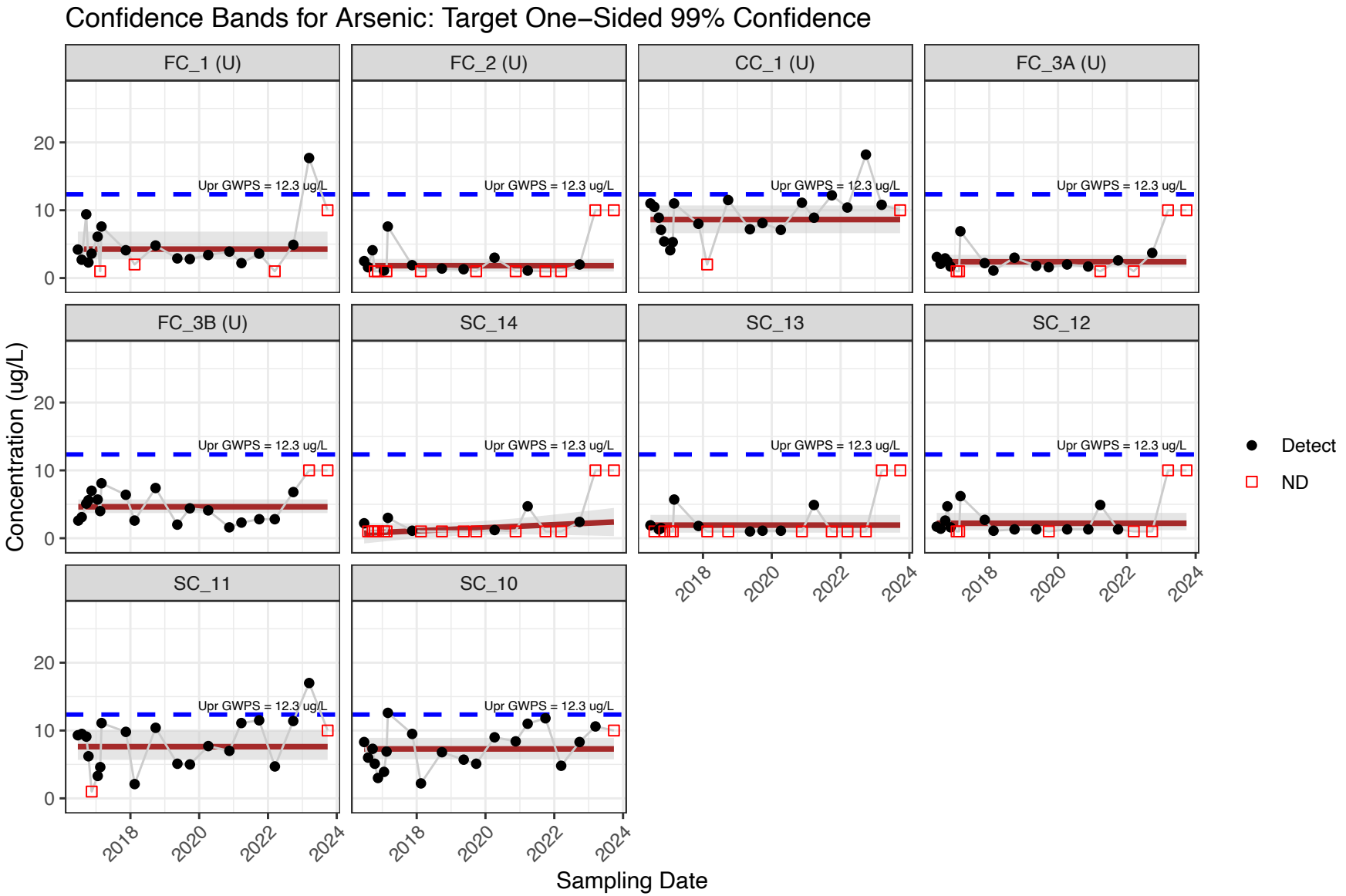


Figure 74: Confidence Band Plots

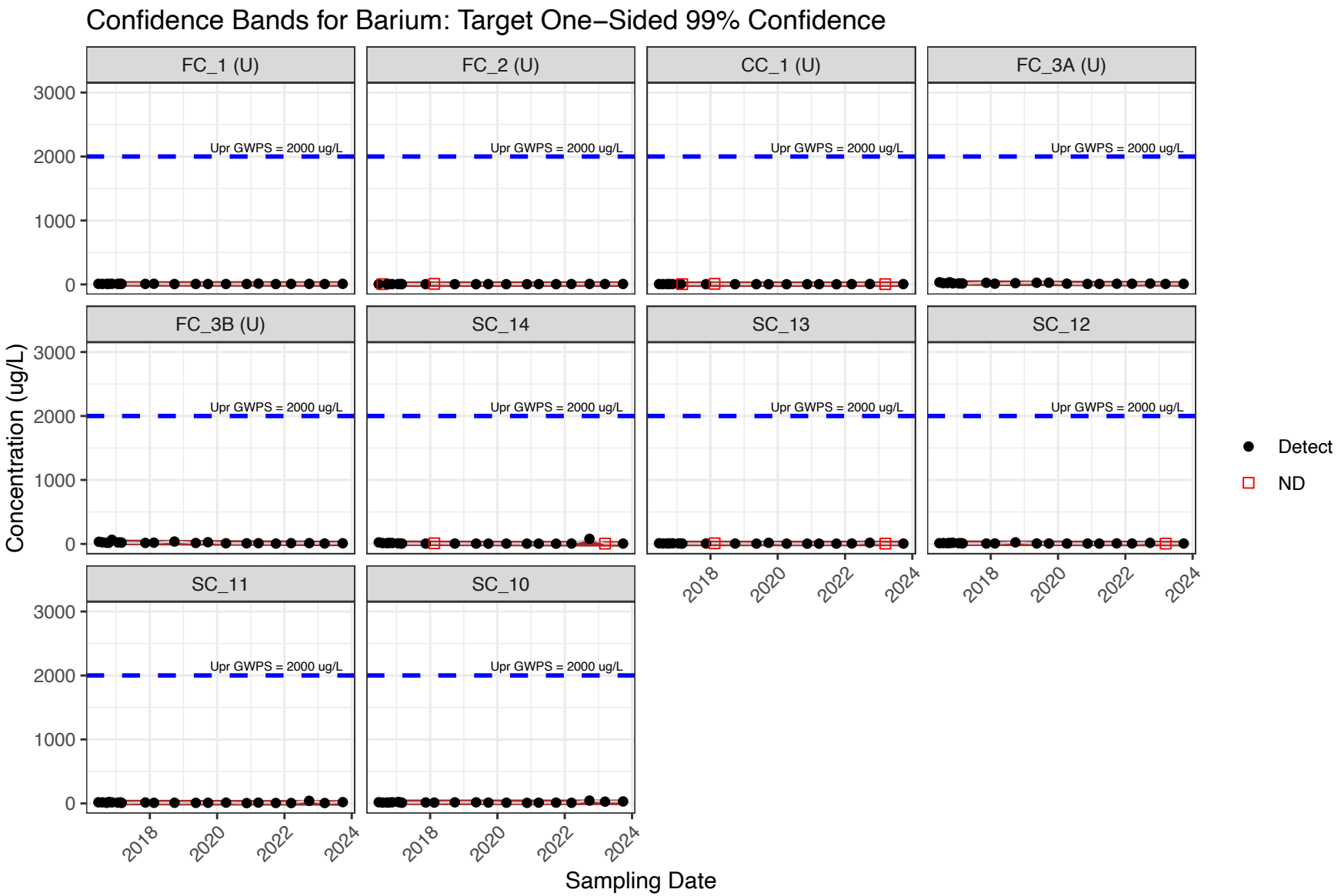


Figure 75: Confidence Band Plots

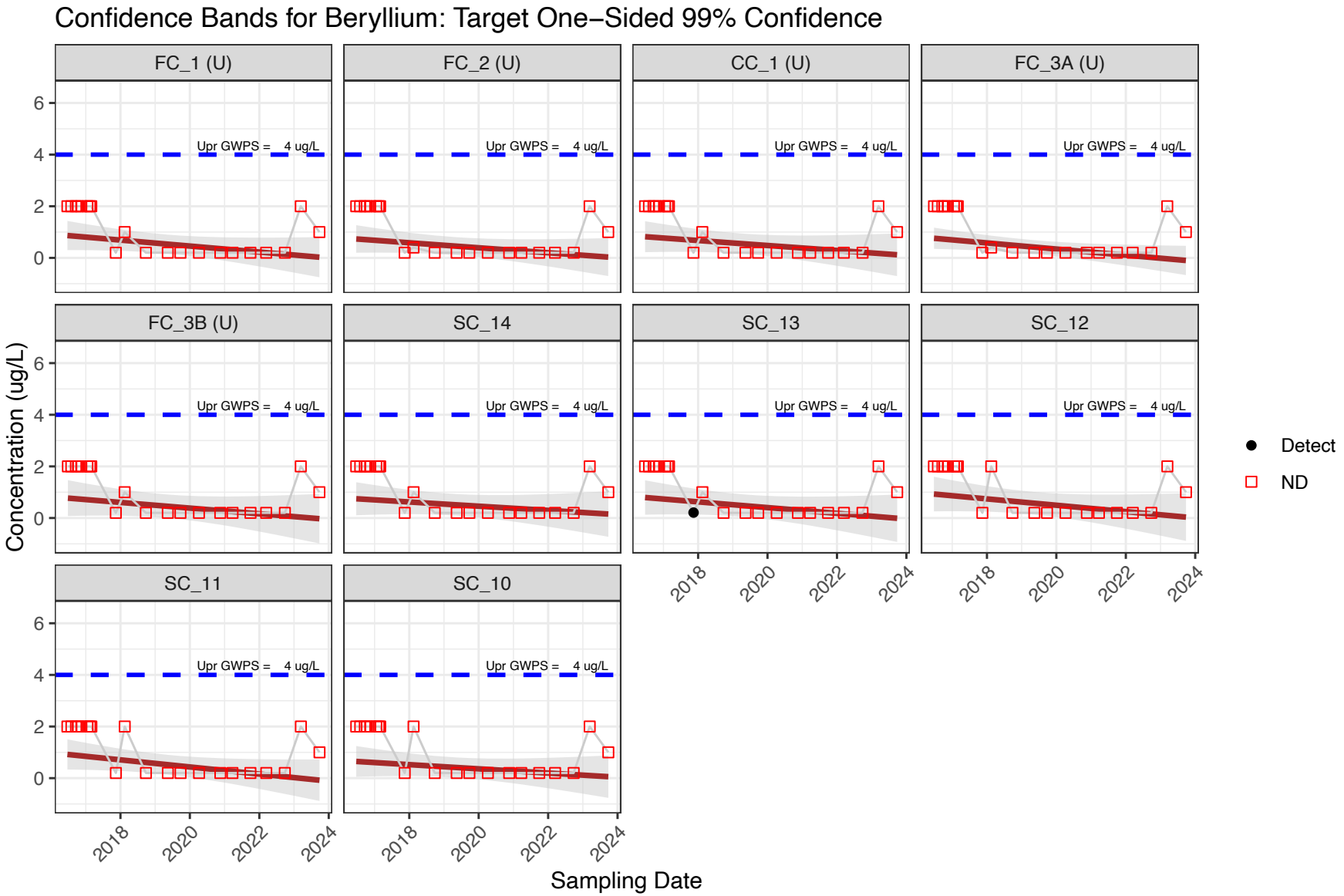


Figure 76: Confidence Band Plots

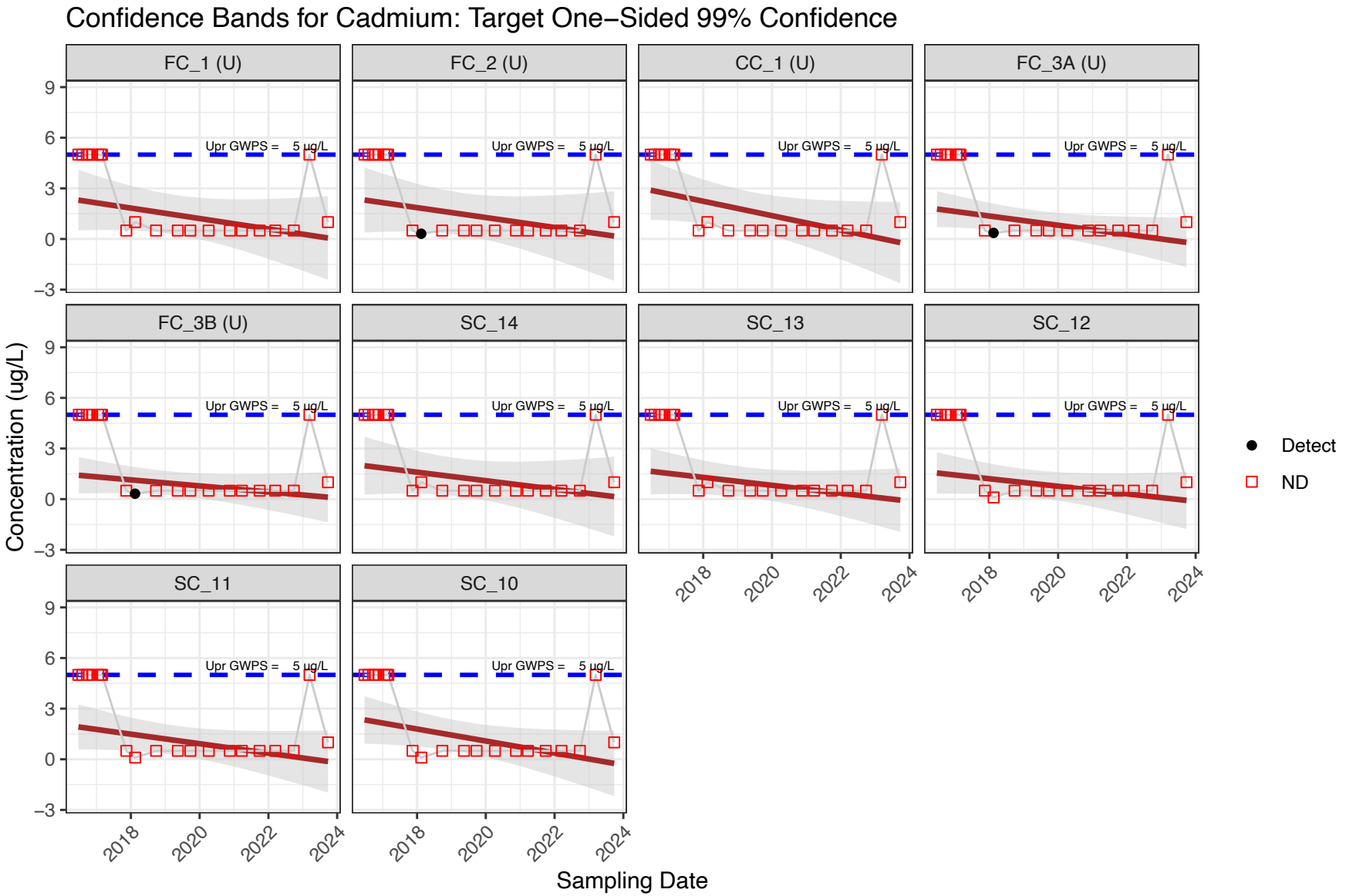


Figure 77: Confidence Band Plots

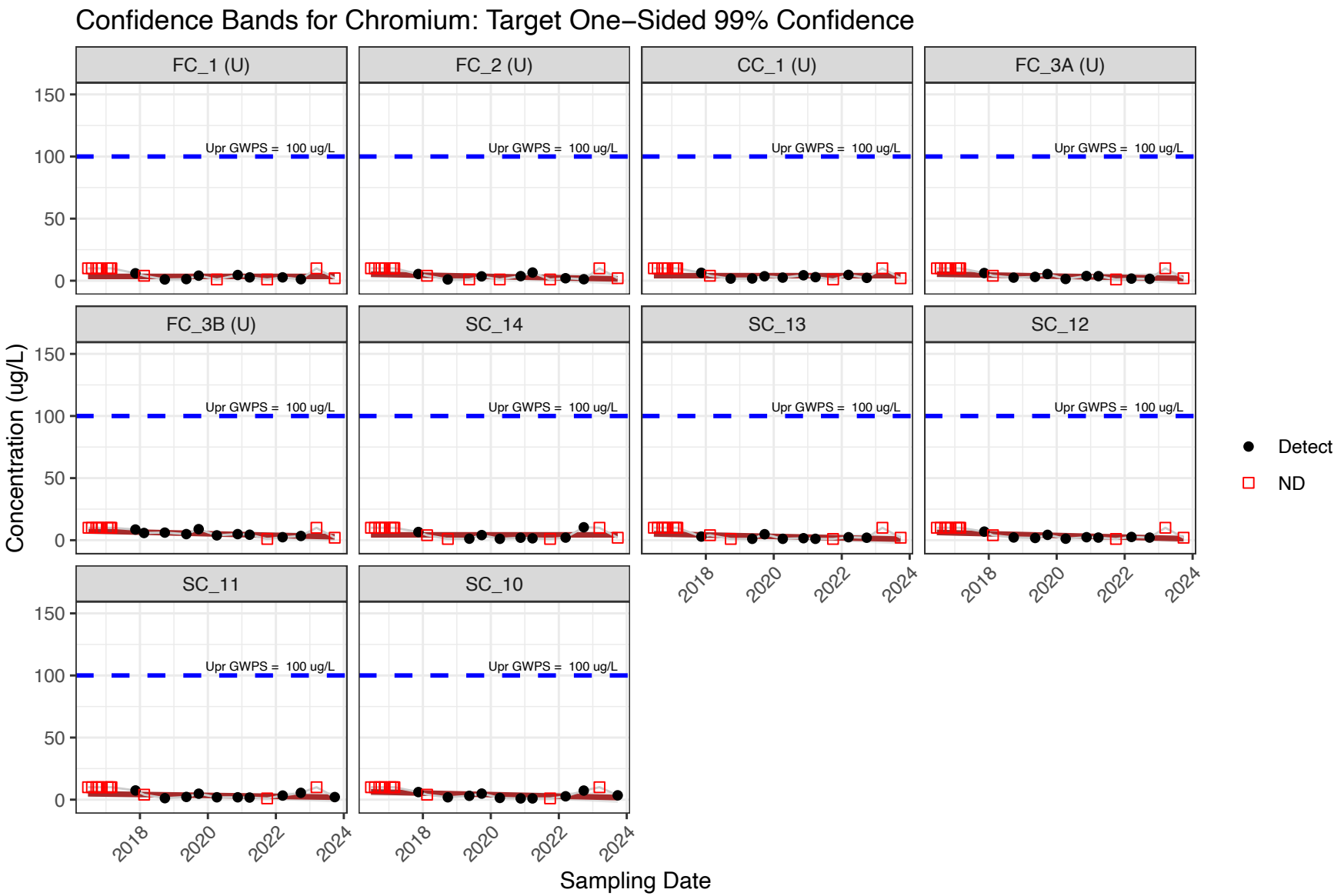


Figure 78: Confidence Band Plots

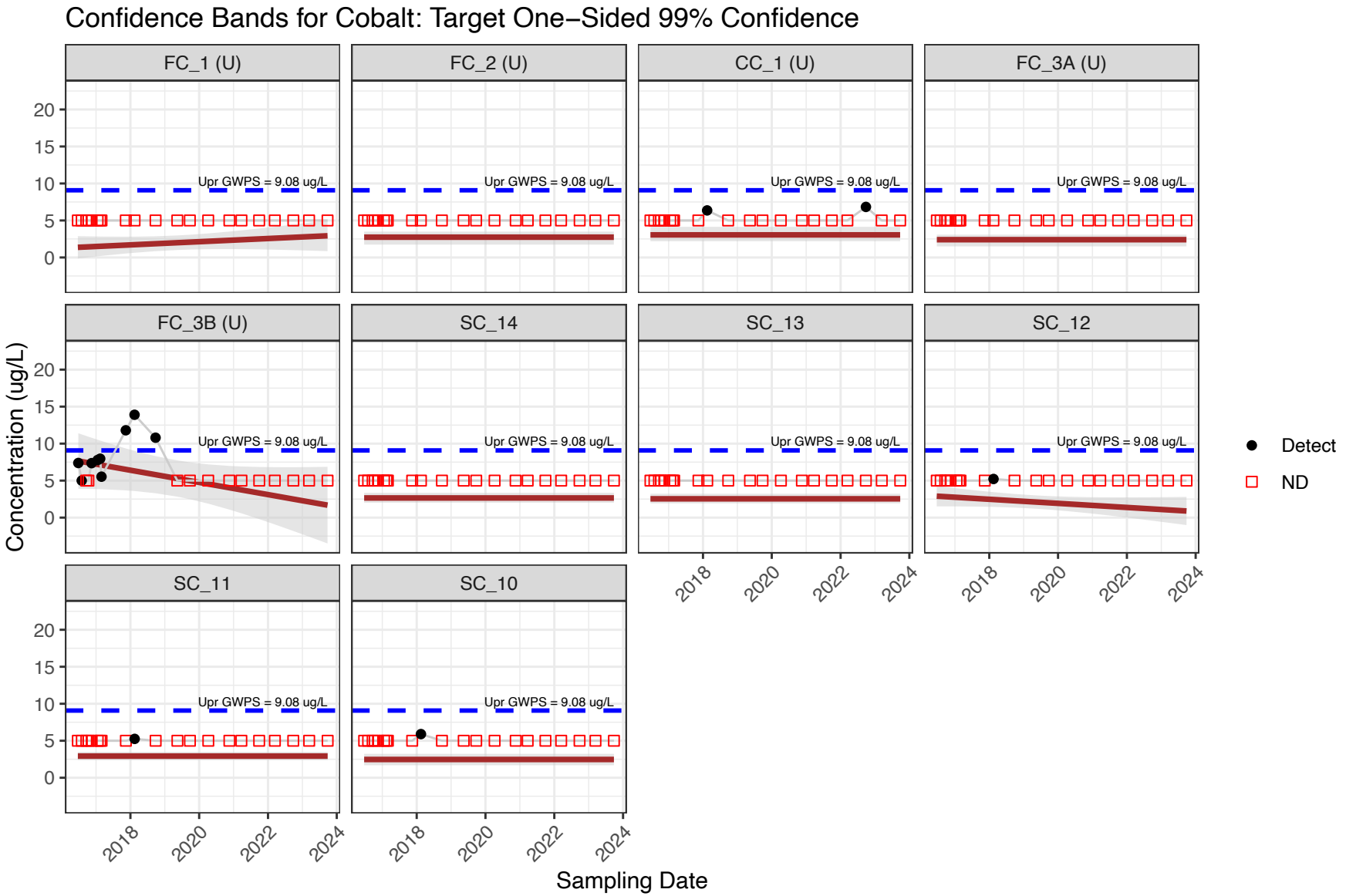


Figure 79: Confidence Band Plots

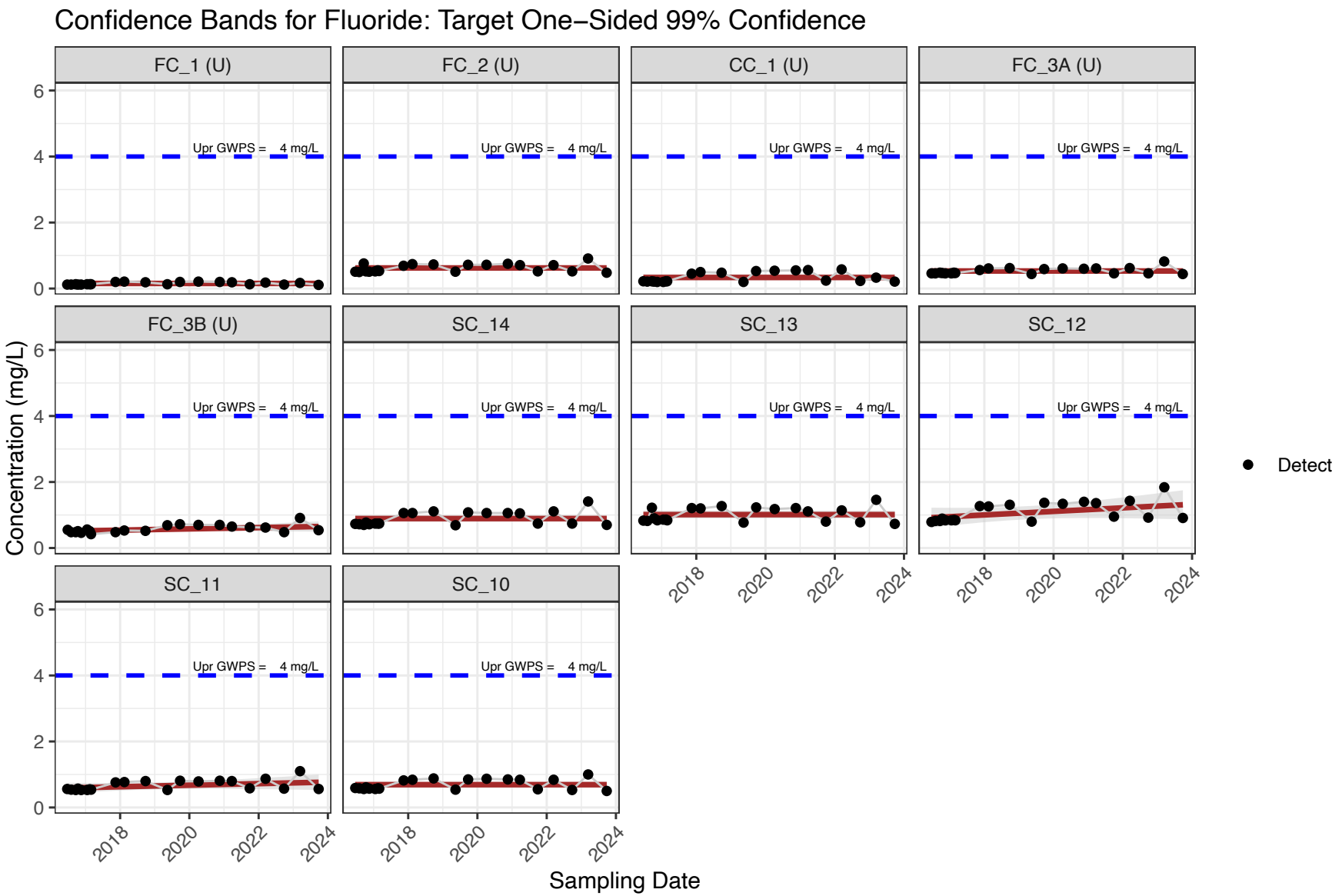


Figure 80: Confidence Band Plots

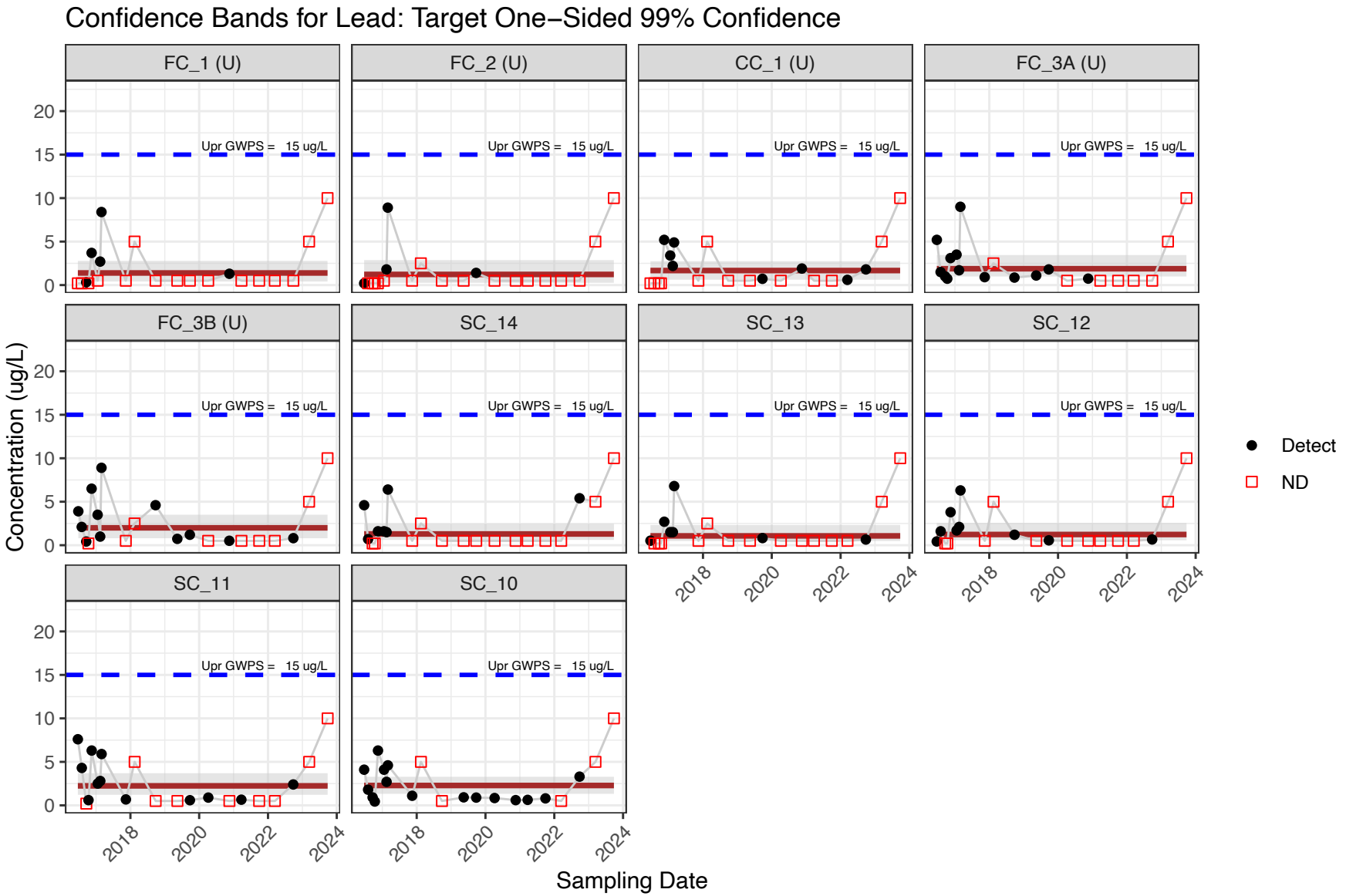


Figure 81: Confidence Band Plots

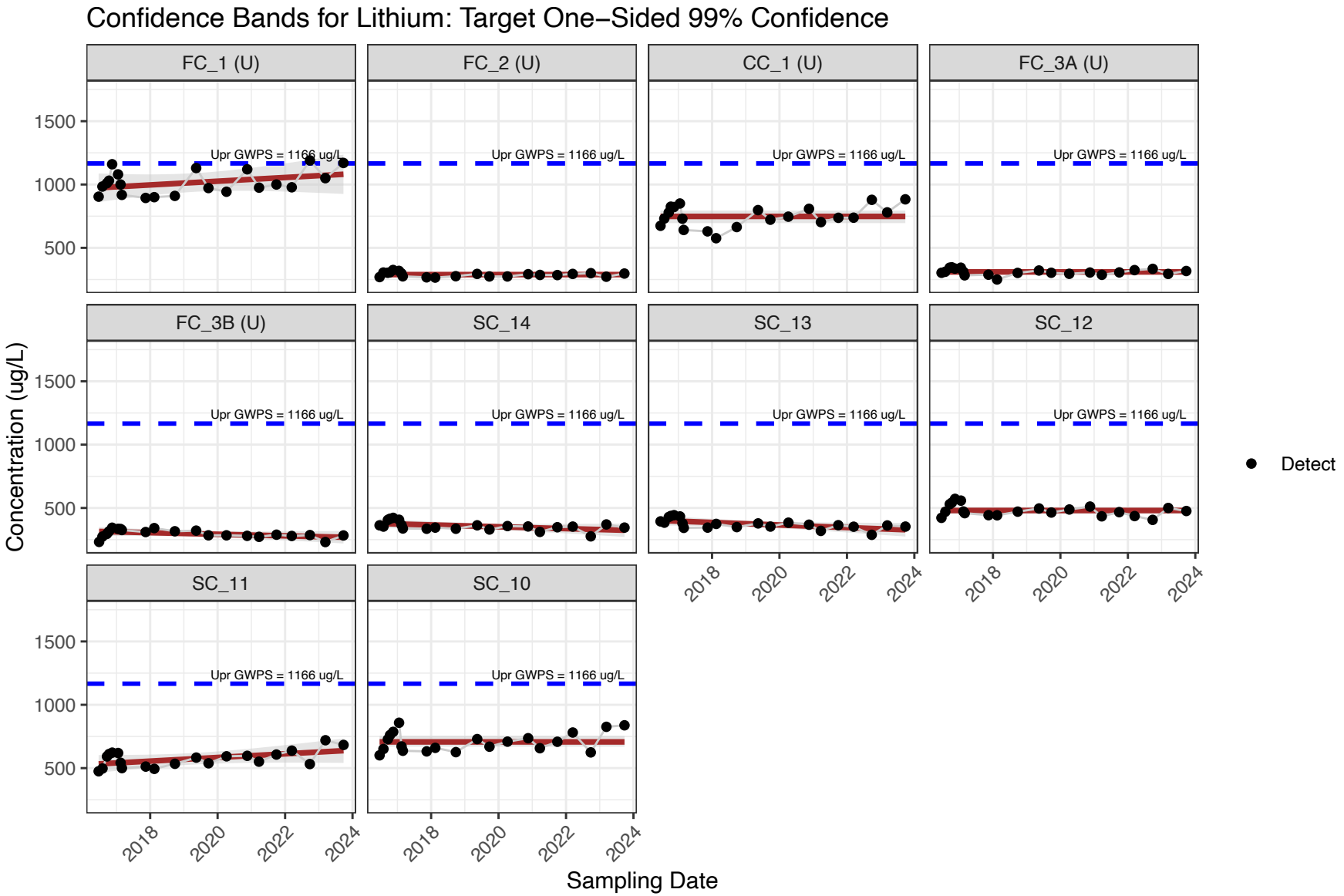


Figure 82: Confidence Band Plots

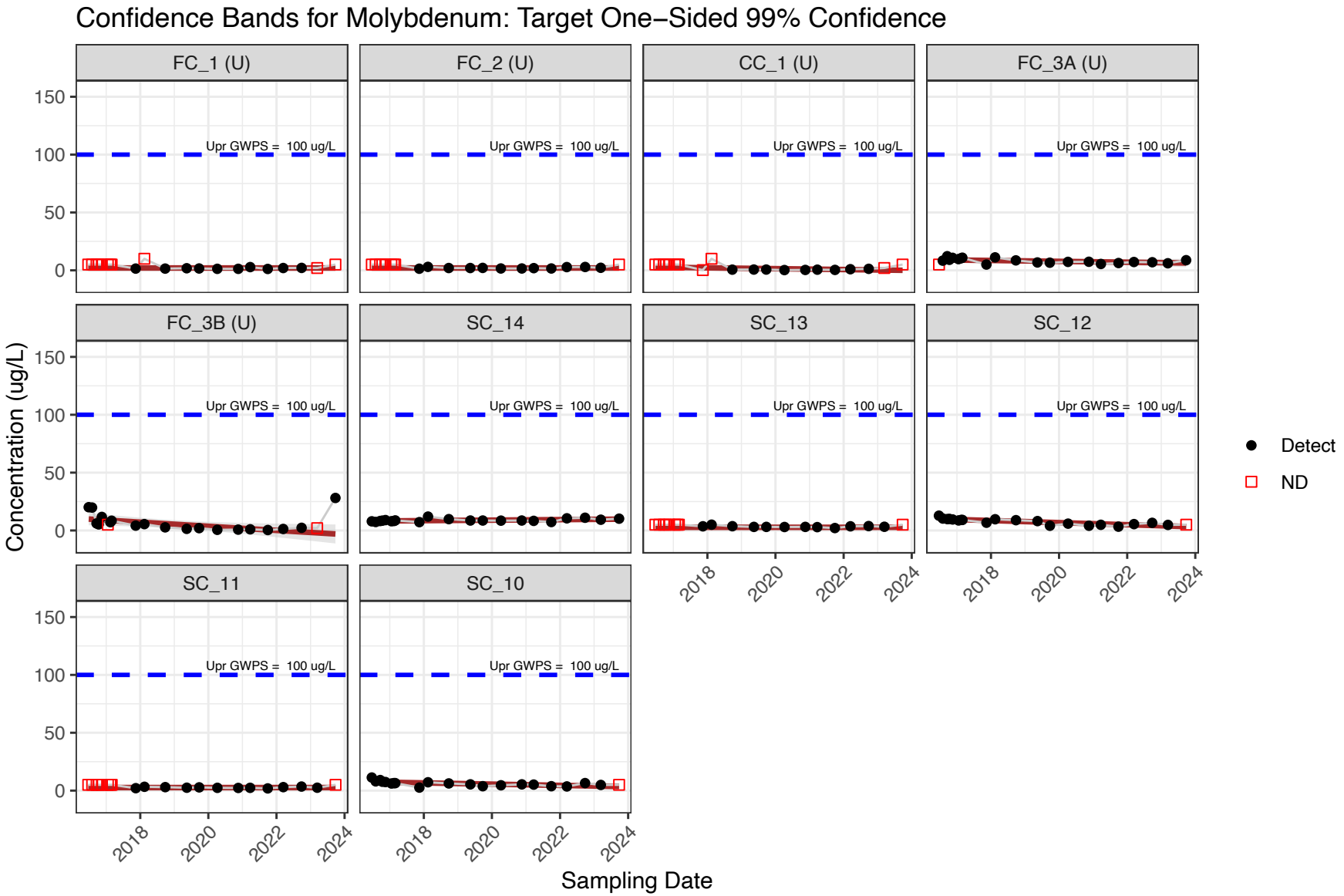


Figure 83: Confidence Band Plots

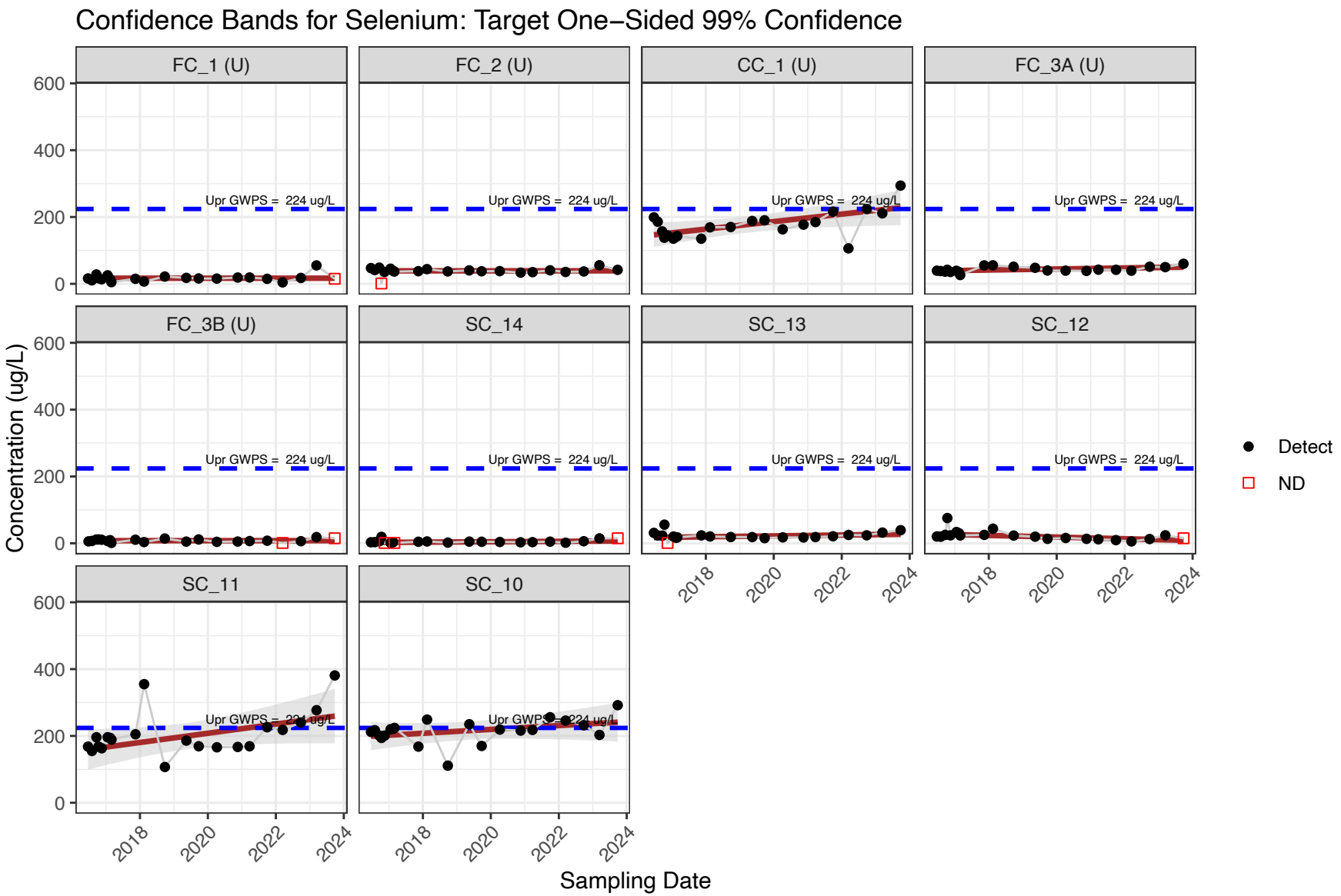


Figure 84: Confidence Band Plots

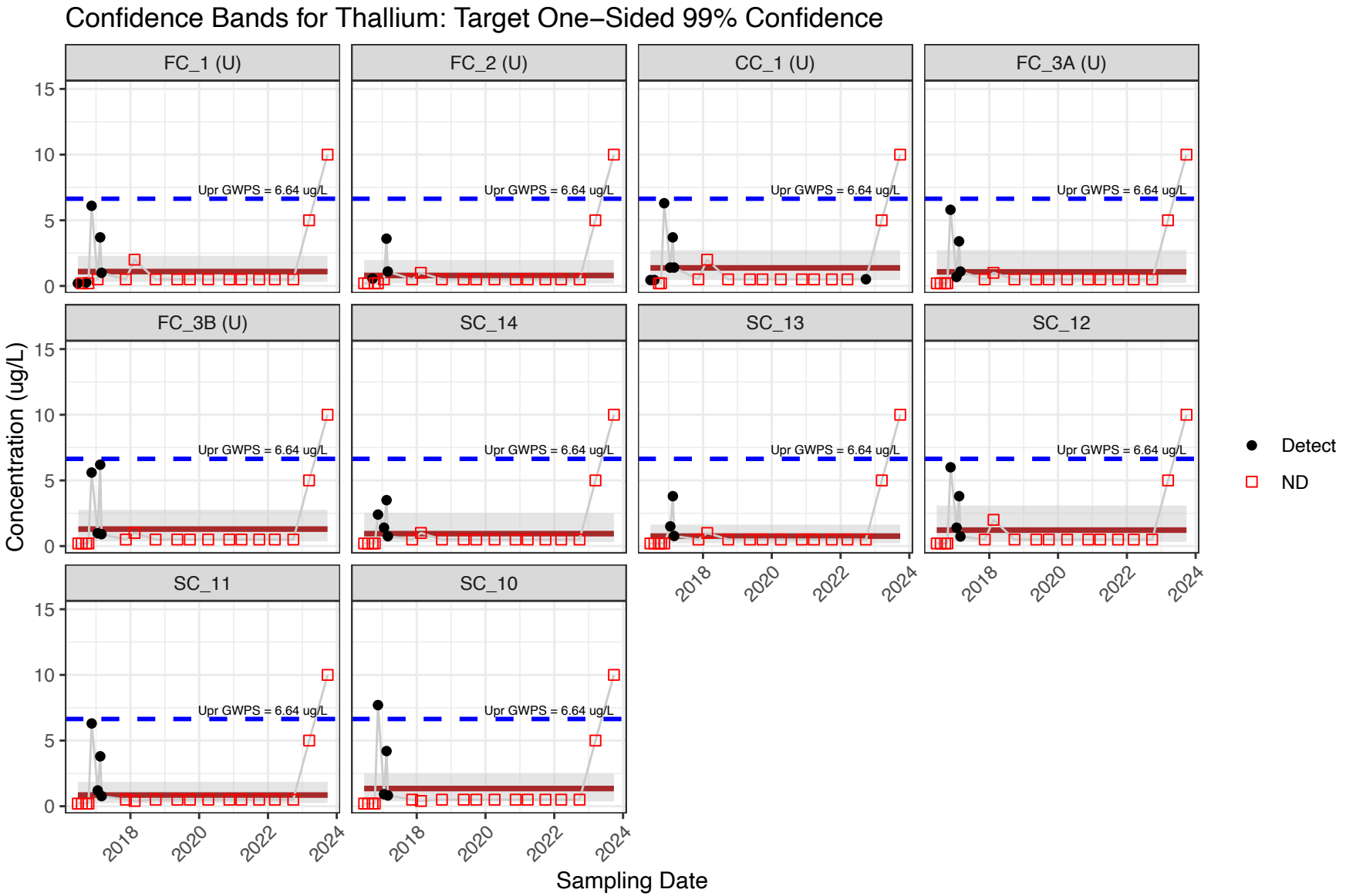


Figure 85: Confidence Band Plots

Attachment A: Statistical Summary

Attachment A - 2023 Year-End CCR Ash Landfill Statistical Summary

	Background Wells					Dgradient Wells				
Statistical Method/Test	**CC_1**	**FC_1**	**FC_2**	**FC_3A**	**FC_3B**	**SC_10**	**SC_11**	**SC_12**	**SC_13**	**SC_14**
Down-weighted Extreme Outliers	1	1	2	1	1	1	1	1	2	2
Seasonality	None	None	None	None	None	None	None	None	None	None
Trends/Time Series - Appendix III	Boron - D; Chloride - U; pH - U; Sulfate - U; TDS - U	Chloride - U; pH - U; Sulfate - D; TDS - D	Boron - U; Chloride - D; pH - U; Sulfate - D; TDS - D	Boron - D; Chloride - U; Sulfate - D; TDS - D	Boron - D; Calcium - D; Chloride - D; pH - U; Sulfate - D; TDS - D	Calcium - D; Chloride - U; Sulfate - D; TDS - D	Boron - U Calcium - D; pH - U; Sulfate - U	Boron - U Chloride - D; Sulfate - D; TDS - D	Boron - D; pH - U; Sulfate - D; TDS - D	Boron - D; pH - U; Sulfate - D; TDS - D
Trends/Time Series - Appendix IV	Molybdenum - D; Selenium - U		Barium - U; Cadmium - D; Chromium - D	Barium - D; Cadmium - D; Mercury - D; Selenium - U	Barium - D; Cadmium - D; Chromium - D; Cobalt - D; Fluoride - U; Lithium - D; Mercury - D; Molybdenum - D	Chromium - D; Molybdenum - D	Lithium - U; Selenium - U	Barium - D; Chromium - D; Cobalt - D; Fluoride - U; Mercury - D; Molybdenum - D; Rad226+228 - D; Selenium - D	Beryllium - D; Chromium - D; Lithium - D	Barium - D; Lithium - D; Molybdenum - U; Selenium - U
Prediction Limit Exceedances	NA	NA	NA	NA	NA	0	1	2	0	0
Confidence Band Exceedances	NA	NA	NA	NA	NA	0	0	0	0	0

Note: U = increasing; D = decreasing

APPENDIX E

August 23, 2023, *Groundwater Monitoring Network Modification* Letter

From:	Lawrence - CDPHE, Ashley
To:	Amber Holmberg
Cc:	Jill Parisi (JILL.PARISI@STATE.CO.US); Heather Barbare; Brock Foster; Mike Brady
Subject:	Re: Colorado Springs Utilities CSR Groundwater Monitoring Network Modifications Memo
Date:	Friday, August 25, 2023 9:33:03 AM

Hi Amber,

Thank you for sending the AECOM memo about the Groundwater Monitoring Network Modifications at Clear Spring Ranch for the Coal Combustions Residuals Landfill. The revisions look good and I don't have any additional questions or concerns at the moment.

Best,

Ashley
--

Ashley Lawrence
Environmental Protection Specialist II
Solid Waste Permitting Unit
Solid Waste and Materials Management Program
C 720.213.8028
P 630.442.9756
222 South 6th Street Grand Junction, CO
ashley.lawrence@state.co.us | www.colorado.gov/cdphe

On Wed, Aug 23, 2023 at 9:36 AM Amber Holmberg <aholmberg@csu.org> wrote:

> Hello Ashley and Jill,
>
> Attached, you will find an AECOM memo about the Groundwater Monitoring Network Modifications at Clear Spring Ranch for the Coal Combustions Residuals Landfill.
>
> Let me know if you need any additional information or have any questions.
>
> Thanks,

Amber

Amber Holmberg | Environmental Engineer I
Colorado Springs Utilities |EVS Technical Services
121 S. Tejon Street, 4th Fl. | MC: 940 | Colorado Springs, CO 80903
O (719) 668-1822 | M (719) 318-8459

AECOM
1601 Prospect Parkway
Fort Collins, CO 80525
tel: (970) 493-8878

August 23, 2023

Ms. Amber Holmberg
Colorado Springs Utilities
121 S. Tejon Street, 4th Floor
Colorado Springs, CO 80947

Subject: Groundwater Monitoring Network Modification
Coal Combustions Residuals Landfill
Colorado Springs Utilities, Clear Spring Ranch
El Paso County, Colorado

Dear Ms. Holmberg,

In response to the downgradient detection of selenium at concentrations representing a statistically significant level (SSL) above the groundwater protection standard (GWPS) at the Colorado Springs Utilities (UTILITIES) Clear Spring Ranch facility coal combustion residuals (CCR) landfill (Landfill), UTILITIES contracted AECOM Technical Services, Inc. (AECOM) to conduct an alternative source demonstration (ASD) to evaluate whether the selenium concentrations were due to the presence or operation of the CCR Landfill or to an alternative source. The ASD report dated April 2022 and Additional Information letter dated August 9, 2022 identified background conditions to the north of the CCR Landfill as an alternative source for the selenium.

To further evaluate the nature and location of the background conditions north of the CCR Landfill responsible for the selenium, three new monitoring wells (SC-15, SC-16, and SC-17) were installed and tested at the locations illustrated on **Figure 1**.

This purpose of this memorandum is to summarize AECOMs evaluation of the groundwater quality data collected from these wells during the November 2022 and March 2023 CCR groundwater monitoring events and to compare concentrations of constituents at each well to determine which of the three newly installed monitoring wells are representative of groundwater conditions upgradient of the CCR Landfill. This letter summarizes this evaluation and current conditions and provides a proposed path forward and recommended changes to the groundwater monitoring network.

Data Evaluation

Groundwater from the three new monitoring wells was sampled during the CCR Landfill's semiannual Assessment Monitoring events in November 2022 and March 2023. The data from these events are presented in **Table 1**.

Concentrations of selenium and nitrate at all three new wells in November 2022 were much lower than concentrations detected in the March 2023 samples (taking into account the different nitrate analyses performed in November versus March). This suggests the newly installed wells had not reached equilibrium with the groundwater environment. Data collected for the newly installed upgradient wells in March 2023 was utilized during this evaluation as it was deemed more representative of site conditions.

The data were evaluated with attention to representing groundwater quality upgradient of the north boundary of the CCR Landfill. Lines of evidence and findings from the ASD report included the following:

- Groundwater flow within the Piney Creek Alluvium Hydrostratigraphic Unit (PCA HSU) beneath the CCR Landfill is present within hydraulically separated buried paleo-alluvial valley drainages, two of which are separated by a bedrock high located beneath the landfill.

- Groundwater chemistry is significantly different in the North Paleo-Alluvial Valley as compared to the South Paleo-Alluvial Valley, but the current background data set for statistical evaluation is based only on wells located within the South Paleo-Alluvial Valley.

- Nitrate concentrations in groundwater samples from upgradient monitoring wells located in the North Paleo-Alluvial Valley are significantly higher than samples obtained from upgradient monitoring wells located in the South Paleo-Alluvial Valley. Concentrations of selenium are correspondingly significantly higher in upgradient monitoring wells located in the North Paleo-Alluvial Valley than upgradient monitoring wells located in the South Paleo-Alluvial Valley.

- Elevated concentrations of nitrate in groundwater can mobilize and transport selenium from naturally occurring geologic sources such as the Pierre Shale bedrock and alluvial sediments derived from the Pierre Shale in the Clear Spring Ranch region.

- Concentrations of boron in downgradient monitoring wells SC-11 and SC-12 triggered the transition from Detection to Assessment monitoring, but the concentration of boron in the selenium-affected northern well (SC-10) does not suggest impact from the Landfill.

The March 2023 data from the new upgradient monitoring wells installed north of the CCR Landfill confirm the groundwater flow direction and flow paths presented in the ASD and the presence of elevated concentrations of both selenium and nitrate in groundwater to the north of the CCR Landfill.

– Water levels measured in the new wells indicate higher groundwater elevations to the north of the CCR Landfill, indicating that groundwater flow direction is from northwest to southeast, following the downstream trend of the North Paleo-Alluvial Valley (**Figure 1**).

– Each Paleo-Alluvial Valley, has unique geochemistry attributes. The March 2023 data, shown in **Table 1**, indicate that there is additional variability within the North Paleo-Alluvial Valley that will be investigated as part of the recommended activities outlined below (Recommendations).

– One element of geochemical variability in the North Paleo-Alluvial Valley upgradient groundwater is the concentrations of nitrate and selenium.

– For the upgradient monitoring wells of the North Paleo-Alluvial Valley, concentrations of selenium are highest in wells SC-9 and SC-16 (0.578 and 0.56 mg/L, respectively), and lowest in wells SC-15 and SC-17 (0.0382 and 0.135 mg/L, respectively).

– In these same monitoring well pairs, concentrations of nitrate are elevated in well SC-9 and well SC-16 (340 and 460 mg/L, respectively), and lowest in wells SC-15 and SC-17 (110 and 130 mg/L, respectively). The highest nitrate concentration was detected in well SC-8 (740 mg/L).

– Groundwater chemistry in each of the new wells (SC-15, SC-16, and SC-17) is consistent with nearby wells in the North Paleo-Alluvial Valley. For example, groundwater chemistry at well SC-16 is very similar to groundwater collected at well SC-8, while SC-15 is similar to nearby WW-3A and SC-17 is similar to nearby SC-9.

The March 2023 data support the hydraulic separation of the North and South Paleo-Alluvial Valleys and support the interpretation that the selenium concentrations observed in downgradient monitoring wells SC-10 and SC-11 are affected by groundwater conditions originating upgradient to the northwest within the North Paleo-Alluvial Valley alignment.

Groundwater chemistry in the new wells supports the association of elevated selenium with elevated nitrate concentrations.

Status and Path Forward

The ASD lines of evidence are supported by data collected from three newly installed wells (SC-15, SC-16, and SC-17), suggesting two parallel paths for action moving forward.

- Modification of the groundwater monitoring program to account for the full diversity of background geochemical conditions of the North and South Paleo-Alluvial Valleys.

- Installation of additional wells as needed to more fully represent the effect of North Paleo-Alluvial Valley geochemistry on nitrate and selenium concentrations.

Recommendations

The recommended sequential steps to achieve the path forward for the Landfill groundwater monitoring program are as follows:

- Installation and testing of two additional monitoring wells (SC-18 and SC-19) at the locations designated on **Figure 2** to further define groundwater flow conditions in the North Paleo-Alluvial Valley HSU and to provide additional upgradient groundwater monitoring points for potential inclusion in the groundwater monitoring program. A brief work plan describing the planned monitoring well installation activities is included as **Attachment 1**.

- Performance of eight (8) bimonthly (every other month) monitoring events for the proposed background evaluation wells (shown in Table 2) to characterize background conditions and establish additional potential baseline conditions.

- Completion of one full round of groundwater monitoring to include 25 monitoring wells during one of the bimonthly monitoring event (Table 3). Groundwater elevations and water quality from this event will be utilized to update the potentiometric surface map and groundwater geochemistry for the CCR Landfill and surrounding area.

- Continue semi-annual groundwater monitoring of the 10 CCR program wells located upgradient and downgradient of the CCR Landfill as described in the current version of the Groundwater Monitoring Plan.

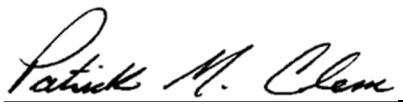
- Modification of the Groundwater Monitoring Plan to include new background monitoring wells for the Landfill. Background monitoring well selection will be based on the baseline sampling program outlined above and in **Tables 2** through **4**.

- Adjustment of the GWPS as appropriate based on the inclusion of additional background (upgradient) groundwater monitoring wells.

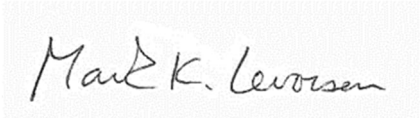
- Submittal of the modified Groundwater Monitoring Plan for CDPHE review / approval.

- Continuation of Assessment Monitoring for the CCR Landfill.

Sincerely,



Patrick Clem, PE
Project Manager



Mark Levorsen, PG
Principal Hydrogeologist

Table 1

Well ID	Sample Date	Boron (Total Recoverable) mg/L	Calcium (Total Recoverable) mg/L	Chloride mg/L	Fluoride (Total) mg/L	Iron (Total Recoverable) mg/L	Nitrite+Nitrate as Nitrogen* mg/L	Selenium (Total Recoverable) mg/L	Sodium (Total Recoverable) mg/L	Sulfate mg/L	Total Dissolved Solids mg/L
SC-15	3/15/2023	1.18	362	407	0.37	0.0363	110	0.038	3,410	11,200	16,000
SC-16	3/16/2023	2.01	501	1,260	0.70	0.0422	460	0.56	2,170	4,800	11,200
SC-17	3/16/2023	1.01	334	510	0.94	0.192	130	0.135	2,600	7,300	12,600
SC-8	3/16/2023	1.03	572	1,380	0.74	0.304	740	0.145	1,860	3,620	11,800
SC-9	3/16/2023	1.27	322	1,430	0.98	7.7	340	0.578	4,230	11,600	18,200
SC-15	11/30/2022	1.21	424	386	0.39	6.92	111.9	0.0026	4,110	11,300	17,400
SC-16	11/30/2022	2.13	340	1,270	0.56	5.38	99.6	0.499	2,570	4,640	11,900
SC-17	11/30/2022	0.985	424	505	0.72	7.54	37.09	0.111	2,820	7,580	11,500
SC-8	11/28/2022	1.17	569	1,410	0.68	0.512	800.36	0.0578	1,820	3,340	11,900
SC-9	11/28/2022	1.37	478	1,530	0.96	134	350.88	0.528	4,430	12,000	20,600

Note*: March 2023 results are for Nitrite+Nitrate as Nitrogen from Method EPA 353.2 and
the November 2022 results shown are the sum of results for Nitrate as Nitrogen and Nitrite as Nitrogen using Method EPA 353.2.

Table 2 - Proposed "Background Evaluation" CCR Lanfill Upgradient Wells - Bi-Monthly Monitoring (8X)

Well ID	HSU	CCR Monitoring Well	Location Relative to CCR Landfill	Appendix III Analytes	Appendix IV Analytes
SC-15	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X
SC-16	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X
SC-17	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X
SC-18 (New Well Install)	PCA-SPAV	Background Evaluation	Upgradient (North)	X	X
SC-19 (New Well Install)	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X
SC-8	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X
SC-9	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X

Notes:

HSU = Hydrostratigraphic Unit

PCA-NPAV = Piney Creek Alluvium-North Paleo-Alluvial Valley

PCA-NSAV = Piney Creek Alluvium-South Paleo-Alluvial Valley

Appendix III Analytes = Boron, Calcium, Chloride, Fluoride, Sulfate, pH, TDS

Appendix IV Analytes = Antimony, Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Fluoride, Lead, Lithium, Mercury, Molybdenum, Rad226+228, Selenium, Thallium

Table 3 - List of Wells and Analytes for One-Time Monitoring Event (Water Levels and Water Chemistry)

Well ID	HSU	CCR Monitoring Well	Location Relative to CCR Landfill	Appendix III Analytes	Appendix IV Analytes	Additional Analytes (AA Below)
SC-15	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-16	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-17	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-18 (New Well Install)	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-19 (New Well Install)	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-8	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
SC-9	PCA-NPAV	Background Evaluation	Upgradient (North)	X	X	AA
FC-1A	PCA-SPAV	No	Upgradient (Southwest)	X	X	AA
FC-2A	PCA-SPAV	No	Upgradient (Southwest)	X	X	AA
SC-2	PCA-SPAV	No	Downgradient	X	X	AA
SC-3	PCA-SPAV	No	Downgradient	X	X	AA
SC-7	PCA-NPAV	No	Downgradient	X	X	AA
WW-3A	Kp-NPAV	No	Upgradient (North)	X	X	AA
WW-5A	Kp-NEPAV	No	Cross-gradient	X	X	AA
WW-6A	Kp-NEPAV	No	Cross-gradient	X	X	AA
CC-1	PCA-SPAV	Current Background	Upgradient (Southwest)	X	X	AA
FC-1	PCA-SPAV	Current Background	Upgradient (Southwest)	X	X	AA
FC-2	PCA-SPAV	Current Background	Upgradient (Southwest)	X	X	AA
FC-3A	PCA-SPAV	Current Background	Upgradient (Southwest)	X	X	AA
FC-3B	Kp-SPAV	Current Background	Upgradient (Southwest)	X	X	AA
SC-10	PCA-NPAV	Current Downgradient	Downgradient (Northeast)	X	X	AA
SC-11	PCA-NPAV	Current Downgradient	Downgradient (Northeast)	X	X	AA
SC-12	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X	AA
SC-13	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X	AA
SC-14	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X	AA

Notes:

HSU = Hydrostratigraphic Unit

PCA-NPAV = Piney Creek Alluvium-North Paleo-Alluvial Valley

PCA-NSAV = Piney Creek Alluvium-South Paleo-Alluvial Valley

Kp-NPCA = Pierre Shale-North Paleo-Alluvial Valley

Kp-NEPCA = Pierre Shale-Northeast Paleo-Alluvial Valley

Kp-SPCA = Pierre Shale-Sorth Paleo-Alluvial Valley

Appendix III Analytes = Boron, Calcium, Chloride, Fluoride, Sulfate, pH, TDS

Appendix IV Analytes = Antimony, Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Fluoride, Lead, Lithium, Mercury, Molybdenum, Rad226+228, Selenium, Thallium

AA - Additional Analytes = Sodium, Potassium, Magnesium, Manganese, Iron, Total Alkalinity, Bicarbonate Alkalinity, Ammonia, and Nitrate+Nitrite

Table 4 - Current CCR Rule Monitoring Well Network - Semi-Annual Monitoring

Well ID	HSU	CCR Monitoring Well	Location Relative to CCR Landfill	Appendix III Analytes	Appendix IV Analytes
CC-1	PCA-SPAV	Current Background	Upgradient (West)	X	X
FC-1	PCA-SPAV	Current Background	Upgradient (West)	X	X
FC-2	PCA-SPAV	Current Background	Upgradient (West)	X	X
FC-3A	PCA-SPAV	Current Background	Upgradient (West)	X	X
FC-3B	Kp-SPAV	Current Background	Upgradient (West)	X	X
SC-10	PCA-NPAV	Current Downgradient	Downgradient (Northeast)	X	X
SC-11	PCA-NPAV	Current Downgradient	Downgradient (Northeast)	X	X
SC-12	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X
SC-13	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X
SC-14	PCA-SPAV	Current Downgradient	Downgradient (Southeast)	X	X

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

SC-15 5457.02
SC-16 5456.72
SC-8 5457.22
SC-17 5440.49
SC-9 5441.15
SC-10 5433.22
SC-11 5433.14
SC-7 5431.12
SC-12 5432.09
SC-13 5433.23

Legend

Groundwater Elevation Nov 2022

- PCA Well November 2022

Groundwater Elevation

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Groundwater Flow Line
- Boundary - Piney Creek Alluvium HSU Approximate
- Boundary Certificate of Designation
- Boundary CCR Landfill

Note: Groundwater elevations for November 2022 were obtained for 11 monitoring wells. This data was used to modify potentiometric contours from the February 2022 monitoring event where 20 wells were monitored.

N

1 inch = 500 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 from February 2022

AECOM

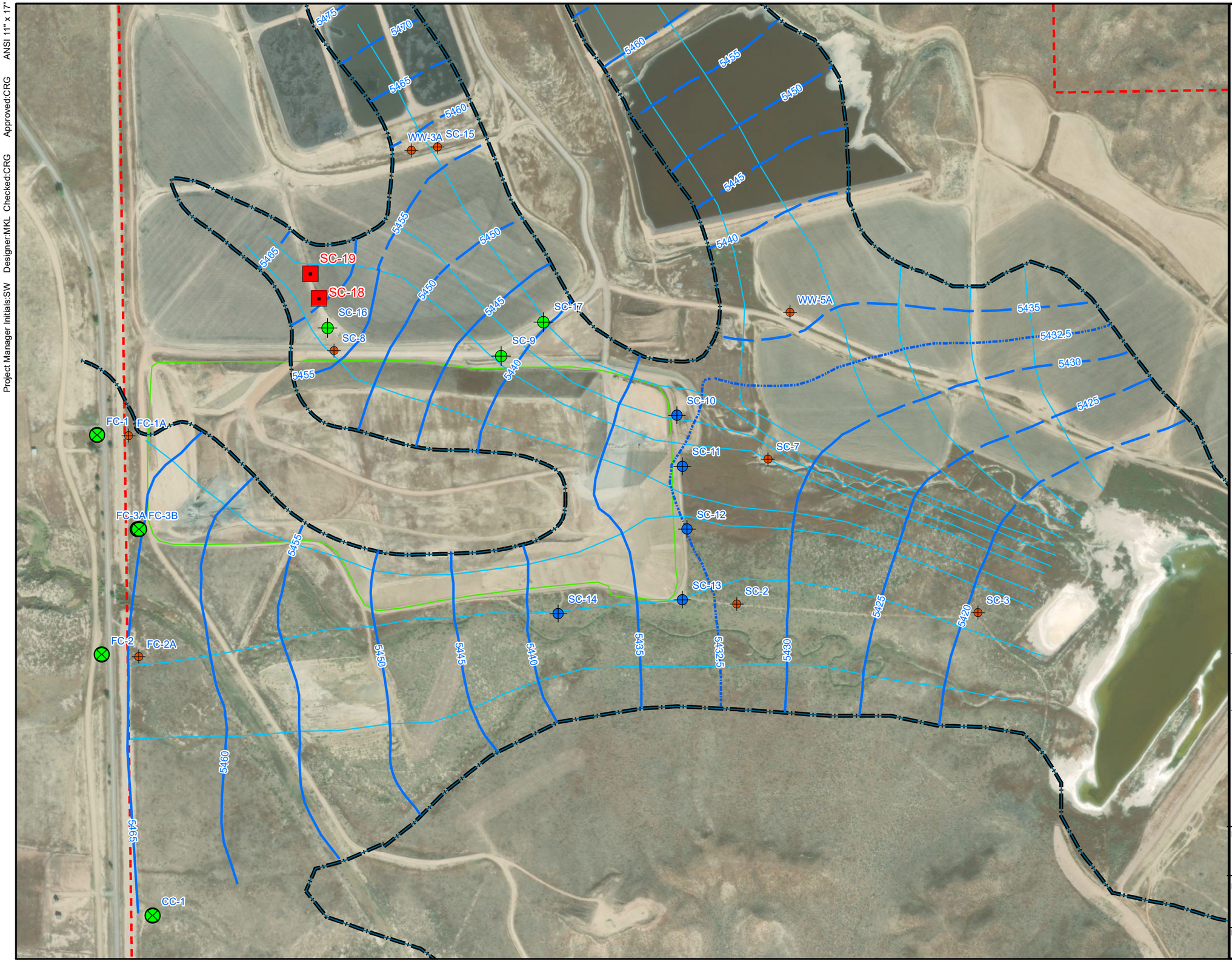
Title: **Groundwater Potentiometric Surface Contours with Flow Lines November 2022 Sampling Event Combined with February 2022 Data Depth to Water Measured November 2022 and February 2022**

Project: Revisions to the Groundwater Monitoring Plan - CCR Landfill

Location: Clear Spring Ranch, El Paso County, CO

Project No.:	Date:	Figure:
60712294	7/28/2023	1

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



Legend

CCR_Status

- Background - NPAV
- Background - SPAV
- Downgradient Compliance
- Other Monitoring Wells

Proposed Well Installations

- SC-18
- SC-19
- Boundary_PCA_HSU

Groundwater Elevation

- Potentiometric Surface Contour (5-ft interval)
- Dashed Where Inferred
- 5432.5 Contour (half-interval)
- Groundwater Flow Line
- Boundary Certificate of Designation
- Boundary CCR Landfill
- Boundary - Piney Creek Alluvium HSU Approximate

1 inch = 500 feet

0 250 500 1,000

Feet

N

AECOM

Title:

Locations of Existing Wells and Proposed Background Monitoring Wells

Project: Revisions to the Groundwater Monitoring Plan
CCR Landfill

Location:
Clear Spring Ranch
El Paso County, CO

Project No.:	Date:	Figure:
60712294	7/28/2023	2

Attachment 1 - Monitoring Well Installation Work Plan

This plan describes the activities that will take place at the Colorado Springs Utilities (UTILITIES) Clear Spring Ranch facility for installation of two new groundwater monitoring wells located north of the CCR Landfill to support revision of the Groundwater Monitoring Plan. The groundwater monitoring well installation activities will include the following.

Utility Locating / Clearance

The Utility Notification Center of Colorado ("UNCC") will be notified at least five business days prior to any excavation or earthwork activities to ensure proper location and clearance of utilities.

Monitoring Well Notifications

Monitoring well permit notifications will be prepared and submitted to the Colorado State Engineer's Office in accordance with Rule 6.3 of the Water Well Construction Rules (2 CCR 402-2). The Notice of Intent will be provided before drilling any groundwater monitoring well. Notice is accomplished by submitting Form GWS-51 (Monitoring and Observation Holes) to the Division of Water Resources at least three (3) days and no more than ninety (90) days prior to well construction.

Monitoring Well Installation

Monitoring wells will be drilled and installed by a Colorado licensed Water Well Construction Contractor. A hydrogeologist or geologist will oversee the field activities performed by the drilling subcontractor. The proposed monitoring wells will be drilled and boreholes will be advanced using continuous sampling with hollow stem augers. Monitoring wells will be constructed using 2-inch diameter flush-joint Schedule 40 PVC. Well screens will be fifteen (15) feet in length with 0.010-inch slot size (10-slot). The bottom of the screen interval will be set at or close to the bedrock-alluvium contact. Graded filtered silica sand (20-40 gradation) will extend from the bottom of the borehole to approximately two feet above the top of the well screen. Bentonite chips will be placed above the filter pack material up to approximately two feet below ground surface. The top portion of the hole will be sealed with cement. The wells will be completed at ground surface with above grade protective well covers / stick-ups in 2 foot x 2 foot x 4 inch concrete well pads. The wells will be equipped with a locking J-plug well cap, or equivalent. Monitoring well locations will be surveyed by UTILITIES to determine the horizontal and vertical coordinates for the top of PVC casing and ground surface at the well head following well installation.

Monitoring Well Development

The monitoring wells will be developed to remove solids or other particulates that may have been deposited on the boring wall during drilling. Development will occur no sooner than 24 hours after well installation. Well development will be accomplished using methods commonly accepted by environmental professionals and approved will include one of more of the following - bailing, surging, and/or pumping. Temperature, pH, conductivity and turbidity will be monitored during well development. The well-development will continue until the groundwater's temperature, pH, turbidity (target <5 NTU) and conductivity have stabilized within 10% between successive readings, *or* a maximum of 10 borehole volumes of water has been removed from the well and at least three surging and bailing/pumping events have been performed. If the well goes dry during development and does not readily recharge, development will be deemed complete after a minimum of 3 well casing volumes have been removed and one surging event. Typically, a well is considered developed when free of visible sediment; however, previous well installations in this area have shown that turbidity doesn't readily clear up.

Field Documentation

Field personnel will document the field activities in a logbook and/or field logs. A daily field log will be kept documenting the timing of field activities and the content of any pertinent project communications. Each daily field log will be dated and signed by field personnel. Photographs will be taken to record the soil core samples and any other relevant field activities. The field geologist logging the soil cores will classify per the Unified Soil Classification System.

Monitoring Well Permits

Monitoring well permit applications will be submitted to the State Engineer's Office upon completion of the well installations. A Monitoring and Observation Well Permit Application (Form GWS-46) and Well Construction and Yield Estimate Report (Form GWS-31) will signed by the well driller to register the monitoring wells with the State Engineer's Office.