Comanche Station CCR Impoundment
Notification of GPS and SSL Determination

Public Service Company of Colorado (PSCo), an Xcel Energy Company, owns and operates Comanche Station, a coal-fired, steam-turbine electric generating station. Comanche currently operates two CCR units on-site, a landfill that is used for final disposal of CCR generated at Comanche Station and a bottom ash pond used for temporary storage and dewatering of bottom ash sluice water, prior to removal of the bottom ash solids for beneficial use or disposal in the on-site CCR landfill. Comanche Station has constructed and is operating an alternative treatment system that replaced the function of the bottom ash pond and commenced closure of the bottom ash pond in August 2021.

Protecting the environment is a priority for Xcel Energy

PSCo conducts all its business in an environmentally responsible manner and that includes monitoring company operations and taking steps to protect air, water and other natural resources. Pursuant to 40 CFR Part 257.93(g) of the Disposal of Coal Combustion Residuals from Electrical Utilities Rule (Federal CCR Rule), finalized on April 17, 2015, PSCo has made determined that one or more constituents listed in Appendix IV have been detected at Statistically Significant Levels (SSLs) above the Groundwater Protection Standards (GPS) established for the site pursuant to 257.95(h). The attached Memo, Comanche CCR Impoundment Groundwater Protection Standards and Determination of SSLs establishes the GPS for each Appendix IV constituent that was detected in groundwater at the CCR impoundment and identifies those constituents for which SSLs above the GPS have been determined. These results do not indicate there is an impact on local drinking water. Instead, the monitoring wells evaluate groundwater in the vicinity of the CCR impoundment, and measure groundwater conditions within the Comanche Station property boundary. Xcel Energy continues to monitor groundwater at the site in accordance with the assessment monitoring program as specified in 257.95 and other applicable requirements of the CCR Rule.

Memo

Date:	Friday, November 19, 2021
To:	Jennifer McCarter, Xcel Energy
From:	Megan Seymour, HDR, Inc.
Subject:	Comanche Station CCR Impoundment Groundwater Protection Standards and Determination of SSLs per 257.95(g)

1.0 Introduction

The U.S. Environmental Protection Agency's (EPA's) final Coal Combustion Residuals (CCR) Rule establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. Comanche Station, located in Pueblo, Colorado, has two CCR units subject to the CCR Rule: the ash landfill and a bottom ash impoundment. The scope of this memorandum is limited to the bottom ash impoundment (also referred to as the bottom ash pond) which is the only CCR unit that is in assessment monitoring. The bottom ash impoundment ceased receipt of CCR and non-CCR wastestreams and initiated closure in August 2021.

The objective of this memorandum is to document the groundwater protection standard (GPS) concentrations for each constituent of interest (COI) for the CCR unit and evaluate if the concentration of detected Appendix IV constituents in groundwater assessment monitoring are present at statistically significant levels (SSLs) over the GPS. At Comanche, groundwater monitoring has been conducted to collect eight rounds of background sampling plus detection monitoring as specified under CCR Rule Part 257.94. The water quality data collected from a monitoring well located upgradient of the CCR facility has been compiled and statistically analyzed to develop background threshold values (BTV) for each COI. In addition, assessment monitoring has been initiated at the impoundment.

CCR Rule 257.95(d)(2) requires that after results have been obtained from the initial and subsequent assessment monitoring sampling events, the owner must establish groundwater protection standards for all constituents detected during those events and that the groundwater protection standards must be established in accordance with paragraph (h) of the CCR Rule 257.95.

2.0 GPS for the Bottom Ash Pond

As stipulated in CCR Rule 257.95(b), an annual assessment monitoring event was completed in April 2021 for all Appendix III and IV parameters. **Table 1** lists the parameters in Appendix III and IV of CCR Rule Part 257.

Table 1. Groundwater quality parameters

Appendix III Constituents for Detection Monitoring	Appendix IV Constituents for Assessment Monitoring
Boron	Antimony
Calcium	Arsenic
Chloride	Barium
Fluoride	Beryllium
pH	Cadmium
Sulfate	Chromium
Total Dissolved Solids (TDS)	Cobalt
Additional Parameters	Fluoride
Total Suspended Solids (TSS)	Lead
	Lithium
	Mercury
	Molybdenum
	Selenium
	Thallium
	Radium-226 and -228 combined

CCR Rule 257.95(h) describes that GPS must be established for each constituent in Appendix IV that is detected in the groundwater. Results from the initial April 2021 assessment monitoring event identified the detected Appendix IV parameters. All Appendix IV parameters were detected in at least one well with the exception of beryllium and mercury. Therefore, GPS are established for all Appendix IV COIs except beryllium and mercury. CCR Rule 257.95(h) describes that GPS shall be:

> (1) the maximum contaminant level (MCL) for that constituent;
> (2) for constituents for which an MCL has not been established, the background concentration for the constituent established from background wells; or,
> (3) For constituents for which the background level is higher than the MCL, the background concentration.

The upper tolerance limits (UTLs) for the detected Appendix IV constituents serve as the BTV for assessment monitoring and are displayed in **Table 2**. The EPA's Unified Guidance has recommended that the UTL be used as a fixed value similar to a groundwater protection standard where an MCL does not exist for the constituent (USEPA, 2009). The UTLs were

established based on the eight background sample events at the upgradient monitoring well (W-2A).

Table 2. Upper Tolerance Limits with 95% coverage and 95% confidence for each detected Appendix IV constituent at Comanche Bottom Ash Pond

Constituent	Unit	N	No BDL	% BDL	Statistical Method	UTL
Detected Appendix IV Constituents						
Antimony	mg/l	8	7	88%	Nonparametric	0.000890
Arsenic	mg/l	8	1	13%	Parametric	0.0550
Barium	mg/l	8	1	13%	Parametric	0.0925
Cadmium	mg/l	8	0	0%	Parametric	0.00588
Chromium	mg/l	8	2	25%	Parametric	0.0535
Cobalt	mg/l	8	0	0%	Parametric	0.0102
Fluoride	mg/l	8	1	13%	Parametric	735
Lead	mg/l	8	3	38%	Parametric	0.0132
Lithium	mg/l	8	0	0%	Parametric	5.51
Molybdenum	mg/l	8	3	38%	Parametric	0.0163
Radium-226/228	pci/l	8	0	0%	Parametric	8.52
Selenium	mg/l	8	0	0%	Parametric	3.67
Thallium	mg/l	8	0	0%	Parametric	0.00645

In accordance with CCR Rule 257.95(h), GPS were established for each detected Appendix IV COI. For each detected COI, **Table 3** lists the EPA established MCL from 40 CFR 141.62 and 141.66, the BTV for the Comanche bottom ash pond, and the GPS. The GPS for each COI is the higher of the two: MCL or BTV. Also, as reflected in the table headings, the CCR Rule requires that groundwater sampling and analysis be completed for total concentrations of metals, while MCL values are established for dissolved concentrations of metals. Additionally, there are four COIs in **Table 3** that do not have established MCLs (cobalt, lead, lithium, and molybdenum); however, the July 17, 2018 CCR Rule Amendment stated that the EPA is adopting health-based concentrations as the GPS for the four Appendix IV constituents without a designated MCL. These concentrations are listed in the MCL column of **Table 3**.

Table 3. Groundwater Protection Standards for Detected Appendix IV COIs

Constituent	Unit	MCL (dissolved metals concentration)	BTV (UTL) (total metals concentration)	GPS (total metals concentration)
Antimony	mg/l	0.006	0.000890	0.006
Arsenic	mg/l	0.01	0.0550	0.0550
Barium	mg/l	2	0.0925	2
Cadmium	mg/l	0.005	0.00588	0.00588
Chromium	mg/l	0.1	0.0535	0.1
Cobalt	mg/l	0.006*	0.0102	0.0102

Table 3. Groundwater Protection Standards for Detected Appendix IV COIs				
Constituent	**Unit**	**MCL (dissolved metals concentration)**	**BTV (UTL) (total metals concentration)**	**GPS (total metals concentration)**
Fluoride	mg/l	4.0	735	735
Lead	mg/l	0.015*	0.0132	0.015
Lithium	mg/l	0.040*	5.51	5.51
Molybdenum	mg/l	0.1*	0.0163	0.1
Radium-226-228	pci/l	5^	8.52	8.52
Selenium	mg/l	0.05	3.67	3.67
Thallium	mg/l	0.002	0.00645	0.00645

*EPA adopted health-based value in place of MCL.
^Colorado Water Quality Regulation

On May 25-June 2, 2021, a semi-annual assessment monitoring event collected groundwater samples from all of the bottom ash pond wells and the perimeter wells. Samples were analyzed for Appendix III and detected Appendix IV COIs. In accordance with CCR Rule 257.95(e), downgradient well concentrations were compared against background threshold values. Some COIs were found to be above BTVs. In accordance with CCR Rule 257.95(f), downgradient well concentrations were compared against GPS and were found to exceed GPS. Therefore, following CCR Rule 257.95(g), downgradient well concentrations were compared against GPS to determine "if one or more constituents in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard."

To determine if an exceedance of a GPS was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells for each of the detected Appendix IV COIs. The data used to calculate the lower confidence limit (LCL) included all samples collected at these wells since the establishment of the groundwater monitoring system. The results of the LCL comparison against GPS are provided in **Table 4**. Downgradient well W-6 has a 95LCL for molybdenum that exceeds the GPS and perimeter well W-7 has a 95LCL for cobalt that exceeds the GPS.

Table 4. Lower Confidence Limit Compared to Groundwater Protection Standard for the only Detected Appendix IV COI that Exceeds GPS			
Monitoring **Well**	**Appendix IV Constituent**	Cobalt	Molybdenum
	Unit	mg/l	mg/l
	GPS	0.0102	0.1
W-6	**95% LCL**	--	0.298
W-7	**95% LCL**	0.016	--

4.0 References

U.S. Environmental Protection Agency (USEPA), 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. Office of Resource Conservation and Recovery, Program Implementation and Information Division, USEPA, EPA 530/R-09-007, 2009