Pawnee Station Former Inactive CCR Impoundments

Notification of Statistically Significant Levels over Groundwater Protections Standards

Public Service Company of Colorado (PSCo), an Xcel Energy Company, owns and operates Pawnee Station, a coal-fired, steam turbine electric generating station. Pawnee currently operates two CCR landfills on site, the North CCR Landfill and the East CCR Landfill. Pawnee Station also formerly had two CCR Impoundments on site, the former Bottom Ash Storage Pond (BASP) and the former Ash Water Recovery Pond (AWRP), both of which were closed by removal of all CCR in 2017 with ongoing groundwater monitoring. After closure of the Bottom Ash Storage Pond (BASP), the East CCR Landfill was constructed in 2018 at the same location as this former impoundment. The former CCR impoundments at Pawnee Station are subject to requirements of the Disposal of Coal Combustion Residuals from Electrical Utilities Rule (Federal CCR Rule), finalized on April 17, 2015.

Protecting the environment is a priority for Xcel Energy

Xcel Energy conducts all its business in an environmentally responsible manner and that includes regularly monitoring operations and taking steps to protect air, water and other natural resources. Pursuant to 257.95(g), Xcel Energy has made a determination that one constituent listed in Appendix IV has 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, Pawnee Station Inactive CCR Impoundments Groundwater Protection Standards and Determination of SSLs establishes the GPS for each Appendix IV constituent that was detected in groundwater at the site and identifies the constituent for which an SSL above the GPS has been determined. These results do not indicate there is any impact on local drinking water. The monitoring wells evaluate groundwater immediately adjacent to the CCR unit, and measure groundwater conditions within the Pawnee Station property boundary. Xcel Energy will continue to monitor groundwater at the site in accordance with the assessment monitoring program as specified in 257.95.

As a next step, and pursuant to 257.95(g)(3), within 90 days, Xcel Energy will either complete an alternative source demonstration or initiate an assessment of corrective measures to identify and evaluate potential corrective measures to address the SSL over GPS. However, at Pawnee we have already completed physical closure of these two impoundments by removal of all CCR and all areas affected by releases of CCR. CCR Removal was completed in March 2017, thus effectively implementing the most significant corrective action that could be taken to mitigate impacts to groundwater. Therefore, additional corrective measures may not be necessary since the concentration of the CCR constituent is expected to decrease through natural attenuation.

Memo

Date:	Friday, May 08, 2020
To:	Pawnee Station CCR Operating Record
From:	Matt Rohr, HDR, Inc.
Subject:	Pawnee Station Ash Water Recovery Pond and Bottom Ash Storage Pond 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. Pawnee Station, located in Morgan County, Colorado, has multiple CCR units subject to the CCR Rule, including the North CCR Landfill, the East CCR Landfill, the former Ash Water Recovery Pond, and the former Bottom Ash Storage Pond. The scope of this memorandum is limited to the former Ash Water Recovery Pond (AWRP), and the former Bottom Ash Storage Pond (BASP).

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

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.

CCR Rule 257.95(h) describes that a groundwater protection standard must be established for each constituent in Appendix IV detected in the groundwater. The groundwater protection standard 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.

2.0 GPS for the AWRP and BASP

As stipulated in CCR Rule 257.95(b), an initial assessment monitoring event was completed in August 2019 to sample all of the monitoring wells around the AWRP and BASP former facilities for Appendix IV parameters. **Table 1** lists the parameters in Appendices 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

The upper tolerance limits (UTLs) for Appendix IV constituents are displayed in **Table 2**. 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 at the location (USEPA, 2009). The UTL was established based on the eight background sample events at the upgradient monitoring well (PNMW-17) of both the former AWRP and BASP. The UTLs serve as the background values for assessment monitoring.

Table 2. Upper Tolerance Limits (UTL) with 95% coverage and 95% confidence for each Appendix IV constituent at the AWRP and BASP (Assessment Monitoring Background Value)							
Constituent	**Unit**	**N**	**No BDL**	**% BDL**	**Statistical Method[1]**	**UTL**	**Notes**
Appendix IV Constituents							
Antimony	mg/l	15	14	93%	Parametric	0.00100	**
Arsenic	mg/l	15	9	60%	Nonparametric	0.00200	****
Barium	mg/l	15	0	0%	Parametric	0.120	
Beryllium	mg/l	15	14	93%	Nonparametric	0.000670	**
Cadmium	mg/l	15	15	100%	Nonparametric	0.000210	***
Chromium, Total	mg/l	15	0	0%	Parametric	0.0162	****
Cobalt	mg/l	15	9	60%	Nonparametric	0.000500	****
Fluoride	mg/l	15	0	0%	Nonparametric	0.314	
Lead	mg/l	15	10	67%	Nonparametric	0.000730	****
Lithium	mg/l	15	0	0%	Parametric	0.0451	
Mercury	mg/l	15	13	93%	Nonparametric	0.0000320	**
Molybdenum	mg/l	15	9	60%	Nonparametric	0.00360	****
Selenium	mg/l	15	0	0%	Parametric	0.0257	
Thallium	mg/l	15	15	100%	Nonparametric	0.000200	***
Radium-226-228	pci/l	15	2	13%	Nonparametric	1.07	****

DQR - Double Quantification Rule: for the 100 percent ND groups, the Unified Guidance (pages 6-11) recommends a confirmed exceedance is registered if any well-constituent pair in the '100% non-detect' group exhibits quantified measurements in two consecutive sample and resample events'. For the application of this rule, observations detected above the MDL are deemed to be quantified measurements.

[1]Best fit is based on detected data.

Notes: **Data set is too small to compute reliable and meaningful statistics and estimates. Recommend maximum detected value as the upper tolerance limit until more samples can be calculated. ***All observations are NDs. Recommend the double quantification rule (**DQR**). ****Upper Tolerance Limits with 85% Coverage and 95% Confidence due to nonparametric data with sample size < 59.

Results from the initial assessment monitoring sample event identified the detected Appendix IV parameters. At both the AWRP and BASP, all Appendix IV parameters were detected in at least one well except antimony, beryllium, cadmium, mercury, and thallium. Therefore, GPS are established for only the detected Appendix IV COIs.

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 background value for both the AWRP and BASP, and the GPS. The GPS for each COI is the higher of the two: MCL or background value. There are four COIs that do not have established MCLs (cobalt, lead, lithium, and molybdenum); however, in the July 17, 2018 CCR Rule Amendment EPA adopted 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 for the AWRP and BASP				
Constituent	**Unit**	**MCL (dissolved metals concentration)**	**Background Value (UTL)**	**GPS**
Arsenic	mg/l	0.01	0.00200	0.01
Barium	mg/l	2.0	0.120	2.0
Chromium, Total	mg/l	0.10	0.0162	0.10
Cobalt	mg/l	0.006*	0.000500	0.006
Fluoride	mg/l	4.0	0.314	4.0
Lead	mg/l	0.015*	0.000730	0.015
Lithium	mg/l	0.04*	0.0451	0.0451
Molybdenum	mg/l	0.1*	0.00360	0.1
Radium-226-228	pci/l	5.0^	1.07	5.0
Selenium	mg/l	0.05	0.0257	0.05

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

On November 6, 2019, the second assessment monitoring samples were collected from all of the AWRP and BASP 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 values, and some concentrations were found to be above background values. In accordance with CCR Rule 257.95(f), detected Appendix IV COI concentrations in downgradient well were compared against GPS and were found to exceed GPS. Therefore, following CCR Rule 257.95(g), downgradient well concentrations were statistically evaluated 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 at the AWRP (PNMW-18, PNMW-19, and PNMW-20) and at the BASP (PNMW-21, PNMW-22, and PNMW-23) for each of the detected Appendix IV COIs. The data set used to calculate the lower confidence limit (LCL) included all Appendix IV results from samples collected at these wells since the establishment of the groundwater monitoring system. Therefore, most wells had 15 sample events that were used to calculate the LCL. The results of the LCL comparison against GPS for the AWRP are provided in Table 4 and for the BASP in Table 5. The 95LCL for lithium in downgradient wells PNMW-20, PNMW-21, and PNMW-22 exceed the GPS.

Table 4. Lower Confidence Limits for Appendix IV Constituents for Pawnee AWRP Wells Exceeding Groundwater Protection Standards		
	Appendix IV Constituent	Lithium
	Units	mg/l
	GPS	0.045
Monitoring Well	PNMW-20	0.065^

^95% Adjusted Gamma LCL

Table 5. Lower Confidence Limits for Appendix IV Constituents for Pawnee BASP Wells Exceeding Groundwater Protection Standards		
	Appendix IV Constituent	Lithium
	Units	mg/l
	GPS	0.045
Monitoring Well	PNMW-21	0.095*
	PNMW-22	0.046^

*95% LCL around the Median (Non-Parametric)
^95% Adjusted Gamma LCL

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