

Pawnee Station North CCR Landfill

Notification of Statistically Significant Levels over Groundwater Protections Standards

Public Service Company of Colorado (PSCo), an Xcel Energy Company, is the owner of Pawnee Station which is a coal-fired, steam turbine electric generating station. Pawnee Station operates multiple CCR units, including the North CCR Landfill, which 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 core value for Xcel Energy

PSCo conducts all of its business in an environmentally responsible manner which includes regularly monitoring operations and taking steps to protect air, water and other natural resources. Pursuant to 257.95(g), PSCo has made a determination 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, Pawnee Station North CCR Landfill 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 those constituents for which SSLs above the GPS have 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. PSCo will continue to monitor groundwater at the site in accordance with the assessment monitoring program as specified in 257.95.

Memo

Date: Wednesday, January 02, 2019

To: Kristen Carney, Xcel Energy
Jennifer McCarter, Xcel Energy

From: Matt Rohr, HDR, Inc.

Subject: Pawnee Station North CCR Landfill
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 North CCR Landfill.

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 were present at statistically significant levels (SSLs) over the GPS. At the North CCR Landfill, groundwater monitoring has been conducted to collect eight rounds of background sampling plus the initial detection monitoring (completed before October 17, 2017) as specified under CCR Rule Part 257.94. The water quality data collected from monitoring wells located upgradient of the CCR unit has been compiled and statistically analyzed to develop background values for each COI. In addition, assessment monitoring was initiated at the North CCR Landfill.

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. Therefore this GPS memo only addresses the North CCR Landfill as it is the only CCR unit in assessment monitoring at Pawnee Station.

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 North CCR Landfill

As stipulated in CCR Rule 257.95(b), an initial assessment monitoring event was completed in May 2018 to sample all of the monitoring wells around the landfill CCR facility 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 wells (PNMW-13, PNMW-14, and PNMW-2B). 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 North CCR Landfill (Assessment Monitoring Background Value)							
Constituent	Unit	N	No BDL	% BDL	Statistical Method ¹	UTL	Notes
Appendix IV Constituents							
Antimony	mg/l	24	15	63%	Parametric	0.00110	****
Arsenic	mg/l	24	4	17%	Nonparametric	0.0140	****
Barium	mg/l	24	0	0%	Parametric	0.491	
Beryllium	mg/l	24	16	67%	Parametric	0.00210	****
Cadmium	mg/l	24	21	88%	Parametric	0.000390	**
Chromium, Total	mg/l	24	2	8%	Nonparametric	0.240	****
Cobalt	mg/l	24	7	29%	Parametric	0.0246	
Fluoride	mg/l	24	0	0%	Nonparametric	1.50	****
Lead	mg/l	24	9	38%	Parametric	0.0385	
Lithium	mg/l	24	0	0%	Parametric	0.0940	
Mercury	mg/l	24	24	100%		0.0000270	***
Molybdenum	mg/l	24	0	0%	Nonparametric	0.0260	****
Selenium	mg/l	24	1	4%	Parametric	0.00629	
Thallium	mg/l	24	22	92%	Nonparametric	0.000780	**
Radium-226-228	pci/l	24	4	17%	Parametric	3.46	

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.

¹Best 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. All Appendix IV parameters were detected in at least one well. Therefore GPS are established for all 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 the North CCR Landfill, and the GPS. The GPS for each COI is the higher of the two: MCL or background value. The GPS is the background value for six of the fifteen COIs. 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 North CCR Landfill				
Constituent	Unit	MCL (dissolved metals concentration)	Background Value (UTL)	GPS
Antimony	mg/l	0.006	0.00110	0.00600
Arsenic	mg/l	0.01	0.0140	0.0140
Barium	mg/l	2.0	0.491	2.00
Beryllium	mg/l	0.004	0.00210	0.00400
Cadmium	mg/l	0.005	0.000390	0.00500
Chromium, Total	mg/l	0.10	0.240	0.240
Cobalt	mg/l	0.006*	0.0246	0.0246
Fluoride	mg/l	4.0	1.50	4.00
Lead	mg/l	0.015*	0.0385	0.0385
Lithium	mg/l	0.04*	0.0940	0.0940
Mercury	mg/l	0.002	0.0000270	0.00200
Molybdenum	mg/l	0.1*	0.0260	0.0260
Radium-226-228	pci/l	5.0^	3.46	5.00
Selenium	mg/l	0.05	0.00629	0.0500
Thallium	mg/l	0.002	0.000780	0.00200

*EPA adopted health-based value in place of MCL.

^Colorado Water Quality Regulation

On August 13-14, 2018, the second assessment monitoring samples were collected from all of the North CCR Landfill 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 wells 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 landfill (PNMW-1B, PNMW-15, and PNMW-16) 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, wells had 10 sample events that were used to calculate the LCL: eight sample events from 2015-2017 collected during the background sampling effort and the two assessment monitoring events in May and August 2018. The 95LCL for lithium in downgradient wells PNMW-15 and PNMW-16 exceed the GPS (**Table 4**).

Table 4. Lower Confidence Limit for the Appendix IV Constituent for North CCR Landfill Wells Exceeding Groundwater Protection Standards	
Lithium GPS = 0.0940 mg/l	
Monitoring Well	Lithium LCL (mg/l)
PNMW-15	0.119*
PNMW-16	0.136*

*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