Semiannual Progress Report on Selection of Remedy

for Compliance with the Coal Combustion Residuals (CCR) Rule

Pawnee Station

Public Service Company of Colorado

July 31, 2020

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1   Introduction

Pawnee Station, located in Brush, Colorado is owned and operated by Public Service Company of Colorado (PSCo), an Xcel Energy Company (Figure 1-1). Pawnee Station has four Coal Combustion Residuals (CCR) units subject to the U.S. Environmental Protection Agency's (EPA's) CCR Rule specified in 40 CFR 257: the North Landfill, the East Landfill, the former Bottom Ash Storage Pond (BASP), and the former Ash Water Recovery Pond (AWRP) (Figure 1-2). Only the North Landfill and the former BASP and AWRP have triggered assessment of corrective measures; however the BASP and AWRP facilities only recently observed the exceedances that triggered assessment of corrective measures and therefore are still in development of the Assessment of Corrective Measures Report. In January 2019, PSCo first reported that concentrations of Appendix IV constituents in monitoring wells at the North Landfill were observed at statistically significant levels (SSLs) above Groundwater Protection Standards (GPS) (HDR, 2019a). Subsequently, PSCo completed the *Conceptual Site Model and Assessment of Corrective Measures (ACM) Report* in August 2019 and posted to PSCo's public website (HDR, 2019b). Thus the North Landfill is the subject of this update on remedy selection.

The purpose of this report is to provide an update describing progress toward selecting a remedy for corrective action at the Pawnee North Landfill, and therefore satisfies the requirements specified in 40 CFR 257.97(a) of the CCR Rule.
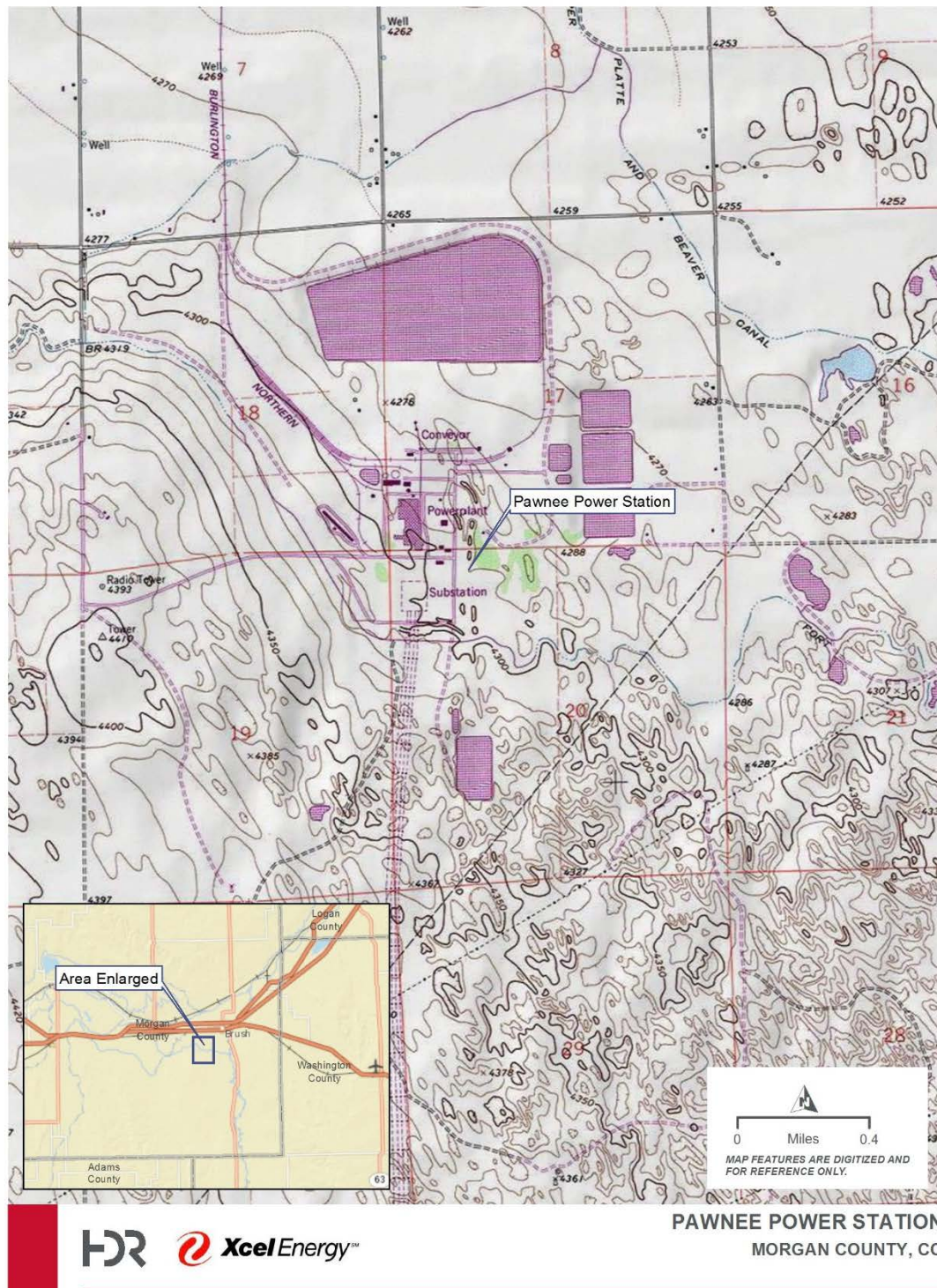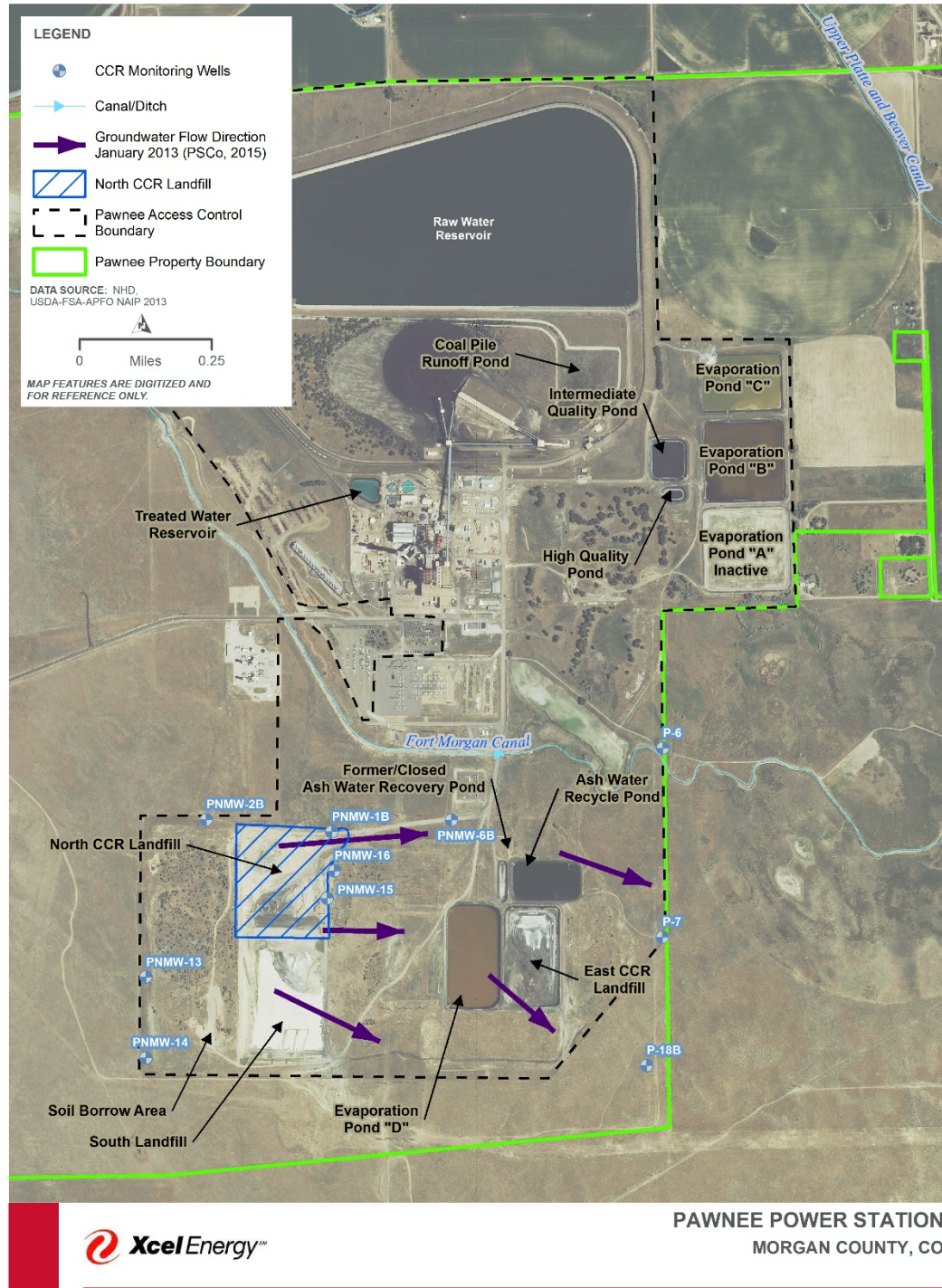
Figure 1-1.   Pawnee Station Vicinity Map

Figure 1-2.   Pawnee Station—North Landfill CCR Unit and Certified Monitoring Well Network

2   Background

In accordance with the CCR Rule, PSCo initiated background groundwater monitoring at the North Landfill in 2015, conducted detection monitoring at the landfill in 2017, and has been performing assessment monitoring continually since 2018. As described in the *Groundwater Protection Standards and Determination of SSLs per 257.95(g)*, downgradient wells at the landfill were first found to have concentrations of constituents at statistically significant levels (SSLs) above the GPS in January 2019 (HDR, 2019a). Concentrations of lithium have been observed at statistically significant levels (SSLs) above the GPS in several downgradient landfill monitoring wells. Therefore, PSCo completed the *Conceptual Site Model and Assessment of Corrective Measures* on June 6, 2019 in accordance with CCR Rule 257.96. A groundwater flow and transport model was developed for the North Landfill in 2019 to support the corrective measures assessment. The groundwater model is described in the *Conceptual Site Model and Assessment of Corrective Measures Report*.

3   Progress on Model and Evaluation of Potential Remedies

Since the last semiannual selection of remedy update in January 2020, substantial work has been completed to continue to refine the groundwater model and evaluate potential remedies. The model is a critical tool in evaluating the extent of constituent concentrations and the effectiveness of the identified potential remedies. Modeling is by its nature an iterative process that requires refinement (recalibration) as new data is incorporated. Recalibrating the model ensures the model is as representative of observed conditions as possible.

The model was developed in 2019 to create a digital representation of the groundwater flow system to predict groundwater movement and constituent fate and transport. Model calibration is the process of adjusting hydraulic parameters, hydrologic stresses, and model boundary conditions within reasonable ranges to achieve an acceptable match between modeled and observed calibration targets. The degree to which the observed and modeled water levels and constituent concentrations match at calibration targets reflects how closely the model represents observed conditions and therefore provides an indication that the model is capable of providing accurate predictions of future conditions, including the relative effectiveness of potential remedies.

Existing monitoring wells that were outside of the CCR certified monitoring network were sampled to more thoroughly delineate the extents of the groundwater protection standard (GPS) exceedances in compliance with CCR Rule § 257.95(g)(1)(iii). Water level and water quality data from these newly sampled monitoring wells was evaluated and incorporated into the conceptual site model.

The flow model developed in 2019 was recalibrated to reduce the difference between simulated and observed head values. The recalibrated flow model with groundwater contours, calibration targets, and modeled head residuals (the difference between observed and modeled values) is provided in Figure 3-1. The recalibration continues to meet the model calibration goals with an acceptable degree of accuracy.

Based on the concentrations observed at these newly sampled wells in 2019, it was determined that it was not necessary to recalibrate the existing transport model to include these new wells as calibration targets. These newly sampled wells validated the transport model simulated concentrations at the well locations and therefore recalibration was not warranted. Observed groundwater concentrations and modeled residual concentrations for lithium are provided in Figure 3.2. Overall, the calibration to measured concentrations shows a good match and is acceptable as a starting point for predictive simulations.

The water quality sampling and preliminary model simulations predict that there is groundwater flow with concentrations of lithium above groundwater protection standards moving eastward from the North Landfill waste boundary. However the predicted mass flux (constituent mass moving across the property boundary) is very small. The model does not predict offsite transport of constituents of concern (COC) at the site; the extent of the elevated lithium in groundwater is well within the plant boundary.

Numerous simulations of the groundwater flow and transport model have been run to predict groundwater movement and constituent transport under the alternative corrective measures described in the ACM, including:

- o   Monitored natural attenuation
- o   Partial ash removal
- o   Complete ash removal
- o   Partial In-situ solidification

Each model simulation assumed conditions reflective of the corrective measure being evaluated. For example, in the ash removal scenario, the model input values that previously represented ash material were removed from the model to predict future constituent concentrations if ash were to be removed. The results of model simulation of the potential remedies are preliminary and do not yet provide a basis upon which to select a remedy. Additional work is needed to evaluate the feasibility and effectiveness of the potential remedies.

Figure 3-1. Pawnee Station— Flow Model Calibration Results Displaying Residual Head Values at Calibration Targets
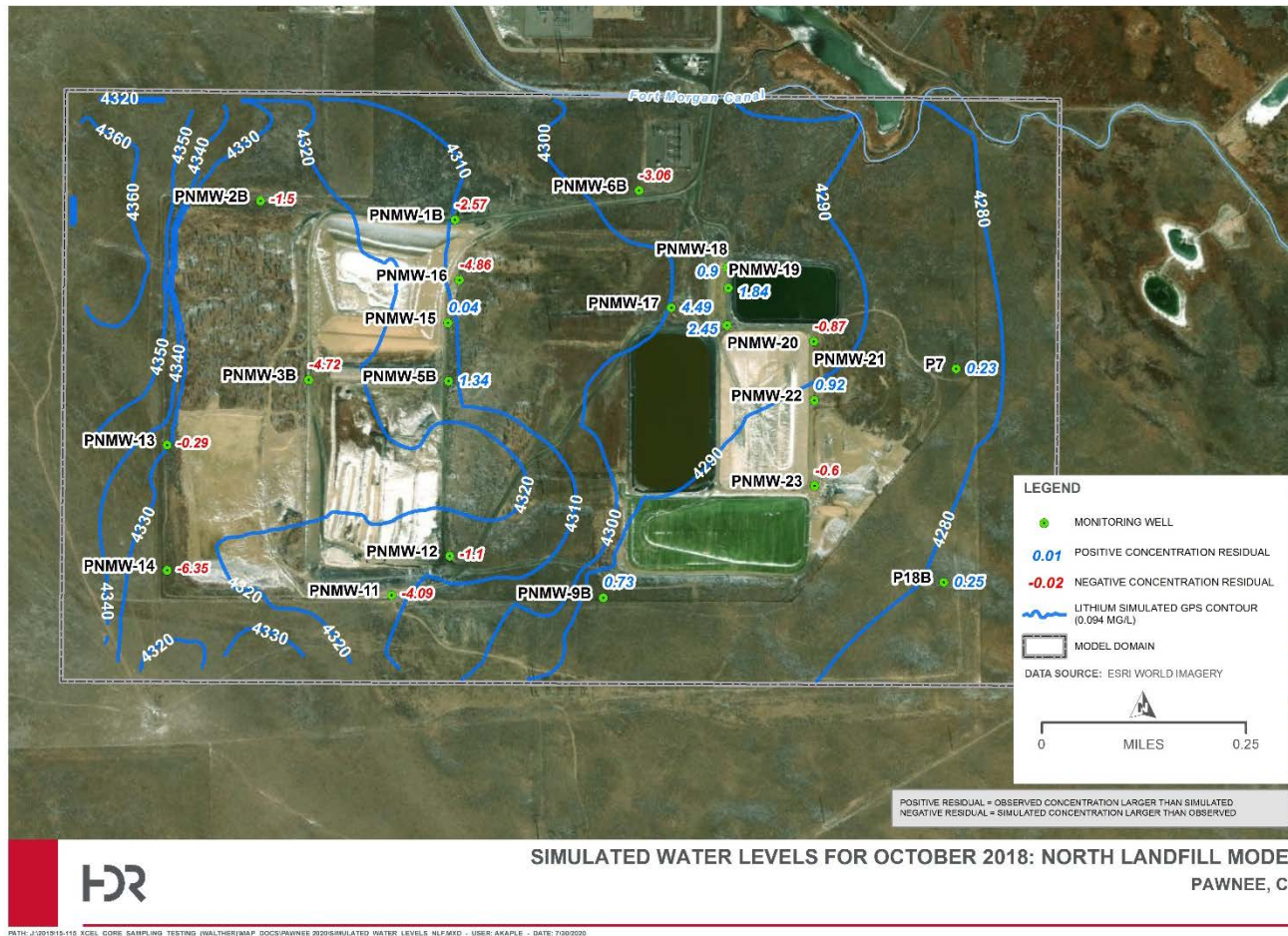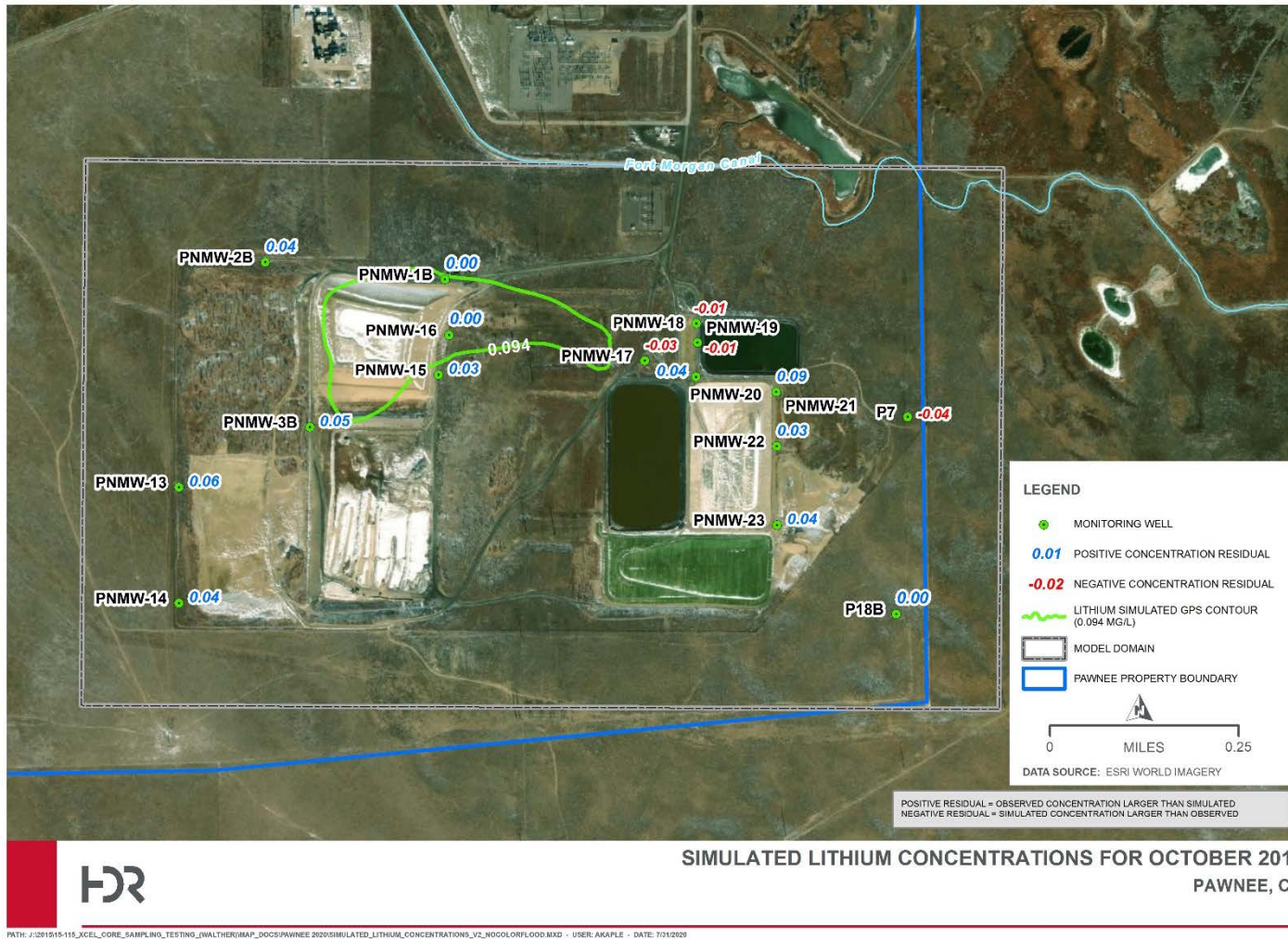

SIMULATED WATER LEVELS FOR OCTOBER 2018: NORTH LANDFILL MODEL

PAWNEE, CO

Figure 3-2.   Pawnee Station— Lithium Model Results Displaying Residual Calibration Concentration Values at Calibration Targets

4 Next Steps

The following activities are anticipated to be completed or initiated in the next 6-month period for the landfill, but are subject to change based upon the iterative nature of the process, uncertainty about the results of each step, and interim findings. PSCo continues to proceed diligently through the process of further evaluating potential remedies, consistent with best practices and professional judgment.

- Completion of model simulations for corrective measure alternatives. Specifically, the model will simulate the extent of the elevated lithium in groundwater and evaluate the effectiveness of potential corrective measures to reduce groundwater concentrations over time with the goal of selecting the best remedy or combination of measures for implementation.
- Preparation of a draft Groundwater Flow Model and Corrective Measures Evaluation Report.
- Continue semiannual groundwater assessment monitoring.

5   References

HDR, 2019a. Conceptual Site Model and Assessment of Corrective Measures - Compliance with the Coal Combustion Residuals Rule Pawnee Station. August 30, 2019.

HDR, 2019b. Groundwater Protection Standards and Determination of SSLs per 257.95(g). January 2, 2019.

HDR, 2020. Annual Groundwater Monitoring and Corrective Action Annual Report and Semi-Annual Remedy Selection and Design Progress Report - Compliance with the Coal Combustion Residuals Rule. January 31, 2020.