

# Semiannual Progress Report Selection of Remedy

for Compliance with the Coal Combustion  
Residuals (CCR) Rule

## **Pawnee Station**

Public Service Company of Colorado

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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. The AWRP and BASP ceased receiving CCR prior to October 19, 2015 and therefore met the definition of Inactive CCR Surface Impoundments that first became subject to the groundwater monitoring requirements under the Direct Final Rule effective October 4, 2016 (Extension Rule). The two impoundments were physically clean closed in 2017 by removal of all CCR.

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). In August 2020, PSCo first initiated the Assessment of Corrective Measures for the former BASP and former AWRP, and PSCo completed the *Conceptual Site Model and Assessment of Corrective Measures (ACM) Report* in January 2021 and posted to PSCo's public website (HDR, 2021). The North Landfill and the BASP and AWRP are the subject of this update on remedy selection.

The purpose of this technical memorandum is to provide an update describing progress toward selecting a remedy for corrective action at the Pawnee North Landfill and former BASP and former AWRP, and therefore satisfies the requirements specified in 40 CFR 257.97(a) of the CCR Rule.

Figure 1-1. Pawnee Station Vicinity Map

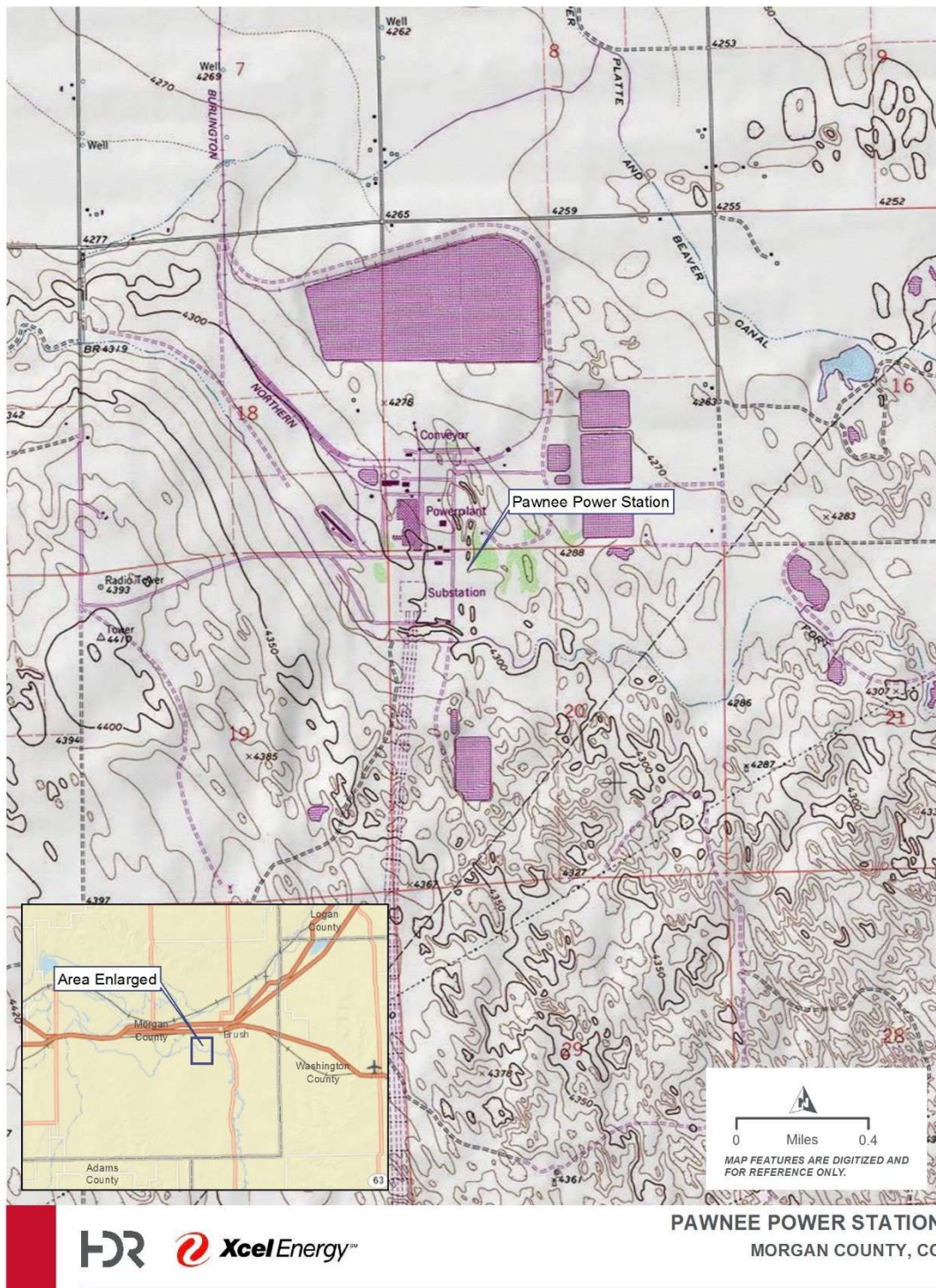
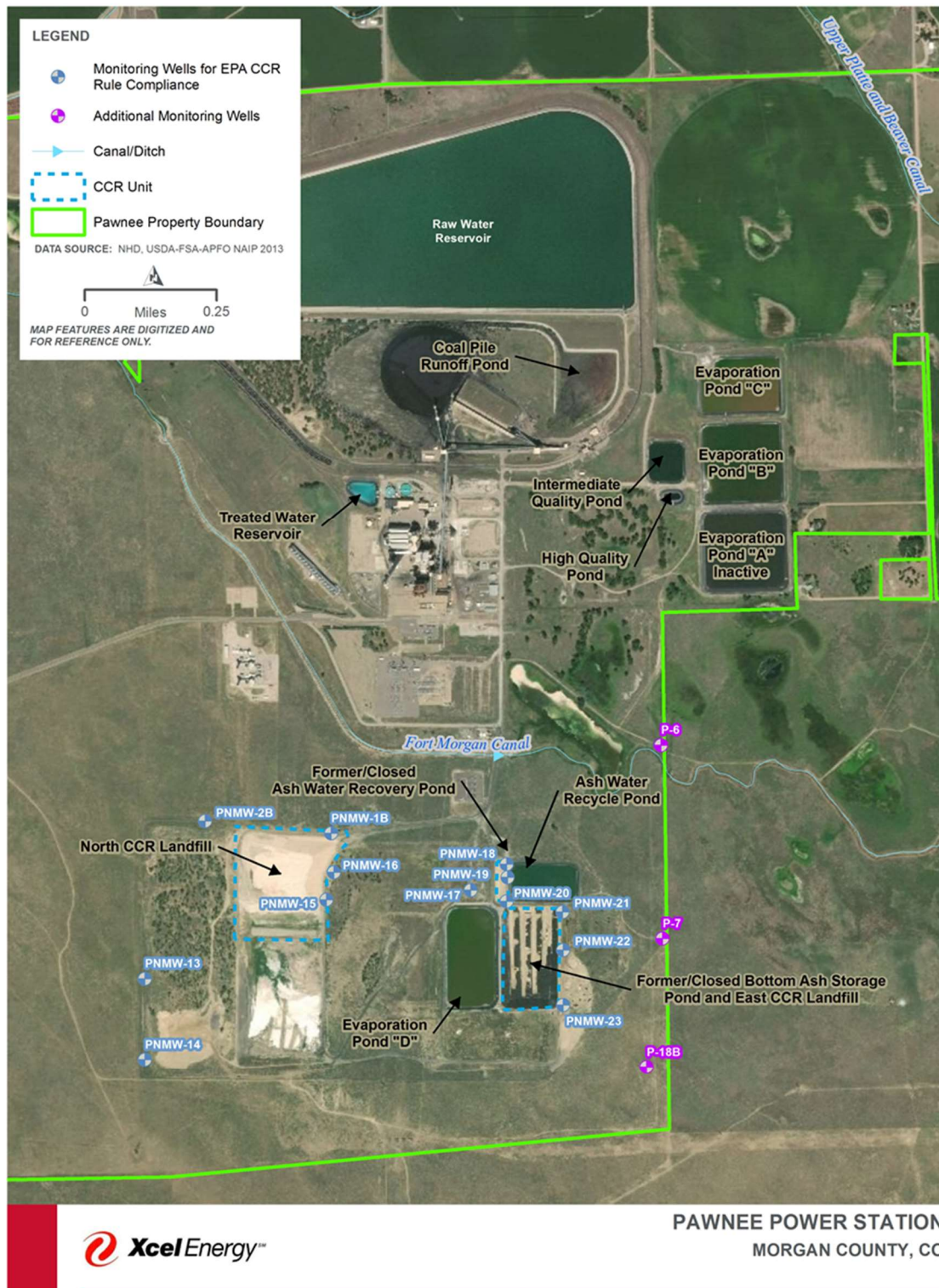




Figure 1-2. Pawnee Station—CCR Units



## 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 SSLs above the GPS in January 2019 (HDR, 2019a). Concentrations of lithium have been observed at 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*. The status of the North Landfill remains in Assessment Monitoring as of July 2021.

PSCo has been performing assessment monitoring at the AWRP and BASP since 2019. As described in the *Groundwater Protection Standards and Determination of SSLs per 257.95(g)*, downgradient wells at the AWRP and BASP were first found to have concentrations of constituents at SSLs above the GPS in May 2020 (HDR, 2020). Concentrations of lithium have been observed at SSLs above the GPS in one downgradient AWRP monitoring well and two downgradient BASP wells. The status of the AWRP and BASP remains in Assessment Monitoring as of July 2021.

A groundwater model was developed in 2019 to create a digital representation of the groundwater flow system to predict groundwater movement and constituent fate and transport. The model is a critical tool in evaluating the nature and extent of constituent concentrations and the effectiveness of the identified potential remedies. The flow model, developed in 2019, was recalibrated in the first half of 2020 to reduce the difference between simulated and observed head values. The recalibration continues to meet the model calibration goals with an acceptable degree of accuracy. Based on the recalibrated flow model, the preliminary model simulations predict that there is groundwater flow with concentrations of lithium above the GPS moving eastward from the North Landfill waste boundary; however, in very small mass fluxes. There is currently no offsite transport of constituents of concern (COCs) at the site, nor does the groundwater flow model simulate offsite migration in the future. The extent of the COCs 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:

- Monitored natural attenuation
- Permeable Reactive Barrier
- Partial ash removal
- Complete ash removal
- Partial In-situ solidification

Each predictive simulation predicts that the extent of the COC in groundwater is well within the Pawnee Station property and does not extend as far as the AWRP and Evaporation Pond D.

## 3 Evaluation of Potential Remedies

### 3.1 North Landfill

Since the last semiannual selection of remedy update in January 2021, two rounds of groundwater sampling have been completed and progress has been made to evaluate potential remedies.

PSCo has advanced the engineering and geochemical feasibility of the Permeable Reactive Barrier (PRB) potential remedy. PSCo developed a PRB feasibility study design. The study is designed to evaluate the feasibility of a PRB via conventional trench, via injection wells, and via funnel and gate. The study is designed to evaluate the geotechnical characteristics of the substrate and geochemical bench testing of reagents with site-specific groundwater. However, prior to initiating the drilling at Pawnee Station to collect site specific substrate and groundwater for bench testing, the results of the bench testing being completed at PSCo's Valmont Power Station need to be evaluated. The Valmont Station CCR Rule groundwater compliance program is in a similar stage of remedy evaluation and also has concentrations of lithium and other COCs in groundwater above the GPS. PSCo has initiated an ongoing bench testing program using samples from Valmont that is evaluating the geochemical feasibility of treating these COCs via PRB reagent alternatives. If the Valmont bench testing program indicates that a PRB effectively treats lithium, the site-specific Pawnee PRB bench testing program will proceed as designed in the Pawnee PRB feasibility study design. The results of the Valmont preliminary feasibility bench test results are anticipated in late 3<sup>rd</sup> quarter or early 4<sup>th</sup> quarter 2021.

### 3.2 AWRP and BASP

#### 3.2.1 Source Control Measures Undertaken

Removal of CCR and all areas affected by releases of CCR at the AWRP and BASP were complete in April 2017. The CCR material has been completely removed from the ponds. Therefore, it is important to note that all groundwater monitoring occurring after April 2017 at these units reflect post-CCR removal conditions.

#### 3.2.2 Progress Towards Remedy Selection

The Assessment of Corrective Measures (ACM) was completed for the AWRP and the BASP and was published on the CCR website January 27, 2021. PSCo is following a phased approach, which includes source removal (complete) and evaluation of natural attenuation. The reduction of hydraulic loading and recharge of the aquifer that result from pond closure and cleanout are expected to slowly change groundwater redox conditions and the physical removal of CCR is expected to improve groundwater quality. PSCo continues assessment monitoring at the former impoundments to evaluate concentration trends since source removal was completed in 2017, and whether natural attenuation, in combination with the previous source removal, is an effective remedy to address groundwater conditions.

## 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.

- Evaluation of the Xcel Valmont feasibility study for effectiveness of a PRB reagent to treat lithium in groundwater.
- Continued evaluation of natural attenuation as a remedy to address groundwater conditions at the former impoundments.
- Continue semi-annual groundwater assessment monitoring.
- In accordance with 257.97(a), PSCo will complete semi-annual progress reporting to document additional work completed towards remedy selection and design.



## 5 References

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

HDR, 2021. Conceptual Site Model and Assessment of Corrective Measures - Compliance with the Coal Combustion Residuals Rule Pawnee Station Ash Water Recovery Pond and Bottom Ash Storage Pond. January 27, 2021.