REPORT

COAL COMBUSTION RESIDUALS LANDFILL GROUNDWATER MONITORING SYSTEM CERTIFICATION

Sheldon Station

Hallam, Nebraska

Nebraska Public Power District
"Always there when you need us"

Submitted To: Nebraska Public Power District
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October 11, 2017 **1785149**

Golder Associates

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this report to certify that the groundwater monitoring system that has been designed and constructed for the active coal combustion residuals (CCR) landfill at Sheldon Station, which is owned and operated by Nebraska Public Power District (NPPD), meets the requirements of 40 CFR 257.91.

2.0 FACILITY INFORMATION

Sheldon Station is owned and operated by NPPD, and is capable of generating 225 MW of power. The facility is located in southeastern Nebraska in Section 19, T7N; R6E; and is 18 miles south of Lincoln, in Lancaster County. The village of Hallam is the closest community to the site and is 1.5 miles south of the facility. NPPD constructed Sheldon Station in 1958, switching the facility entirely to low-sulfur coal from Wyoming's Powder River Basin in 1974. The active CCR landfill at the site contains fly ash and bottom ash.

2.1 Geology and Hydrogeology

A well drilling program was initiated at Sheldon Station between 1998 and 1999. The borings were used to characterize the nature of the Pleistocene Age sediments and glacial till present in the area. In the area of the CCR facility, the thickness of the till ranges from approximately 180 to 200 feet, thinning toward the north. The composition of the till varies throughout the formation, generally consisting of predominately clay to silty clay with sand lenses. The uppermost water-bearing zone is typically encountered between 15 and 25 feet below the ground surface in the area, well above the principal groundwater reservoir for the area (typically found approximately 300 feet below ground surface).

Regional groundwater in the upper water-bearing zone near Ash Landfill No. 4 flows from the southeast to the northwest. However, Sheldon Station is located in a geologic area dominated by glacial drift in southeastern Nebraska, and flow systems in the glacial deposits observed at Sheldon Station mimic local surface topography. The local groundwater flow system at Ash Landfill No. 4 varies from the regional groundwater flow pattern due to surface topography, which consists of a hill to the north and surface water drainages to the east and west of Ash Landfill No. 4. Thus, groundwater generally flows away from the landfill to the east and west, and towards the landfill from the north and south.

3.0 GROUNDWATER MONITORING SYSTEM

The groundwater monitoring system for the active CCR landfill at Sheldon Station consists of 7 monitoring wells, as shown on Figure 1. The two upgradient monitoring wells are MW-1 and MW-2. The five downgradient monitoring wells are MW-3, MW-4, MW-5, MW-6, and MW-7.

3.1 Information Reviewed

Golder reviewed information from the operating record documenting the design, installation, and development of the monitoring wells to help assess the adequacy of the groundwater monitoring system. The information reviewed included:

ENSR, 2003. Hydrogeologic Characterization – Sheldon Station Ash Disposal Facility No. 3, Final Report. Document No. 4899-002-500, December, 2003.

Golder, 2001. *Hydrogeologic Characterization Report and Alternative Liner Demonstration*. Golder Associates, Inc., January, 2001.

Golder, 2017. *Sampling and Analysis Plan, Sheldon Station Ash Landfill No. 4*. Golder Associates, Inc., October 11, 2017.

NDNR, 2017. *Well Registration Records*, Nebraska Department of Natural Resources. www.dnr.nebraska.gov. Accessed August, 2017.

3.2 Number, Locations, and Depths of Monitoring Wells

40 CFR 257.91 includes the following requirements for the number, locations, and depths of monitoring wells:

- The groundwater monitoring well system must yield sufficient groundwater samples from the uppermost aquifer to accurately represent background water quality
- The groundwater monitoring system must yield sufficient groundwater samples from the uppermost aquifer to accurately represent the quality of groundwater passing the waste boundary
- The number, spacing, and depths of monitoring wells must be based on characterization of the uppermost aquifer and overlying materials
- The groundwater monitoring system must include at least one upgradient monitoring well and at least three downgradient monitoring well

Two upgradient monitoring wells are included in the groundwater monitoring system to appropriately represent the background water quality, including potential variability. Five downgradient wells were installed along the western, northern, and eastern boundaries of the active CCR landfill, based on the regional groundwater flow direction (generally from south to north), to enable detection of impacts to groundwater from the active CCR landfill and represent the quality of groundwater passing the waste boundary. The number and spacing of downgradient monitoring wells were selected based on the hydrogeologic conditions at the site, the aerial extent of the active CCR landfill, and possible minor easterly

or westerly components to the groundwater flow direction, such that impacts to groundwater quality in the uppermost aquifer can be detected along potential flow pathways if they occur. The depths of the monitoring wells were selected such that the monitoring wells are screened in zones to yield groundwater samples that are representative of water quality in the uppermost aquifer.

3.3 Monitoring Well Casing

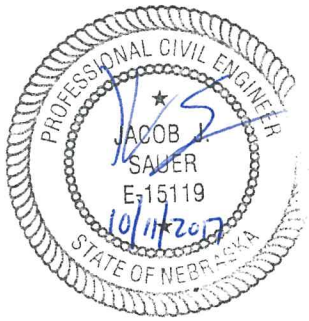
40 CFR 257.91(e) includes the following requirements for monitoring well construction:

- Monitoring wells must be cased to maintain borehole integrity
- The casing must be screened or perforated and packed with sand or gravel to enable collection of groundwater samples
- The annular space above the sampling depth must be sealed to prevent impacts to groundwater

The monitoring wells at the site have polyvinyl chloride (PVC) casings to maintain the integrity of the monitoring well boreholes. The casings are screened within the uppermost aquifer and packed with sand to enable collection of groundwater samples from the uppermost aquifer. The annular space above the screened interval in each monitoring well is sealed with a cement or bentonite grout seal.

4.0 CERTIFICATION

Based upon the review described in this report, the undersigned Professional Engineer registered in Nebraska certifies that the groundwater monitoring system for the active CCR landfill at Sheldon Station has been designed and constructed to meet the requirements of 40 CFR 257.91.



FIGURE

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0 75 150
1" = 150' FEET

NEBRASKA PUBLIC POWER DISTRICT
SHELDON STATION
GROUNDWATER MONITORING WELL NETWORK

FIGURE 1

Path: \\Denver.golder.gds\projects\17-JOBS\1785149 NPPD SS 2017 CCR\NPPD SS 2017 CCR SUPPORT\PE Certification\ | File Name: SS Site Layout Figure.dwg

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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