BURNS McDONNELL

October 12, 2017

Tyler Esplin, PE
Environmental Superintendent
Bonanza Power Plant
12500 East 25500 South
Vernal, UT 84078-8525

Re: Groundwater Monitoring System Certification
Deseret Generation and Transmission Cooperative – Bonanza Power Plant, Vernal, Utah

Dear Mr. Esplin:

Deseret Generation and Transmission Cooperative (Deseret Power) retained Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to review the existing groundwater monitoring system associated with two (2) coal combustion residual (CCR) units at the Bonanza Power Plant located near Vernal, Utah (Bonanza or Site). The CCR units located at Bonanza meet the definition of existing CCR landfills presented in the Final Rule and are therefore subject to groundwater monitoring requirements identified in 40 CFR §257.91. The groundwater monitoring system review included an assessment of compliance with 40 CFR §257.91 – Groundwater Monitoring Systems, which is contained in the United States Environmental Protection Agency's (EPA's) *Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments* (40 CFR Parts 257 and 261).

Bonanza is operated by Deseret Generation and Transmission Cooperative (Deseret Power) and is located approximately 35 miles southeast of Vernal, Utah. Bonanza is a 500 megawatt (MW) gross coal fired steam turbine and generator with two existing CCR landfills. These landfills contain fly ash, bottom ash, boiler slag, and flue gas desulfurization (FGD) materials. One of the existing landfills, located on the north end of the Site, mainly contains fly ash and FGD material and is referred to as the Fly Ash and FGD Sludge Landfill. The other existing landfill, located on the south end of the Site, mainly contains bottom ash and boiler slag and is referred to as the Bottom Ash Landfill.

On behalf of Deseret Power, Burns & McDonnell is submitting certification that the groundwater monitoring systems associated with the two (2) CCR landfills located at Bonanza have been designed and constructed to meet the requirements set forth in 40 CFR §257.91. This certification is intended to fulfill the requirements presented in 40 CFR §257.91(f). The groundwater monitoring system for the Fly Ash and FGD Sludge Landfill consists of one upgradient monitoring well (FA-UG1) and three downgradient monitoring wells (FA-DG2, FA-DG-3 and FA-DG4). A fourth monitoring well (FA-DG1) was installed in May 2016 but was dry. The groundwater monitoring system for the Bottom Ash Landfill consists of one upgradient monitoring well (BA-UG1) and three downgradient monitoring wells (BA-DG2, BA-DG-3 and BA-DG4). Additional wells and piezometers provide data (e.g., groundwater levels) to further

9400 Ward Parkway \ Kansas City, MO 64114
O 816-333-9400 \ F 816-333-3690 \ burnsmcd.com

evaluate hydraulic conditions at Bonanza. Locations of the CCR landfills and monitoring wells comprising the respective groundwater monitoring systems are presented on the attached figure.

Monitoring wells FA-UG1 and BA-DG1 were installed in April 1991 as summarized in Appendix C of the *Annual Review of Ground Water Levels, Water Quality, and Soil Moisture Data at the Bonanza Power Plant* report prepared by Dames & Moore[1]. The remaining groundwater monitoring system wells (FA-DG2, FA-DG3, FA-DG4, BA-UG1, BA-DG2, BA-DG3) were installed in May 2016 as summarized in the *Bonanza Power Plant, Coal Combustion Residuals, Monitoring Well Installation Report* prepared by Loughlin Water Associates, LLC[2]. The well construction diagrams, boring logs, and additional documentation were provided in the documents referenced above.

Groundwater Flow Direction and Rate

The Site is located along the western flank of the Kennedy Wash ephemeral stream valley within the wider White River drainage basin. The Kennedy Wash consists of primarily of Holocene and Pleistocene age alluvial fan deposits containing poorly sorted gravel, sand and silt, and clay. Based on a review of subsurface information provided in the well installation reports[1,2], the Site is underlain by up to 60 feet of alluvial and colluvial silt, sand, and clay deposited by the erosion of nearby exposed bedrock. The uppermost alluvial aquifer is underlain by soft shale, mudstone, claystone, and minor sandstone with local tuffaceous interbeds that forms the uppermost units of the Uinta Formation. The Uinta Formation bedrock is characterized by permeability much lower than the overlying alluvium. A weathered transition zone at the contact of the alluvium and bedrock can contain coarser material and may exhibit higher permeability.

Based on a review of subsurface information in the *Annual Review of Groundwater Levels, December 2015 through December 2016* report prepared by Loughlin Water Associates, LLC[3] and well installation reports[1,2], The natural groundwater flow direction at the Site is generally to south, mimicking the direction of surface drainage. The groundwater flow direction is also strongly influenced by the topography of the top of bedrock surface underlying the uppermost alluvial aquifer. A lack of measurable groundwater in alluvium piezometers located along the eastern and western flanks of the ephemeral stream valley indicates that groundwater is not

---

[1] Dames & Moore, *Annual Review of Ground Water Levels, Water Quality, and Soil Moisture Data at the Bonanza Power Plant, for Deseret Generation & Transmission Co-Operative*, Appendix C, Groundwater Water Quality Monitoring Well Installation Field Investigations and Results, February 1992.
[2] Loughlin Water Associates, LLC, *Bonanza Power Plant, Coal Combustion Residuals, Monitoring Well Installation Report, Deseret Generation & Transmission Co-Operative, Vernal, UT*, January 10, 2017.
[3] Loughlin Water Associates, LLC, *Annual Review of Groundwater Levels December 2015 through December 2016 for Deseret Generation & Transmission Co-Operative, Vernal, Utah*, February 20, 2017.

present within the alluvium in these areas where the thickness of the alluvium decreases as the depth to bedrock also decreases.

Fly Ash and FGD Sludge Landfill

Groundwater flow beneath the Fly Ash and FGD Sludge Landfill is generally to the southeast. A lack of measurable groundwater in piezometers located along the northwestern and northeastern sides of the landfill indicates that the alluvium is unsaturated in these areas. The groundwater gradient in the uppermost aquifer beneath the Fly Ash and FGD Sludge Landfill is relatively flat ranging from approximately 0.003 feet per foot (ft/ft) in the northwest to 0.01 ft/ft in the southeast. Estimated hydraulic conductivity values based on in-situ aquifer testing of the groundwater monitoring system wells range from approximately 0.2 to 8.8 feet per day (ft/day).

Given a porosity of 0.40[4] characteristic of the uppermost aquifer material, the average linear groundwater velocity beneath the Fly Ash and FGD Sludge Landfill ranges from less than 0.01 ft/day to approximately 0.22 ft/day. The highest hydraulic conductivity value was measured in well FA-DG4 which is screened within a zone containing fine sand and gravel near the centerline of an apparent top of bedrock topographic low that trends from northwest to southeast beneath the Fly Ash and FGD Sludge Landfill. The groundwater monitoring system for the Fly Ash and FGD Sludge Landfill satisfies the requirement [specified in 40 CFR §257.91(c)(1)] of having a minimum of one upgradient and three downgradient monitoring wells.

Bottom Ash Landfill

Groundwater flow beneath the Bottom Ash Landfill is generally to the south. A lack of measurable groundwater in piezometers located to the northwestern and northeast of the landfill indicates that the alluvium is unsaturated in these areas. The groundwater gradient in the uppermost aquifer beneath the Bottom Ash Landfill is relatively flat at approximately 0.004 ft/ft. Estimated hydraulic conductivity values based on in-situ aquifer testing of the groundwater monitoring system wells range from approximately 0.6 to 5.2 ft/day.

Given a porosity of 0.40[4] characteristic of the uppermost aquifer material, the average linear groundwater velocity beneath the Bottom Ash Landfill ranges from less than 0.01 ft/day to approximately 0.05 ft/day. The highest hydraulic conductivity value was measured in well BA-DG1 which is screened within a zone containing fine sand and some gravel. The groundwater monitoring system for the Bottom Ash Landfill satisfies the requirement [specified in 40 CFR

---

[4] Freethey, G.W., Spangler, L.E., and Monheiser, W.J, 1994, *Determination of Hydrologic Properties Needed to Calculate Average Linear Velocity and Travel Time of Ground Water in the Principal Aquifer Underlying the Southeastern Part of Salt Lake Valley,* U.S. Geological Survey Water-Resources Investigations Report 92-4085.

§257.91(c)(1)] of having a minimum of one upgradient and three downgradient monitoring wells.

Groundwater Monitoring System Requirements

Requirements stated in 40 CFR §257.91(a) – Performance Standard, specify that a groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer. Through a review of site-specific technical information, Burns & McDonnell confirmed that the groundwater monitoring systems associated with the CCR landfills at the Site meet these requirements and that monitoring wells included in the system accurately represent the quality of background groundwater that has not been affected by potential leakage from a CCR unit. The monitoring networks also include wells that accurately represent the quality of groundwater passing the waste boundary of the CCR landfills.

Limitations

Burns & McDonnel has prepared this groundwater monitoring system certification letter with reasonable skill, care, and diligence in accordance with customarily accepted professional practices in effect at the time it was prepared. Conclusions are interpretation of available data and constitute a professional opinion based on that data.

If you have questions regarding the information presented herein please contact me at 816-349-6796 or bandrews@burnsmcd.com.

Sincerely,

Block Andrews

Mr. Block Andrews, PE
Project Manager

Wayne A. Weber

Mr. Wayne A. Weber, PE, PG
Project Engineer

WAW/waw

Attachment

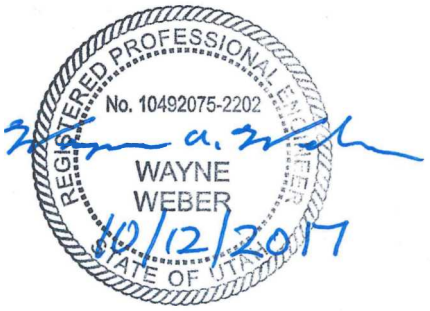
cc: David Crabtree (Deseret Power)
Katie Bland (Burns & McDonnell)

Certification

I hereby certify, as a Professional Engineer in the State of Utah, that the groundwater monitoring systems associated with the two (2) CCR Landfills at the Bonanza Power Plant located near Vernal, Utah that is operated by Deseret Generation and Transmission Cooperative have been designed and constructed to meet the requirements of 40 CFR §257.91 based on information provided in this letter, and a review of groundwater monitoring system documentation regarding the design, installation, development, and decommissioning of monitoring wells, piezometers and other measurement, sampling, and analytical devices placed in the facility's operating record and provided by Deseret Generation and Transmission Cooperative in accordance with 40 CFR §257.91(e)(1).

Wayne Weber, Utah PE License No. 10492075-2202

Date: 10/12/2017



9400 Ward Parkway \ Kansas City, MO 64114
O 816-333-9400 \ F 816-333-3690 \ burnsmcd.com

Attachment - Groundwater Monitoring Network Figure

Base maps:
UGS - 2016
Vernal, Utah
Jensen, Utah

Scale in Miles

0 0.25 0.5

LOUGHLIN WATER ASSOCIATES, LLC

Deseret Power

Bonanza Power Plant CCR Monitor Well Locatlon Map

Figure 2