Groundwater Monitoring System Certification

for Compliance with the Coal Combustion Residuals (CCR) Rule

Valmont Station

Xcel Energy

May 4, 2016

Revised:
February 26, 2019

Valmont Station, Boulder County, Colorado

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Table of Abbreviations and Acronyms

Abbreviation	Definition
AMSL	above mean sea level
BGS	below ground surface
CCR	Coal Combustion Residuals
EPA	U.S. Environmental Protection Agency
TOC	top of casing

Certification

Groundwater Monitoring System for Compliance with the Coal Combustion Residuals Rule

Public Service Company of Colorado, an Xcel Energy Company

Valmont Station, Boulder County, Colorado

I hereby certify that the groundwater monitoring system at Valmont Station is designed to meet the performance standard in Sections 257.91(a)(1) and (2) of the Federal Coal Combustion Residuals Rule, and that the groundwater monitoring system has been designed and constructed to ensure that the groundwater monitoring will meet this performance standard for the CCR units located at Valmont Station.

Matthew M Rohr

Colorado PE License 0053467

License Renewal Date October 31, 2019

1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) 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. Valmont Station, located in Boulder County, Colorado (**Figure 1**), has four CCR units subject to the CCR Rule: the ash landfill, two former incised bottom ash impoundments, and a former ash settling pond (**Figure 2**). The Settling Pond was closed in 2017 and both bottom ash impoundments were closed in 2018. Each impoundment was physically closed by removal of CCR, with ongoing groundwater monitoring.

This document supports compliance with the CCR Rule by demonstrating that the groundwater monitoring system at Valmont Station meets the requirements outlined in Section § 257.91 of the Rule. Specifically, this document satisfies requirements outlined in Section § 257.91 of the Rule, which states:

- Section § 257.91(f): '*The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet requirements of this section* [§257.91]. *If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section* [Section § 257.91], *the certification must document the basis supporting this determination*.'

Table 1 summarizes components required by groundwater monitoring systems, per the CCR Rule and the professional engineer's certification of compliance with these requirements. The remainder of this document provides information to support certification for the multiunit groundwater monitoring system for the two former CCR impoundments and the groundwater monitoring system for the ash landfill and former settling pond.

Table 1. Summary of 40 CFR Section § 257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance

Groundwater Monitoring System Requirements	Compliance with Requirement
(a) *Performance standard.* The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that: (1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where: (i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or (ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and (2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.	**Yes.** The direction of groundwater flow has been determined at the site; the groundwater monitoring system includes the minimum number of wells at appropriate locations and depths to yield groundwater samples necessary to meet performance standards (a)(1) and (a)(2). See Sections 3 and 4.

Table 1. Summary of 40 CFR Section § 257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance	
Groundwater Monitoring System Requirements	**Compliance with Requirement**
(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of: (1) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and (2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.	**Yes.** The monitoring system was designed based on results of technical, site-specific data, including (b)(1) and (b)(2). See Sections 3 and 4.
(c) The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain: (1) A minimum of one upgradient and three downgradient monitoring wells; and (2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.	**Yes.** One background and three downgradient wells at the former ash ponds; two upgradient and nine downgradient wells at the ash landfill; and one upgradient and three downgradient wells at the former settling pond that meet the performance standards are being monitored in compliance with the CCR Rule. See Section 4.
(d) The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit. (1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors:(i) Number, spacing, and orientation of each CCR unit; (ii) Hydrogeologic setting; (iii) Site history; and (iv) Engineering design of the CCR unit. (2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by §257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under §257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under §257.101(a) to retrofit or close.	**Yes.** A multiunit system capable of detecting monitored constituents per (d)(1) was installed for the two former bottom ash impoundments that are adjacent to each other. See Sections 2 and 4. The two former CCR bottom ash impoundments were unlined. Requirements per (d)(2) will be followed.

<table>
<tr><th colspan="2">Table 1. Summary of 40 CFR Section § 257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance</th></tr>
<tr><th>Groundwater Monitoring System Requirements</th><th>Compliance with Requirement</th></tr>
<tr><td>(e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.

(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.

(2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.</td><td>Yes. Well design meets requirements (e).

See Section 4.

Groundwater monitoring system will be operated and maintained per (e)(2).</td></tr>
<tr><td>(f) The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.</td><td>Yes. System designed and constructed to meet the requirements of Section §257.91. Technical information to support certification and number of wells, per (c)(1).

See Sections 2.0, 3.0 and 4.0.</td></tr>
</table>

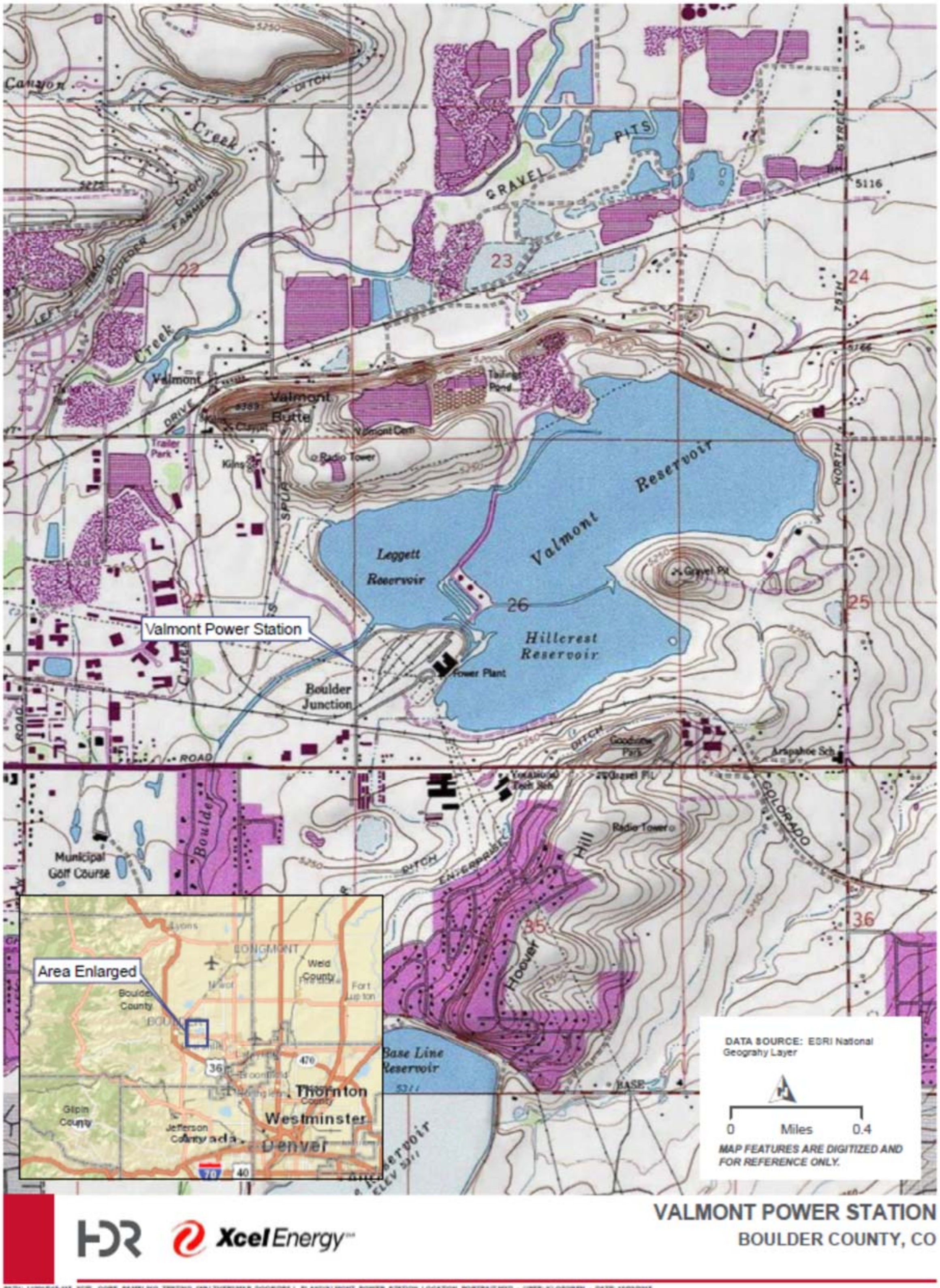

Figure 1. Vicinity Map for Valmont Station

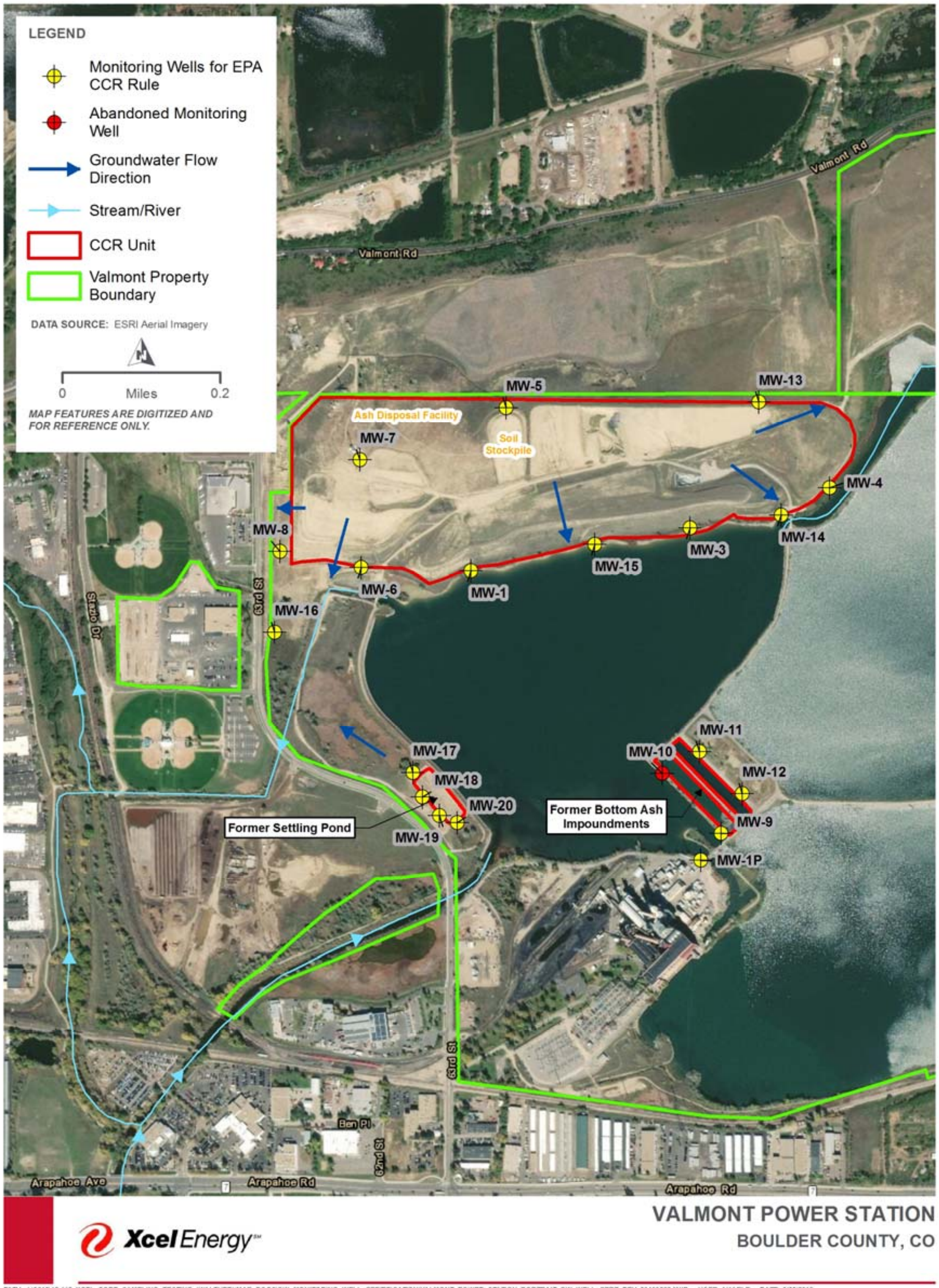

Figure 2. Valmont Station – CCR Units and Monitoring Well Location Map

2.0 Facility Description

Valmont Station is located in Boulder, Colorado (Figure 1). The first Valmont Station coal-fired generation unit went into service in 1924. Valmont Station was a coal-fired, steam turbine electric generating station that burned sub-bituminous, low-sulfur coal supplied by several mines in western Colorado. At one time, Valmont was the largest power station west of the Missouri River and it remained the company's largest Colorado generating station for several decades. Valmont Station was retired from operations on September 30, 2017.

Valmont Station has four CCR Units subject to the CCR Rule: the ash landfill, two former incised bottom ash impoundments, and the former settling pond. During the active operations, the two bottom ash impoundments (3A and 3B) were used for temporary storage of bottom ash prior to final disposition. Fly ash was dry handled and trucked either off site for beneficial use, or to the on-site ash landfill. The landfill is located adjacent to and north of Leggett Reservoir, and the impoundments are to the southeast of Leggett Reservoir (**Figure 2**). During operations, the impoundments were periodically dredged and the bottom ash disposed in the on-site landfill. Both impoundments were physically closed by final removal of all CCR, which was completed in September 2018; completion of CCR removal was certified by a Professional Engineer. The CCR waste removed during closure was disposed in the on-site landfill. The landfill will continue to be used for disposal of non-CCR waste and is planned to be closed in 2021.

The former Settling Pond is located on the west side of Leggett Reservoir and was constructed in 1973 (**Figure 2**). It was used for bottom ash settling from 1973 to 1980 and was inactive from 1980 to 2017. The pond was physically closed in 2017.

2.1 3A CCR Impoundment (3A Ash Pond – West)

3A CCR Impoundment (3A Ash Pond - West) was constructed in 1964 and encompasses 1.02 acres. Sheet piling was installed in approximately 1992 around the exterior of the impoundment to a depth of approximately 22 feet. During active operations, bottom ash was sluiced from the boiler to the impoundment for temporary storage. The impoundment was periodically dewatered and the ash removed for disposal at the on-site landfill. After Valmont Station was retired, the impoundment was dewatered and all ash was removed along with most of the sheet piling in the summer of 2018 for clean closure of the impoundments.

2.2 3B CCR Impoundment (3B Ash Pond – East)

3B CCR Impoundment (3B Ash Pond - East) was constructed in 1964 and encompasses 1.02 acres. The design, operation and closure of this impoundment was identical to the 3A Ash Pond – West. The impoundment was dewatered and all ash was removed along with most of the sheet piling in the summer of 2018 for clean closure of the impoundments.

2.3 CCR Ash Landfill

The Valmont Station Ash Landfill is located approximately 1/2 mile northeast of the power plant on the north side of the Leggett Reservoir. The majority of waste disposal at the landfill is coal ash generated at the Valmont Station. Operation of the landfill began in the early 1990's in the eastern portion of the landfill and progressed to other areas of the landfill over time. The ash disposal facility is a mono-fill underlain by the Pierre Shale Formation. A man-made liner is not present.

2.4 Inactive Settling Pond

The former Settling Pond was constructed in 1973 and encompassed 1.02 acres. The pond is approximately 365 feet long by 140 feet wide and has an average depth of 12 feet. The pond had a PVC liner that was installed when the pond was constructed. The Settling Pond was temporarily used to manage ash from 1973 to 1980. The pond was inactive from that time until it was cleaned closed in 2017. The pond was physically closed by removal of all CCR and liner material, which was completed in July 2017; completion of CCR removal was certified by a Professional Engineer. The CCR waste removed during closure was disposed in the on-site landfill

3.0 Site Hydrogeology/Geology

Prior hydrogeologic and geotechnical investigations have been conducted at Valmont, as documented in the following reports and summarized in the text below.

- Monitoring Well Installation Report (MW-1-3) (Xcel, 2002)
- Monitoring Well Installation (MW-4-8) (APEX, 2008)
- Geotechnical Engineering Study (Kumar and Associates, Inc., 2008)
- Geotechnical Engineering Study (Kumar and Associates, Inc., 2011)
- Ground Water Monitoring Report, Fall 2014 (Xcel, 2014)
- Ash Disposal Facility Design and Operations Plan (Xcel, 2009)
- Inventory and Preliminary Classification Report, Waste Impoundments (Tetra Tech, 2013)

The ash landfill at Valmont Station is located on the flanks of Valmont Butte, above the claystone bedrock Pierre Shale. The Pierre Shale is a sedimentary bedrock that is approximately 2,000 feet thick in this area. The unit consists of claystone with interbeds of siltstone and discontinuous cemented layers. The upper part of the shale is a weathered bedrock shale that is continuous under the landfill and above the consolidated shale. In geotechnical borings completed in the landfill, compacted ash is directly on top of the weathered Pierre Shale (Kumar and Associates, Inc., 2011). The thickness of weathered bedrock under the ash fill and over the consolidated bedrock varies from 5 to 40 feet.

There is evidence of perched water beneath the landfill. Most of the perched water surface is coincident with the top of the Pierre Shale and the water surface of Leggett Reservoir. Due to the Pierre Shale thickness and low permeability, underlying formations do not receive significant recharge from above (Kumar and Associates, Inc., 2011).

According to the Colorado Geologic Service (CGS) the first regional groundwater exists at an elevation of 5,200 feet and flows north, discharging to Boulder Creek. The CGS identified the area in which the landfill is located as being an area where localized water tables may occur within fractures of consolidated materials. The monitoring wells in the topographic highs of the landfill (MW-2, MW-5, and MW-7) indicate a perched water table occurs in the upper portion of the Pierre Shale, at an elevation of approximately 5,248 to 5,270 feet above mean sea level (AMSL) (**Figure 2**). Further west the ground surface lowers at the property boundary and the groundwater elevation at MW-8 is lower (5,211 feet AMSL) implying westward groundwater flow between the middle of the landfill and the west side of the landfill; and the groundwater elevation is lower still (5194 feet AMSL) at MW-16 further south along the western property boundary. The groundwater elevation in MW-1, MW-15, MW-3, MW-14, and MW-4, closest to the Leggett reservoir is between 5,207 and 5,226 feet AMSL and is consistent with the reservoir water surface as groundwater elevations were observed to decrease as the reservoir surface was lowered in 2018. The groundwater elevation at MW-6 is approximately 5,214 feet AMSL. The groundwater elevation at MW-13 in the northeast part of the landfill is approximately 5,220 feet AMSL. Therefore, the shallow groundwater flow beneath the landfill follows topography and is radial from the topographic high. Groundwater flow is to the northeast and southeast in the eastern portion of the landfill, and to the southwest at the western portion of the landfill (**Figure 2**). An average gradient of 0.017 was calculated for the eastern portion of the landfill using data from monitoring wells MW-1, MW-2, MW-3, and MW-4. An average gradient of 0.068 was calculated for the western portion of the landfill using data from monitoring wells MW-6, MW-7, and MW-8. The average hydraulic conductivity calculated from slug tests is 0.003 feet/day (APEX, 2008).

The depth to groundwater in monitor wells MW-9 through MW-12 around impoundments 3A and 3B varied between 5,226.5 to 5,226.8 feet AMSL in March 2016, and coincides with the seasonally fluctuating Leggett Reservoir water surface. In the nearby MW-1P (different from MW-1 at the landfill), just south of the impoundments near the hot water canal, the depth to groundwater was 5,226.5, also coincident with reservoir water level.

Monitoring wells MW-17 through MW-20 were installed around the former Settling Pond to capture groundwater quality on three of the four sides of the pond (the east side of the pond is the reservoir embankment). Groundwater elevations in MW-17, MW-18, and MW-20 are 5214.01, 5214.90, and 5217.98 feet AMSL, respectively. The water level in MW-19 is approximately 30 feet lower than the other Settling Pond wells. The reason is unknown; however it is likely the result of the well screen being located in a tighter portion of the Pierre Shale formation, which does not represent overall aquifer conditions. Groundwater flow under the Settling Pond is generally to the north northwest.

4.0 Monitoring Wells

The CCR Rule requires, at a minimum, one upgradient and three downgradient monitoring wells per CCR unit to be completed in the uppermost aquifer. Section 257.9 of the Rule states that the operator: *"…may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit."* In addition, the CCR Rule states that downgradient monitoring wells should be installed to: *"accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer."*

Based on the CCR requirements, hydrogeological data, and site visits, five wells were originally sited for CCR compliance for the former 3A and 3B ash impoundments, with four monitoring wells around the perimeter of the impoundments and one upgradient well (MW-1P) at the plant. Seven existing wells plus four new wells were identified for CCR compliance for the Ash Landfill, with nine downgradient monitoring wells and two upgradient wells (**Figure 2**). Four wells were sited surrounding the former settling pond (Figure 2). **Table 2** provides the construction details of wells monitored for compliance with the CCR Rule.

<u>Background/Upgradient Monitoring Well at the CCR Impoundments</u>

The background well for the impoundments will be MW-1P, located approximately 300 feet south of the impoundments on the edge of Leggett Reservoir (**Figure 2**). The groundwater flow direction beneath the impoundments is very flat and consistent with the reservoir water surface surrounding the island. MW-1P has been identified as the background/upgradient well based upon its location south of the impoundments and separation from the impoundments by Leggett Reservoir.

<u>Background/Upgradient Monitoring Wells at the Ash Landfill</u>

There are eleven monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-13, MW-14, MW-15, and MW-16; **Figure 2**) at the landfill. The background monitoring wells are MW-7 and MW-5. MW-7 is located on the northwest side of the landfill while MW-5 is located on the north side of the landfill. Groundwater under the west part of the landfill flows southwest, under the middle part of the landfill flows south towards Leggett Reservoir, and under the east part of the landfill flows east and southeast. Wells MW-7 and MW-5 are upgradient of the ash disposal areas, and therefore are representative of background groundwater quality at the landfill.

<u>Downgradient Monitoring Wells at the CCR Impoundments</u>

The groundwater gradient in the immediate vicinity of the impoundments is very flat and coincident with the reservoir water level. There is inadequate access for drilling between the impoundments; therefore, a multi-unit monitoring network was installed, consisting of four wells (MW-9, MW-10, MW-11, MW-12), along the perimeter of the impoundments to serve as downgradient wells (Figure 2). Each downgradient well was sited at a corner of the waste boundary of the CCR units to ensure the water quality from these four locations will detect constituents from the CCR unit, if present. In 2018, it was necessary to abandon monitoring well MW-10 during the closure and regrading of the impoundments. The remaining three downgradient wells are sufficient to represent the quality of groundwater passing the impoundments boundary.

<u>Downgradient Monitoring Wells at the Ash Landfill</u>

Eight monitoring wells at the landfill (MW-1, MW-3, MW-4, MW-6, MW-8, MW-13, MW-14, and MW-15; **Figure 2**) are located along the waste boundary and are hydrologically downgradient based upon the radial groundwater flow direction. Therefore, they meet the criteria for downgradient monitoring wells under the CCR Rule. Additionally, well MW-16 was installed in 2018, located at the property boundary downgradient of the landfill.

Monitoring Wells at the Former Settling Pond

The groundwater flow direction beneath the former settling pond was unknown prior to well installation; however it was assumed to flow to the west, consistent with the surface topography and expected influence from Leggett Reservoir to the east. Wells could not be installed on the east side of the pond or the northeast or southeast corners of the pond because the eastern pond sidewall is considered an embankment for Leggett Reservoir. Four monitoring wells were installed around the three sides of the waste boundary of the CCR unit to ensure the water quality from the four locations will detect constituents from the CCR unit, if present. After well installation and monitoring, groundwater elevations show monitoring well MW-20 is upgradient of the former pond and MW-17 and MW-18 are downgradient of the former waste boundary. MW-19 water level is 30 feet different and appears to reflect a very low permeability section of the lithology but is downgradient and will continue to be monitored.

4.1 Well Construction

All of the CCR monitoring wells were drilled by a licensed well driller using a nominal 6-inch diameter hollow-stem auger drilling method. Well construction details for all CCR wells are summarized in **Table 2**. All wells were drilled to a depth of 10 feet below the water table, with screens installed just above the bedrock surface, designed to capture the uppermost alluvial groundwater (HDR, 2015a). Each monitoring well was constructed with 2-inch diameter, Schedule 40 PVC casing and screen with 0.010-inch screen slots. A 10-20 washed silica sand was used for the filter pack and placed approximately 2 to 3 feet above the well screen. An annular seal of bentonite grout was placed to above the top of the filter pack and hydrated for 12 hours after placement. An annular surface seal consisting of neat cement was installed from the top of the bentonite grout to the surface. Wells were developed according to the Well Installation Plan (HDR, 2015a).

Table 2. Monitoring Well Construction

Well I.D.	Northing	Easting	Elevation TOC (ft)	Well Total Depth (ft bgs)	Screen Interval (ft bgs)	Well Stickup (ft)	Well Type	Static WL (ft AMSL) March 2016	Well Permit Number	Purpose
	(UTM 13N Meter)									
MW-1	482404.7332	4430670.386	5234.27	38.7	28.5-38.5	2.6	2-inch PVC	5226.70	257834	Landfill Downgradient
MW-3	482852.3567	4430758.349	5233.52	49.4	39.2-49.2	2.8	2-inch PVC	5228.09	257836	Landfill Downgradient
MW-4	483138.3867	4430840.14	5237.21	22.6	12.5-22.5	1.9	2-inch PVC	5227.73	275212	Landfill Downgradient
MW-5	482523.758	4430972.90	5292.10	65.0	50-65	2.2	2-inch PVC	5237.6	275213	Landfill Upgradient
MW-6	482180.545	4430677.549	5235.23	30.1	15-30	1.75	2-inch PVC	5215.60	275214	Landfill Downgradient
MW-7	482177.6864	4430897.269	5299.46	65.6	50.5-65.5	2.5	2-inch PVC	5267.18	275215	Landfill Upgradient
MW-8	482014.6153	4430710.278	5234.97	30.1	15-30	2.3	2-inch PVC	5211.36	275216	Landfill Downgradient
MW-13	482993.2	4431016	5279.18	70	59-69	2.74	2-inch PVC	5216.71	NA	Landfill Downgradient
MW-14	483038.7	4430785	5230.89	44	33-43	2.51	2-inch PVC	5219.50	NA	Landfill Downgradient
MW-15	482658.3	4430725	5229.08	39	29-39	2.70	2-inch PVC	5213.75	NA	Landfill Downgradient
MW-16	482003.6	4430544	5217.17	30	19-29	2.64	2-inch PVC	5190.16	NA	Landfill Downgradient
MW-1P	482874.6351	4430078.765	5234.38	13.0	3-13	unknown	2-inch PVC	5226.50	257298	Impoundments Upgradient
MW-9	482916.0858	4430133.974	5234.25	26	8.83-18.83	1.98	2-inch PVC	5226.47	299967	Impoundments Downgradient
MW-10	482795.7423	4430255.585	5233.81	25	10-20	1.92	2-inch PVC	5226.51	299968	Impoundments Downgradient (Abandoned)
MW-11	482871.9677	4430300.494	5235.22	25.5	12-22	2.16	2-inch PVC	5226.79	299969	Impoundments Downgradient
MW-12	482959.2548	4430214.045	5235.05	26	13.6-23.6	2.25	2-inch PVC	5226.46	299970	Impoundments Downgradient
MW-17	482286.1	4430257	5224.51	29	19-29	2.77	2-inch PVC	5216.59	NA	Inactive Settling Pond Downgradient
MW-18	482305.6	4430207	5228.89	49	35-45	2.52	2-inch PVC	5219.43	NA	Inactive Settling Pond Downgradient
MW-19	482340.5	4430170	5231.77	49	39-49	2.45	2-inch PVC	5218.14	NA	Inactive Settling Pond Downgradient
MW-20	482377.0	4430156	5228.64	39.5	28.5-38.5	2.28	2-inch PVC	5218.08	NA	Inactive Settling Pond Upgradient

bgs = below ground surface TOC = top of casing AMSL = above mean sea level NA = not available yet, permits applications submitted

5.0 Groundwater Quality Sampling

5.1 Schedule

Sampling is conducted at a frequency compliant with CCR Part 257.94. Eight rounds of upgradient and downgradient monitoring well sampling were completed before October 17, 2017 for the former bottom ash impoundment wells (MW-1P, MW-9, MW-10 (abandoned in 2018), MW-11, and MW-12) and for the original landfill wells (MW-1, MW-3, MW-4, MW-6, MW-7, and MW-8). Groundwater sampling of those facilities was conducted quarterly between the fourth quarter 2015 and the third quarter 2017 for background water quality monitoring. After the sampling to establish background water quality, detection monitoring was initiated in 2017. The wells installed in 2018 at the landfill (MW-5, MW-13, MW-14, MW-15, and MW-16) have been added to the monitoring well network and sampling was initiated in 2018. Groundwater monitoring will continue as appropriate based upon the results of sampling

As stipulated in the Direct Final Rule (Extension Rule), eight rounds of background groundwater sampling were initiated in 2018 for the former Settling Pond, to be completed before April 17, 2019. Sampling frequency was conducted on an approximate three week frequency, beginning in June 2018, for collection of seven samples in 2018. After sampling to establish background water quality is completed, detection monitoring will be initiated in compliance with CCR Part 257.94.

Samples are collected following the protocol in the Xcel Energy Groundwater Sample Collection Standard Operating Procedure (HDR, 2015c). Groundwater quality sampling is conducted in all upgradient and downgradient monitoring wells unless wells are dry. In accordance with the CCR Rule, groundwater samples are not field filtered. The field parameters of turbidity, pH, and temperature are measured using a YSI Professional Plus (or an equivalent) portable water quality instrument that has been calibrated prior to use.

5.2 Analytical testing

Analytical testing of groundwater samples will be performed by TestAmerica or other EPA certified laboratory. For the initial eight background sample events, samples are analyzed for the constituents shown on **Table 3**, which include all of the constituents in Appendices III and IV of Part 257, plus Total Suspended Solids (TSS). For detection monitoring, the constituents listed in Appendix III will be analyzed. Subsequent sampling events will be analyzed for the constituents listed in Appendix III or IV as appropriate, based upon the results of previous sampling and statistical evaluation of results. For quality control, one field duplicate sample and one field equipment blank sample will be collected for each sample event. The laboratory will analyze matrix spike/matrix spike duplicates at a rate of 5 percent, per laboratory quality control standards.

Table 3. Groundwater Quality Constituents
Appendix III Constituents for Detection Monitoring
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)
Appendix IV Constituents for Assessment Monitoring
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined
Additional Parameters
Total Suspended Solids (TSS)

6.0 Reporting

The CCR Rule 297.90(e) identifies the reporting requirements for the groundwater monitoring program for the CCR units. The annual reporting documents were developed no later than January 31, 2018 and annually thereafter. The annual reports are placed in the Valmont operating record. The data validation, verification, and statistical methods used to analyze each specified constituent in each monitoring well is described in a separate Statistical Methods Certification document.

Annual reports will summarize key monitoring actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For CCR compliance, Xcel Energy will file the report in the operating record.

Xcel will comply with the CCR Rule recordkeeping requirements specified in § 257.105(h), notification requirements specified in § 257.106(h), and internet requirements specified in § 257.107(h).

7.0 References

APEX Consulting Services, Inc. 2008. Letter to Jennifer McCarter, Xcel Energy. Valmont Station Ash Disposal Facility Additional Monitoring Well Installation. February 11, 2008.

2015. Letter to Dino Lombardi, Xcel Energy. Annual Groundwater Monitoring and Diesel Fuel Recovery, Valmont Station, 1800 North 63rd Street, Boulder, Colorado. May 29, 2015.

HDR, 2015a. Monitoring Well Installation Plan for Compliance with the Coal Combustion Residuals (CCR) Rule, Xcel Energy Valmont Station, November 30, 2015.

HDR, 2015b. Monitoring Well Installation Report for Compliance with the Coal Combustion Residuals (CCR) Rule, Xcel Energy Valmont Station, February 5, 2016.

HDR, 2015c. Groundwater Sample Collection Standard Operating Procedure for Compliance with the Coal Combustion Residuals (CCR) Rule, Xcel Energy.

Kumar and Associates, Inc. 2011. Geotechnical Engineering Study and Slope Stability Evaluation, Ash Disposal Facility, Valmont Station, 1800 North 63rd Street, Boulder, Colorado. December 21, 2011.

Tetra Tech, 2013. Inventory and Preliminary Classification Report, Waste Impoundments Waste Impoundments Valmont Station, Boulder, Colorado. January 31, 2013.

Xcel Energy, 2002. Valmont Station Ash Disposal Facility Monitoring Well Installation Report. December 23, 2002.

2009. Valmont Station Coal Ash Disposal Facility Design and Operations Plan. January 2009.

2014. Valmont Station Ash Disposal Site Ground Water Monitoring Report, Fall 2014. December 2014.