Groundwater Monitoring System Certification

Neal North CCR Impoundment 3B
Sergeant Bluff, Iowa

MidAmerican Energy Company

GHD | 11228 Aurora Avenue Des Moines Iowa 50322

11114642 | Report No 13 (Revision B) | January 30 2018

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1. Introduction

MidAmerican Energy Company (MidAmerican) has installed a groundwater monitoring system at coal combustion residue (CCR) Impoundment 3B at the Neal North facility in accordance with 40 CFR Part 257. GHD has prepared this memorandum to certify the groundwater monitoring system meets the requirements specified in 40 CFR §257.91 Groundwater Monitoring Systems.

2. Groundwater Monitoring System

The groundwater monitoring system at CCR Impoundment 3B consists of 15 monitoring wells. Groundwater elevation data are collected from the 15 wells and groundwater samples are collected from 11 of the 15 monitoring wells. The 11 sampled monitoring wells and 3 other shallow monitoring wells are screened at the water table (approximately 15 to 38 feet below ground surface [bgs]) and 1 deep monitoring well is screened in a deeper portion of the alluvial aquifer (approximately 45 feet bgs). Horizontal spacing between the downgradient shallow alluvial aquifer monitoring wells ranges from approximately 500 to 900 feet. To more thoroughly assess background groundwater concentrations, additional background monitoring wells (MW-13, MW-27, and MW-29) were included in the groundwater monitoring network. As described in 40 CFR 257.91(a)(1)(ii), a determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where sampling will provide an indication of background groundwater quality that is as representative as that provided by the upgradient wells.

One monitoring well (MW-221S) was damaged during nearby construction activities; this monitoring well was replaced by monitoring well MW-221S(R), which was drilled and constructed to be substantially similar to the original monitoring well. Monitoring well MW-221S was plugged in accordance with Rule 567—39.8 of the Iowa Administrative Code.

The uppermost aquifer in the vicinity is the Missouri River alluvial aquifer. In general, the sediment grain size increases with depth; clays, silts, and fine sands are typically present from 0 to 30 feet bgs where the water table occurs; coarser sands and gravels are typically present below 30 feet where the deeper wells are screened. Bedrock was not encountered during drilling at CCR Impoundment 3B; however, at the adjacent Neal North CCR Monofill, an attempt was made in 1996 to drill and sample to a depth of 100 feet bgs, but coarse gravel prevented drilling beyond 62 feet bgs (MWH, 2006). Bedrock was encountered at approximately 137 feet bgs during installation of a water well at the Neal North Energy Center (MWH, 2007), located less than 1 mile west-northwest of CCR Impoundment 3B. The uppermost bedrock in the area is the Cretaceous-age Dakota Formation.

On a site-wide basis, the groundwater flow direction in the alluvial aquifer is to the west-southwest toward the Missouri River, based on the nine monitoring events conducted between December 2015 and September 2017. The groundwater contour maps show the groundwater elevations in the shallow portion of the alluvial aquifer have recently ranged from 1,059.82 feet at MW-104 to 1,077.13 at MW-218S, with groundwater flow directions predominantly toward the

Missouri River. Tabulated groundwater elevations for the nine recent sampling events are provided in Table 1.

Groundwater flow direction at CCR Impoundment 3B has been observed to be consistent with only minor temporal variations. Monitoring well MW-223S is located upgradient and monitoring wells MW-209, MW-217S, MW-218S, MW-219S, MW-220S, MW-221S(R), and MW-222S are consistently located downgradient. Monitoring wells MW-13, MW-27, and MW-29 are located south of Impoundment 3B in the upgradient direction.

All monitoring wells in the groundwater monitoring system consist of 2-inch nominal inner-diameter polyvinyl chloride (PVC) casing and screen. Monitoring well construction included placement of clean silica sand in the screened interval and an annular seal of bentonite to the near surface. Monitoring well surface completions consist of either a lockable stick-up surface casing set in a concrete pad and placement of protective bollards in locations where traffic may be of concern, or a flushmount cover with a watertight well plug in high traffic areas where a stick-up well is not suitable. Review of monitoring records and well inspections indicate the monitoring wells have been operated and maintained adequately to meet the design specifications of the monitoring program.

3. Certification

I certify the CCR Impoundment 3B groundwater monitoring system has been designed and constructed to meet the requirements of 40 CFR Part 257, Section 91. The groundwater monitoring system includes the minimum number of monitoring wells specified in 40 CFR Part 257, Section 91, Paragraph (c)(1), as described in this report.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Michael J. Alowitz

Michael J. Alowitz, P.E.

1/30/2018

Date

License Number: 18160

My license renewal date is: December 31, 2018

Pages or sheets covered by this seal: Entire Document

4. References

MWH, 2006. Hydrogeological Investigation Report, Coal Combustion Residue Monofill, Neal North Generating Facility, Woodbury County, Iowa. December 2006.

MWH, 2007. Hydrologic Monitoring System Plan, Coal Combustion Residue Monofill, Neal North Generating Facility, Woodbury County, Iowa. August 2007.

5. Record of Revisions

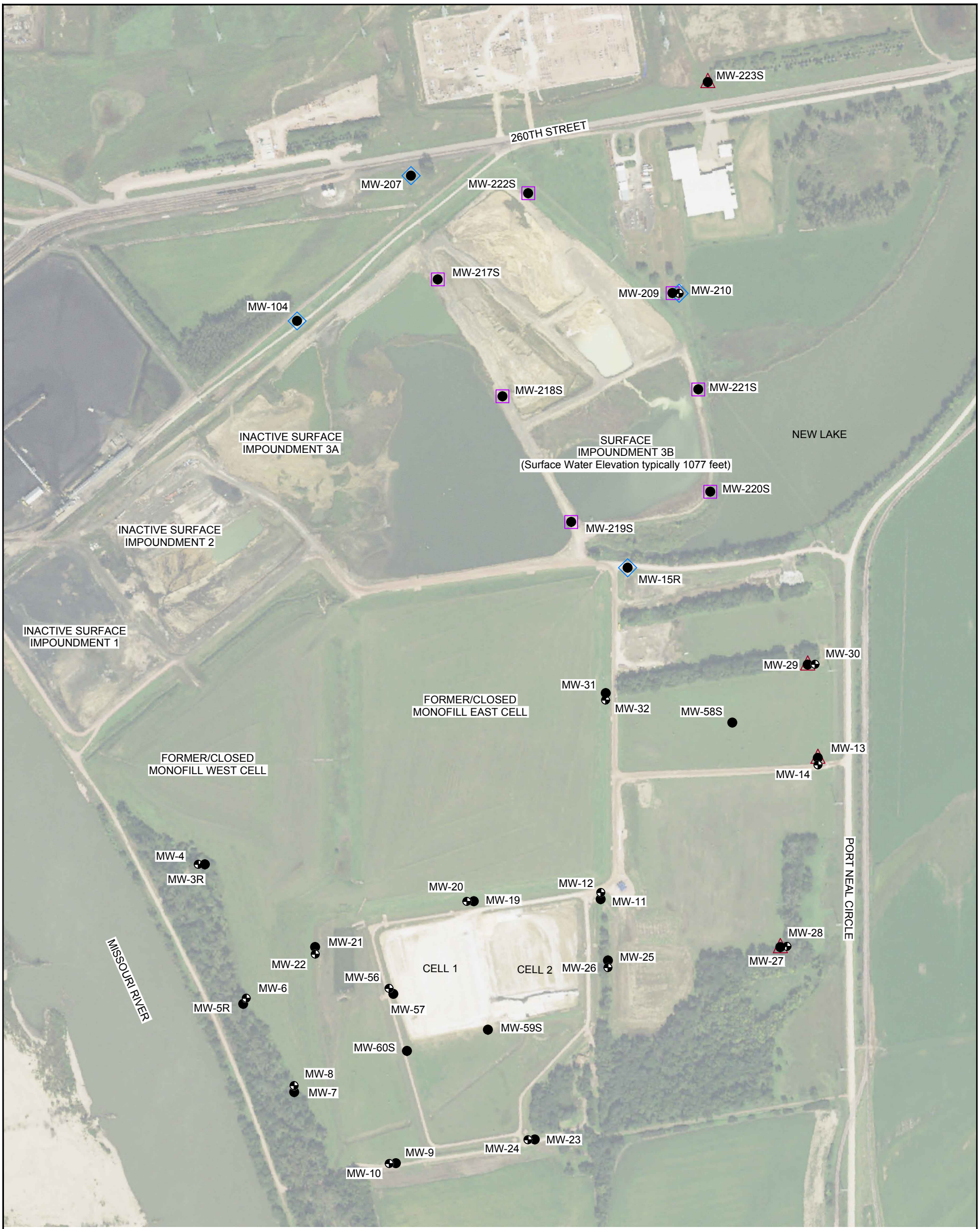
Revision	Date	Revisions Made	By Whom
A	10/17/2017	Initial Issue	GHD
B	01/30/2018	Monitoring wells MW-13, MW-27, and MW-29 added to monitoring network as background wells	GHD

Table 1

Groundwater Elevation Data
MidAmerican Energy Company
Neal North CCR Impoundment 3B
Sergeant Bluff, Iowa

Well	Top of Casing (feet NAVD)	Total Depth (feet BTOC)	Groundwater Elevation (feet NAVD)								
			8-Dec-2015	1-Mar-2016	7-Jun-2016	20-Sep-2016	19-Dec-2016	21-Feb-2017	24-Apr-2017	6-Jul-2017	12-Sep-2017
MW-13	1,088.12	30.58	1,064.13	1,063.60	1,065.38	1,063.76	1,062.50	1,062.04	1,062.97	1,064.10	1,064.04
MW-15R	1,089.45	37.20	1,063.26	1,062.83	1,064.63	1,063.27	1,061.71	1,061.33	1,062.53	1,063.61	1,063.42
MW-27	1,087.56	33.66	1,063.35	1,062.82	1,064.61	1,063.20	1,061.77	1,061.25	1,062.32	1,063.54	1,063.39
MW-29	1,090.01	29.71	1,064.28	1,063.71	1,065.49	1,064.08	1,062.61	1,062.15	1,063.08	1,064.20	1,064.12
MW-104	1,076.93	21.40	1,061.52	1,061.22	1,062.08	1,061.78	1,060.16	1,059.82	1,061.30	1,062.49	1,062.19
MW-207	1,079.33	26.10	1,062.92	1,062.40	1,064.21	1,062.88	1,061.47	1,060.91	1,062.00	1,063.27	1,063.14
MW-209	1,077.04	18.40	1,064.51	1,064.00	1,065.69	1,064.26	1,062.94	1,062.33	1,063.18	1,064.31	1,064.27
MW-210 [a]	1,077.12	48.80	1,064.63	1,064.10	1,065.79	1,064.36	1,063.01	1,062.41	1,063.31	1,064.40	1,064.36
MW-217S	1,092.11	38.38	1,063.18	1,062.77	1,064.55	1,063.63	1,061.87	1,061.94	1,062.75	1,064.27	1,063.80
MW-218S	1,089.35	30.12	1,076.30	1,076.94	1,076.50	1,077.08	1,077.00	1,076.83	1,077.13	1,076.65	1,077.06
MW-219S	1,087.33	30.17	1,076.12	1,074.48	1,073.44	1,075.57	1,075.74	1,075.73	1,075.83	1,074.78	1,075.72
MW-220S	1,085.88	33.39	1,063.93	1,063.43	1,065.21	1,063.83	1,062.34	1,061.89	1,062.95	1,064.44	1,064.69
MW-221S	1,085.75	29.36	1,064.34	1,063.76	1,065.48	NA	NA	NA	NA	NA	NA
MW-221S(R)	1,085.10	30.35	NA	NA	NA	1,063.99	1,062.61	1,062.06	1,062.95	1,064.06	1,064.02
MW-222S	1,086.57	30.09	1,063.89	1,063.35	1,065.09	1,063.73	1,062.37	1,061.74	1,062.67	1,063.89	1,063.85
MW-223S	1,077.99	23.11	1,064.94	1,064.40	1,066.04	1,064.56	1,063.31	1,062.65	1,063.37	1,064.48	1,064.49

Notes:
[a] Well is screened in deep portion of the alluvial aquifer.
BTOC - Below top of casing.
CCR - Coal combustion residual.
NA - Not applicable/not available.
NAVD - North American Vertical Datum of 1988.



LEGEND

- MW-29 — SHALLOW GROUNDWATER MONITORING WELL
- MW-30 — DEEP GROUNDWATER MONITORING WELL
- UPGRADIENT SAMPLING LOCATION
- DOWNGRADIENT SAMPLING LOCATION
- GAUGING LOCATION

Source: U.S. Department of Agriculture (USDA) Imagery Date: September 16, 2014

0 250 500ft

Coordinate System:
NA83 STATE PLANE
IOWA NORTH

MIDAMERICAN ENERGY COMPANY
SURFACE IMPOUNDMENT 3B
SERGEANT BLUFF, IOWA

11114642-CCR17

Jan 30, 2018

SITE MAP AND MONITORING NETWORK

FIGURE 1

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