2018 Annual Groundwater Monitoring and Corrective Action Report

Leland Olds Station
Stanton, North Dakota

Basin Electric Power Cooperative

January 30, 2019

Project #60569675

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List of Acronyms

bgs	below ground surface
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FGD	Flue Gas Desulfurization
ft	feet
ft/d	feet per day
GWMS	groundwater monitoring system
GWPS	groundwater protection standard
LOS	Leland Olds Station
MCL	maximum contaminant level
MW	megawatt
RCRA	Resource Conservation and Recovery Act
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit
USGS	U.S. Geological Survey

1. Introduction

On behalf of Basin Electric Power Cooperative, (Basin), AECOM prepared the 2018 annual report documenting groundwater monitoring and corrective action for the Coal Combustion Residuals (CCR) units at Basin's Leland Olds Station (LOS).

Chapter 1.0 provides background information on the power generating facility, the CCR unit(s) present at the facility, and the physical setting of the CCR unit(s), specifically with regard to groundwater conditions. Chapter 2.0 summarizes CCR groundwater monitoring activities conducted prior to 2018. Chapter 3.0 summarizes the groundwater monitoring and corrective action activities completed in 2016 and 2017, and references attachments to this report that contain detailed documentation of those activities. Chapter 4.0 provides an evaluation of the condition of the groundwater monitoring system. Chapter 5.0 summarizes the groundwater sampling and analysis conducted during the reporting period. Chapter 6.0 reviews the methods and results of statistical analysis of the groundwater monitoring data. Chapter 7.0 presents a summary and conclusions from the CCR groundwater monitoring in 2016-2017 and statistical analysis of the results. Chapter 8.0 lists references cited in this report.

Regulatory Background

The CCR rule became effective on October 19, 2015 and established standards for the disposal of CCR in landfills and surface impoundments (CCR units). In particular, the rule set forth groundwater monitoring and corrective action requirements for CCR units. The rule includes the requirement for an "annual groundwater monitoring and corrective action report" (annual report), with the first annual report due by January 31, 2018. The annual report is intended to document the status of the groundwater monitoring and corrective action program for each CCR unit, summarize key actions completed in the previous year, and project key activities for the upcoming year. This report is the first second report, and includes activities performed in calendar year 2018.

Facility Location and Operational History

LOS is a coal-based generating station located north of Stanton, North Dakota (**Figure 1**). The plant began operating in 1966 consists of two power generating units with a total power output capacity of 669 megawatts (MW).

CCR produced at LOS includes fly ash, bottom ash, and flue gas desulfurization (FGD) waste.

CCR Unit Description

Coal ash is disposed at LOS in the following CCR unit:

- Glenharold CCR Landfill

The ash landfill is located approximately 3 miles southwest of the generating units and office complex, in an area of mine spoils (**Figure 1**). The landfill is currently accessed via a haul road running generally east to west along the south side of the landfill.

Physical Setting

The geology underlying the site includes mine spoils underlain by the Sentinel Butte Formation. This formation is comprised of continental deposits in excess of 1,000 feet of dense clay, weakly cemented sandstone, mudstone and lignite beds.

The topography of the surrounding areas consists of alluvial terraces and historic mine spoils. Much of the surrounding mined areas have historically been developed such that precipitation outside of the landfill footprint is generally redirected as surface water runoff toward drainage ditches and culverts that drain to Alderin Creek and ultimately to the Missouri River. Groundwater is recharged primarily through regional infiltration of melt water in the spring.

The base of the LOS CCR Landfill is underlain by 50 feet (approximately) of clay rich mine spoil that overlies the Lower Sentinel Butte Formation. The 2016 AECOM drilling investigation did not penetrate to depths great enough to expose the lower portions of the Sentinel Butte.

The uppermost aquifer is found within the 6 to 9-foot unmined lignite bed located at depths ranging roughly from 86 to 125 feet below ground surface (ft, bgs). The potentiometric surface of the uppermost groundwater present within the lignite is approximately 1880 feet above mean sea level (ft, amsl) in the southern portion of the Landfill facility sloping generally north-northeast to 1843 ft., amsl on the northern side of the landfill. Aquifer testing completed at monitoring wells MW-2016-4, MW-2016-8, and MW-2016-10 indicates an average hydraulic conductivity of 1.52 X 10^{-5} centimeters per second (cm/sec) for the saturated materials.

2. CCR Groundwater Monitoring Activities Prior to 2018

The regulatory process for CCR groundwater monitoring and corrective action is established by 40 CFR § 257.90 through 257.98. The process includes a phased approach to groundwater monitoring, leading (if applicable) to the establishment of groundwater protection standards (GWPSs) for each CCR unit. Exceedances of the GWPSs that are determined to be statistically significant can trigger requirements for additional groundwater characterization and corrective action assessment followed by corrective action implementation. The following paragraphs provide a brief summary of CCR groundwater monitoring activities performed prior to 2018. CCR groundwater monitoring activities performed in 2018 are discussed in Chapter 3.

Groundwater monitoring at LOS is performed using a network of monitoring wells that includes both wells to monitor background water quality that is not potentially influenced by the presence of the CCR unit, and wells placed at the downgradient boundary of the unit (**Figure 2**). The hydrostratigraphic positions of the CCR monitoring wells selected for sampling background and downgradient groundwater quality for the LOS CCR unit is summarized below:

CCR unit	Background wells	Downgradient wells
Landfill	MW-2016-3, MW-2016-4, MW-2016-5, MW-2016-6, MW-2016-8	MW-2016-2, MW-2016-9, MW-2016-10, MW-2016-11

Monitoring well MW-2016-1 is being excluded from the groundwater monitoring network due to insufficient water production to obtain a representative sample. However, it remains in place for groundwater level measurements.

Baseline Detection Monitoring was initiated in August 2016, which involved sampling groundwater for Part 257 Appendix III and IV constituents over eight Baseline Detection Monitoring events.

Baseline Detection Monitoring events were performed in general accordance with procedures established in the site-specific Sampling and Analysis Plan (AECOM 2018a), which is included in the facility's Operating Record. The Sampling and Analysis Plan describes the procedures for equipment calibration, monitoring well water level measurement, monitoring well purging and sampling, sample custody, sample shipping, laboratory analysis and documentation requirements for each groundwater sample submitted. The results of detection monitoring at LOS were presented and discussed in the First Annual Groundwater Monitoring and Corrective Action Report, 2016-2017 (AECOM 2018b).

If a statistically significant increase (SSI) of any Appendix III constituent relative to background conditions is detected in the downgradient monitoring wells, and cannot be demonstrated to be associated with a source other than the CCR unit, then the CCR rule requires that groundwater monitoring transition from Detection Monitoring phase to the Assessment Monitoring phase.

The results of Baseline Detection Monitoring for the CCR unit at LOS identified no SSIs relative to background for Appendix III constituents:

As a result, the LOS groundwater monitoring system proceeded to Detection Monitoring in 2018.

3. CCR Groundwater Monitoring and Corrective Action Activities in 2018

This chapter summarizes the activities conducted at LOS in 2018 to comply with the groundwater requirements of the CCR rule:

- Groundwater Detection Monitoring activities
  - monitoring system evaluation
  - groundwater sampling
  - laboratory analysis
- Statistical analysis of the monitoring results

Further details concerning each of these activities are provided below.

Detection Monitoring Activities

Monitoring System Evaluation

As described in the CCR Groundwater Monitoring System Report (AECOM 2017), monitoring wells were installed around the CCR unit at LOS with appropriate total depth and placement of the well screen to: (1) facilitate collection of representative groundwater samples from the uppermost aquifer, and (2) accurately measure water table elevations to support evaluation of groundwater gradient and flow direction. All monitoring wells comprising the LOS CCR monitoring system were found to be in good condition during the Detection Monitoring events conducted in 2018.

Analysis of potentiometric surface maps constructed using the depth to groundwater measurements obtained during groundwater Detection Monitoring indicates the direction of groundwater flow is generally to the north-northeast, consistent with previous data collected during baseline detection monitoring in 2016 and 2017 (AECOM 2018b), and supports the wells selected to represent background groundwater quality and the quality of groundwater downgradient of the CCR units.

Groundwater Sampling and Analysis

Basin implemented a Detection Monitoring program for the CCR Landfill unit in the spring of 2018 based on the results of Baseline Detection Monitoring as discussed in Chapter 2. The initial Detection Monitoring event for the CCR unit was conducted in April 2018, and included analysis of collected groundwater samples for the constituents listed in Part 257 Appendix III.

Detection Monitoring sampling and analysis in 2018 was performed in general accordance with procedures established in the Sampling and Analysis Plan (AECOM 2018a). The results are presented in **Attachment A**, which also includes potentiometric surface maps for the uppermost aquifer, inferred groundwater flow direction and estimated velocities, and tabulated summary of field measurements and laboratory analytical data.

Statistical Procedures and Analysis

Statistical analysis of the results of Baseline Detection Monitoring in 2017 indicated that no Appendix III or Appendix IV constituents had SSIs over background (AECOM 2018b). These results prompted Basin to continue Detection Monitoring in 2018.

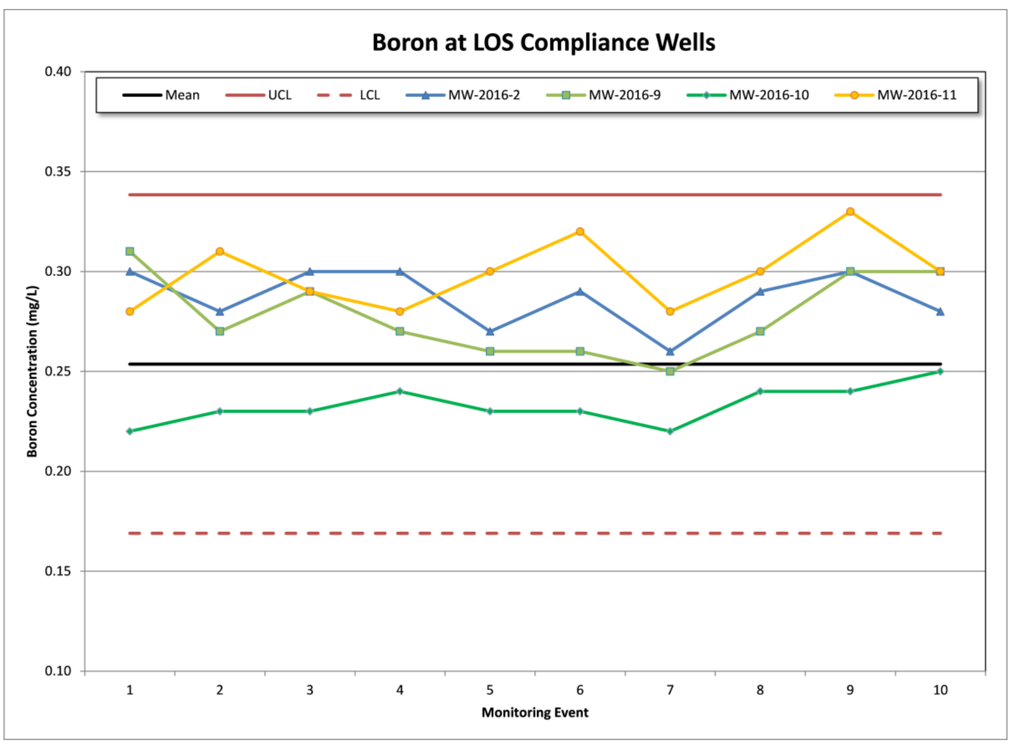
The Appendix III groundwater quality data were evaluated using an interwell approach that statistically compares constituent concentrations at downgradient monitoring wells to those present at background monitoring wells. For the

LOS Landfill, monitoring wells MW-2016-3, MW-2016-4, MW-2016-5, MW-2016-6, and MW-2016-8 are designated as the background wells because they are located upgradient of the ash landfill, whereas the remaining monitoring wells (MW-2016-2, MW-2016-9, MW-2016-10, and MW-2016-11) are located downgradient of the facility.

Prediction limits (i.e., parametric or nonparametric) were developed for each constituent, except boron, based on the frequency of non-detect values and whether the background data for that constituent exhibited a normal, lognormal, or nonparametric distribution. Analytical data from the background monitoring wells collected between September 2016 and October 2018 were used to develop an upper prediction limit (UPL) for the Appendix III background data at 95 percent confidence. A lower prediction limit (LPL) was also developed for pH which is a two-sided parameter. ProUCL Version 5.1 was used to store the data and run the statistical analyses.

Data from the downgradient monitoring wells for the same time period were compared to the UPL or LPL to identify statistically significant increases (SSIs) over background. Mann-Kendall trend analysis was used to identify statistically significant increasing trends for constituents with SSIs. The statistical analysis results indicate that calcium, chloride, fluoride, pH, sulfate and total dissolved solids (TDS) do not currently exhibit SSIs over background. pH also does not exhibit a SSI below background.

Boron was evaluated using a control chart. Upper and lower control limits were developed as the mean [0.254 milligrams per liter (mg/L)] ± 4.5 standard deviations using the boron data for monitoring wells MW-2016-3, MW-2016-4, MW-2016-5, MW-2016-6, and MW-2016-8. Starks 1988; EPA 2009; ASTM 2017 suggest using 4.5 standard deviations to develop control limits for groundwater detection monitoring. The control chart below shows the background mean (0.254 mg/L), upper and lower control limits (UCL and LCL), 0.338 and 0.169 mg/L, respectively, and the baseline and detection monitoring results for downgradient compliance wells MW-2016-2, MW-2016-9, MW-2016-10, and MW-2016-11 through October 2018. The results depicted on the control chart indicate that boron does not exceed the UCL at monitoring wells MW-2016-2, MW-2016-9, MW-2016-10, and MW-2016-11 for any sampling event. Therefore, boron does not currently exhibit a SSI over background at any of the downgradient compliance wells.



The results of the analyses, including the UPLs and LPL, are provided in **Table 1**.

4. General Information

The following subsections summarize any problems encountered in the LOS CCR program through 2018, any resolutions to those problems, if needed and upcoming actions planned for 2019.

Program Transitions 2018

There were no groundwater monitoring program transitions for the LOS Landfill monitoring system in 2018 except for the transition from Baseline Detection to Detection Monitoring.

Problems Encountered

No problems were encountered during the 2018 monitoring period.

Actions Planned for 2019

Basin plans on continuing the Detection Monitoring program for the CCR unit at LOS in 2019. The Detection Monitoring program will include semi-annual groundwater sampling events and the required statistical evaluations.

5. Summary and Conclusions

AECOM, on behalf of Basin, conducted two rounds of CCR groundwater Detection Monitoring at the LOS CCR Landfill in 2018. The results were used to establish background groundwater quality for Appendix III constituents in the uppermost aquifer, identify appropriate UPLs, and determine whether any UPLs were exceeded at statistically significant levels downgradient of the CCR unit at LOS.

The statistical analysis results indicate that none of the Appendix III constituents had SSIs over background or statistically significant increasing trends in constituent concentrations. Based on these results, assessment monitoring is not required at the Leland Olds Station CCR Landfill. Detection monitoring will continue at the site in 2019.

6. References

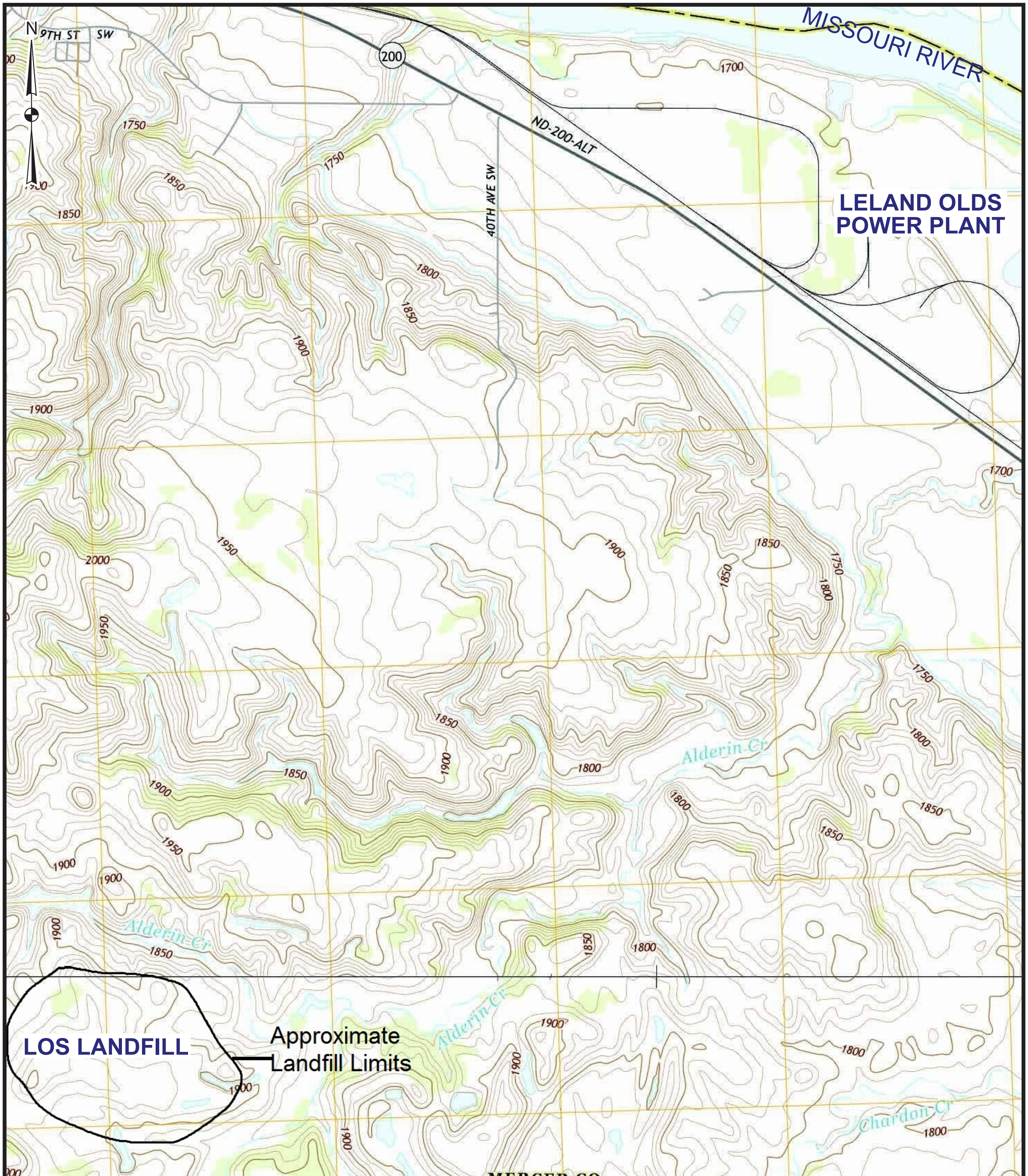
AECOM. 2017. CCR Groundwater Monitoring System Report, Leland Olds Station, Stanton, North Dakota. Basin Electric Power Cooperative. October 2017.

AECOM. 2018a. Sampling and Analysis Plan, CCR Monitoring Program, Leland Olds Station, Stanton, North Dakota. Basin Electric Power Cooperative. January 2018.

AECOM. 2018b. First Annual Groundwater Monitoring and Corrective Action Report, 2016-2017, Leland Olds Station, Stanton, North Dakota. Basin Electric Power Cooperative. January 2018.

U.S. Environmental Protection Agency. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities. Unified Guidance. EPA 530-R-09-007. March 2009. 884 pp.

Figures



0 2,000 4,000

APPROXIMATE SCALE IN FEET

BASE MAP SOURCE: USGS 7½ minute topographic quadrangle maps: Hannover NE, North Dakota 2014; Stanton SE, North Dakota 2014.

ND

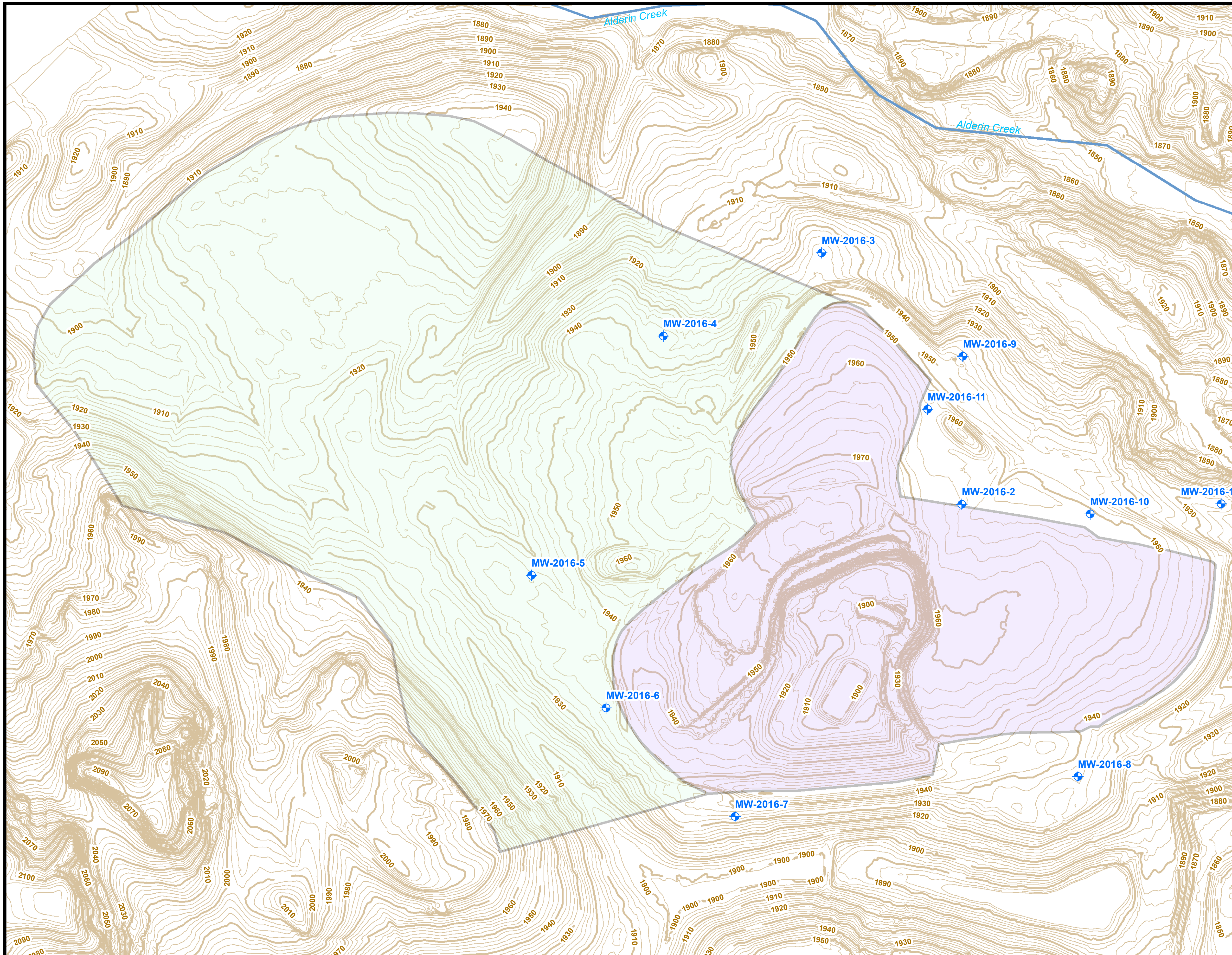
Quadrangle Location

BASIN ELECTRIC POWER COOPERATIVE

FIGURE 1
SITE LOCATION MAP
LOS LANDFILL

AECOM

J:\Project\B\Basin Electric Coop\60514340 LOS Landfill CCR Well\Data-Tech\TI



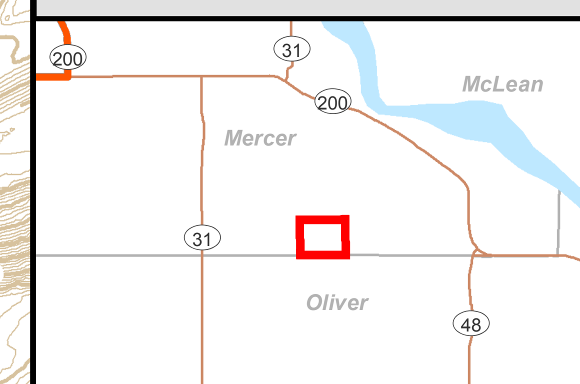
Legend

- Monitoring Well
- Existing Limits of Waste
- Expansion Limits of Waste
- Surface Contours (2-foot interval)

N
W E
S

1 inch = 400 feet

0 0.05 0.1 Miles



BASIN ELECTRIC POWER COOPERATIVE
FIGURE 2
LOS CCR MONITORING WELL NETWORK

AECOM

Tables

TABLE 1

BACKGROUND UPPER PREDICTION LIMITS (UPLS) OR CONTROL LIMITS

Parameter (Units)	Number of Samples	Percent Nondetects	Normal or Lognormal Distribution?	Statistical Method	Background Prediction or Control Limit
Boron (mg/L)	50	0	Yes/NA	Control Chart 99.9% UCL	0.338
Calcium (mg/L)	50	0	No/No	Nonparametric 95% UPL	23
Chloride (mg/L)	50	2	No/No	Nonparametric 95% UPL	39
Fluoride (mg/L)	50	44	No/No	Nonparametric 95% UPL	0.64
pH (std units)	60	0	No/No	Nonparametric 95% LPL/UPL	7.22/8.38
Sulfate (mg/L)	50	0	No/No	Nonparametric 95% UPL	745
TDS (mg/L)	50	0	No/No	Nonparametric 95% UPL	2,245

Note: pH has both a LPL and UPL; all other constituents only have an UPL or UCL; NA=Not applicable

Attachment A
Sampling and Analysis Report, 2016-2017

2018 Sampling and Analysis Report, CCR Monitoring Program

Leland Olds Station
Stanton, North Dakota

Basin Electric Power Cooperative

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CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
LOS	Leland Olds Station
QA/QC	Quality assurance/quality control

1. Introduction

On behalf of Basin Electric Power Cooperative (Basin), AECOM Technical Services, Inc. (AECOM) prepared this Coal Combustion Residuals (CCR) Groundwater Sampling and Analysis Report for the Basin Leland Olds Station (LOS). The objective of the report is to provide a description of the field and office activities performed in 2018 in support of the LOS CCR groundwater monitoring program.

This Sampling and Analysis Report was prepared to present the results of sampling and analysis of groundwater conducted for the monitoring requirements of the United States Environmental Protection Agency (EPA) CCR rule (Chapter 40 of the Code of Federal Regulations (CFR), §§ 257.90 to 257.98). Specifically, the report presents the data collected for the groundwater Detection Monitoring events conducted in 2018.

2. Groundwater Flow

As required by 40 CFR 257.93(c), groundwater elevations were measured in each well prior to purging each time groundwater was sampled. The measurements, presented in **Table 1**, were used to create potentiometric surface maps for the uppermost aquifer for the baseline monitoring events. The resulting potentiometric surface maps were used to evaluate the direction of groundwater flow and hydraulic gradient for the subject CCR unit. **Figure 1** and **Figure 2** represent potentiometric surface maps constructed using measurements taken on April 18, 2018 and October 11, 2018 respectively. These potentiometric maps illustrate groundwater flow patterns that are generally consistent with the patterns observed during CCR monitoring events performed at LOS in 2017. Groundwater flow velocities were calculated and are summarized in **Table 2**.

Based on the groundwater flow conditions documented in this chapter, the relative function of the monitoring wells employed in the LOS CCR groundwater monitoring system is as follows:

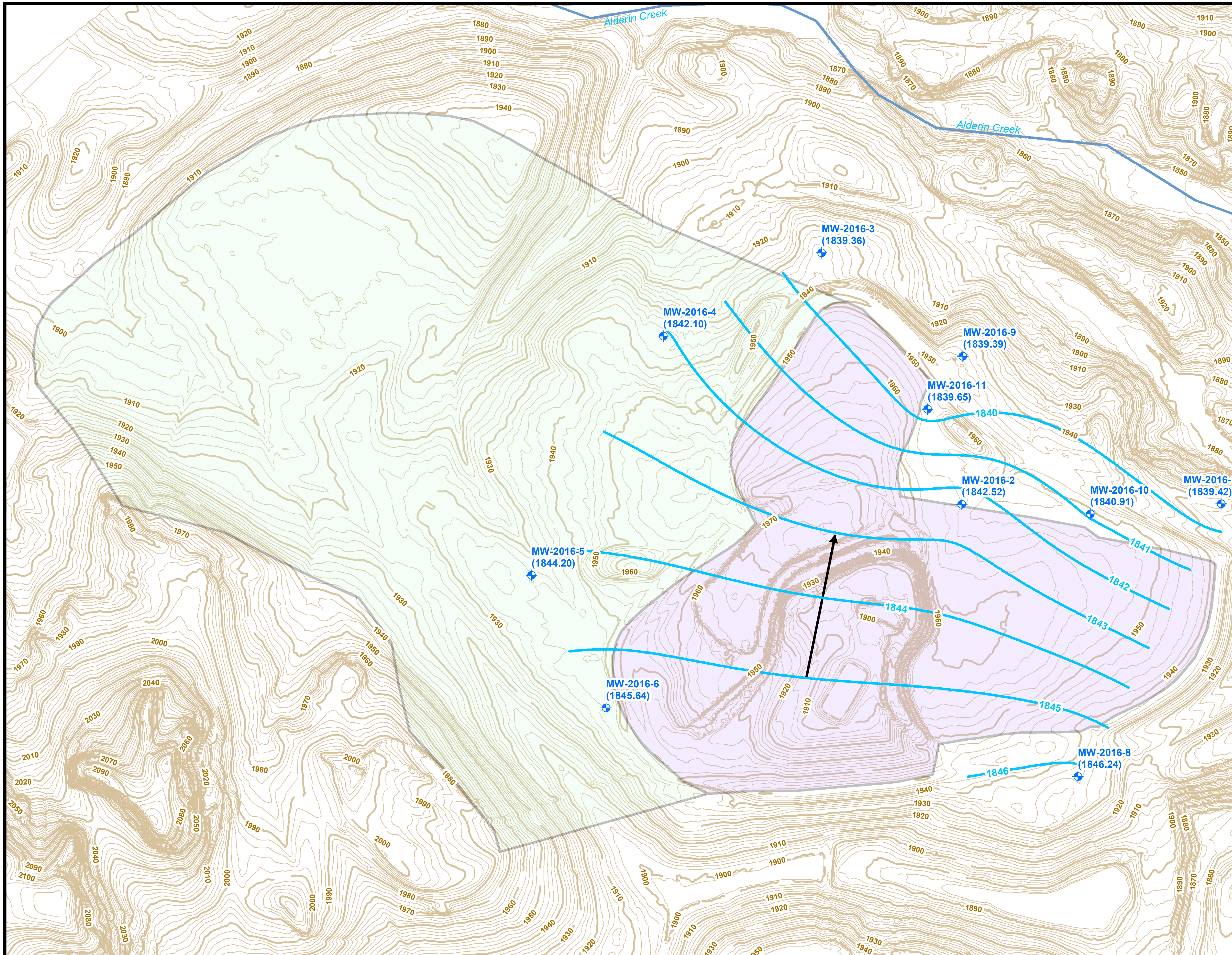
CCR unit	Background wells	Downgradient wells
Landfill	MW-2016-3, MW-2016-4, MW-2016-5, MW-2016-6, MW-2016-8	MW-2016-2, MW-2016-9, MW-2016-10, MW-2016-11

Monitoring well MW-2016-1 is being excluded from the groundwater monitoring network due to insufficient water production to obtain a representative sample. However, it remains in place for groundwater level measurements.

3. Groundwater Quality

The analytical testing laboratory provided reports presenting the results of laboratory analysis for each monitoring event. These laboratory reports are included in the operating record, and were reviewed for completeness against the project-required methods and the chain-of-custody forms. Laboratory reports were also reviewed for holding times, and that the data was appropriately flagged based on the quality assurance/quality control (QA/QC) data provided. Data validation reports were prepared for each monitoring event and are included in the operating record. The validated results were compiled into summary form as presented in **Table 3**.

Figures



Legend

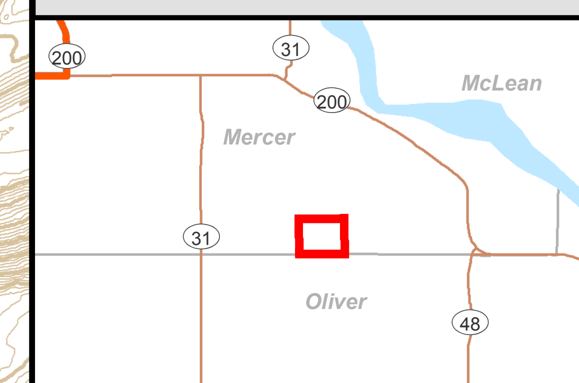
- Monitoring Well
- Piezometric Surface Contour (1-foot interval) April 18, 2018 (2nd quarter)
- Groundwater Flow Direction
- Existing Limits of Waste
- Expansion Limits of Waste
- Surface Contours (2-foot interval)

NOTE: Groundwater elevations were obtained on April 18, 2018.

N
W E
S

1 inch = 400 feet

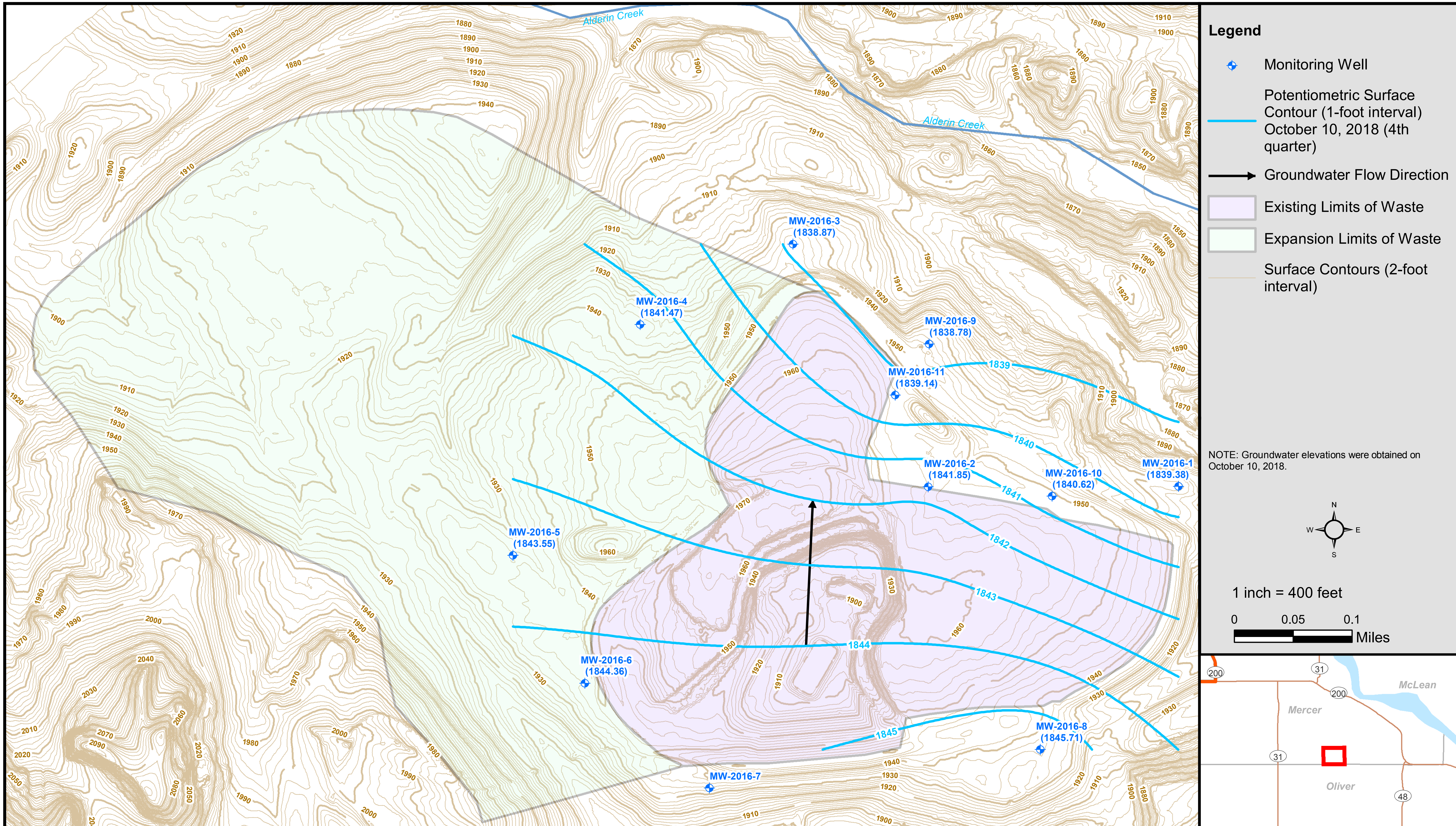
0 0.05 0.1 Miles



BASIN ELECTRIC POWER COOPERATIVE
FIGURE 1
POTENTIOMETRIC SURFACE MAP
APRIL 2018
LOS LANDFILL

JOB NO. 60569675

AECOM



BASIN ELECTRIC POWER COOPERATIVE
FIGURE 2
POTENTIOMETRIC SURFACE MAP
OCTOBER 2018
LOS LANDFILL

JOB NO. 60569675

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Tables

TABLE 1

GROUNDWATER MONITORING WATER LEVELS AND ELEVATIONS
CCR MONITORING WELLS 2018

LELAND OLDS STATION - STANTON, ND

Well ID	Reference Elevation Top of Casing (feet, NAVD 88)	April 18, 2018 Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	October 11, 2018 Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)
MW-2016-1	1931.725	92.31	1839.42	92.35	1747.07
MW-2016-2	1957.977	115.46	1842.52	116.13	1726.39
MW-2016-3	1939.881	100.52	1839.36	101.01	1738.35
MW-2016-4	1939.973	97.87	1842.10	98.50	1743.60
MW-2016-5	1937.538	93.34	1844.20	93.99	1750.21
MW-2016-6	1939.312	93.67	1845.64	94.95	1750.69
MW-2016-7	1936.114	NA	NA	NA	NA
MW-2016-8	1939.361	93.12	1846.24	93.65	1752.59
MW-2016-9	1947.392	108.00	1839.39	108.61	1730.78
MW-2016-10	1953.315	112.41	1840.91	112.70	1728.21
MW-2016-11	1956.73	117.08	1839.65	117.59	1722.06

NA = Measurements not available/Sample not analyzed for

TABLE 2

LANDFILL GROUNDWATER GRADIENT AND SEEPAGE VELOCITY

Date of event	d_l (ft)	d_h (ft)	i (ft/ft)	n_e	K (ft/day)	v_s (ft/day)
9/27/2016	680	4	5.88E-03	0.185	0.0344	1.09E-03
2/13/2017	680	3	4.41E-03	0.185	0.0344	8.20E-04
3/16/2017	600	4	6.67E-03	0.185	0.0344	1.24E-03
4/11/2017	600	3	5.00E-03	0.185	0.0344	9.30E-04
5/17/2017	920	4	4.35E-03	0.185	0.0344	8.08E-04
6/20/2017	880	4	4.55E-03	0.185	0.0344	8.45E-04
7/18/2017	960	6	6.25E-03	0.185	0.0344	1.16E-03
8/21/2017	960	5	5.21E-03	0.185	0.0344	9.68E-04

d_l = Horizontal separation between upgradient and downgradient locations perpendicular to potentiometric contours

d_h = Change in hydraulic head between upgradient and downgradient locations

i = Hydraulic gradient (change in elevation over distance)

n_e = Site average porosity of 18.5%

K = Site average hydraulic conductivity of 3.44 E-02 ft/day from slug and pumping tests at site

v_s = Seepage Velocity (ft/day)

Hydraulic Gradient Governing Equation[1] – $i = -{}^{dh}/_{dl}$

Seepage Velocity Governing Equation[2] – $v_s = {}^{-K * i}/_{n_e}$

1. In textbook form, d_h is a negative number as hydraulic head is reported as the higher value subtracted from the lower value.
2. Negative operation performed as in textbook form, hydraulic gradient is negative.

TABLE 3

LANDFILL ANALYTICAL RESULTS

Analytical Results Summary

			Appendix III Constituents										
	Analyte Name		Boron		Calcium	Chloride		Fluoride		pH	Sulfate		TDS
	Unit		mg/L		mg/L	mg/L		mg/L		S.U.	mg/L		mg/L
Downgradient	MW-2016-2	9/27/2016	0.30		25	12		0.50	U	7.56	420		1500
		2/15/2017	0.28		17	12		0.55		NA	460		1900
		3/16/2017	0.30		13	15	U	2.50	U	NA	520		2000
		4/11/2017	0.30		13	11		0.50	U	7.31	540		2000
		5/17/2017	0.27		9.5	8.1		0.50	U	7.32	550		1900
		6/20/2017	0.29		13	8.5	1	0.50	U 1	7.59	520	1	1900
		7/18/2017	0.26		11	9.1	2	0.50	U 2	7.67	470		1900
		8/21/2017	0.29		10	8.8	H	0.50	H	7.4	530	H	1700
		4/19/2018	0.30	B	11	8.8		0.50		7.94	500		1800
		10/11/2018	0.28		8.91	10.70		0.491	J	7.93	498		1850
	MW-2016-9	9/27/2016	NA		NA	NA		NA		NA	NA		NA
		1/24/2017	0.31		19	19		0.50		7.47	270		2300
		2/16/2017	0.27		13	18		0.51		7.45	320		1700
		3/16/2017	0.29		13	18		0.50	U	7.58	310		1800
		4/11/2017	0.27		9.0	18		0.54		7.35	310		1700
		5/17/2017	0.26		9.7	15		0.50	U	7.41	310		1700
		6/20/2017	0.26		7.6	16	1	0.50	U 1	7.84	340	1	1600
		7/18/2017	0.25		7.5	16	2	0.51	2	7.50	300	2	1700
		8/21/2017	0.27		7.5	16	H	0.53	H	7.41	360	H	1600
		4/19/2018	0.30	B	7.6	19		0.50		7.72	280		1800
		10/11/2018	0.298		8.16	20.3		0.483	J	8.08	272		1750
	MW-2016-10	9/27/2016	NA		NA	NA		NA		NA	NA		NA
		1/24/2017	0.22		20	17		0.60		7.66	300		1700
		2/13/2017	0.23		6.8	17		0.60		7.77	290		1700
		3/17/2017	0.23		7.5	15		0.55		7.65	310		1700
		4/11/2017	0.24		12	16		0.62		7.52	270		1800
		5/18/2017	0.23		7.7	15		0.54		7.87	240		1700
		6/21/2017	0.23		11	16	1	0.53	1	7.33	260	1	1700
		7/20/2017	0.22		7.6	15	2	0.60	2	7.23	220	2	1700
		8/22/2017	0.24		7.5	16	H	0.62	H	7.39	260	H	1600
		4/19/2018	0.24	B	5.5	14		0.60	F1	7.93	310		1700
		10/11/2018	0.253		6.650	15.10		0.583		8.18	311		1560
	MW-2016-11	9/27/2016	NA		NA	NA		NA		NA	NA		NA
		1/24/2017	0.28		36	18		0.54		7.59	260		1600
		2/16/2017	0.31		29	18		0.53		7.60	280		2400
		3/16/2017	0.29		13	17		2.50	U	7.61	290		1900
		4/11/2017	0.28		10	18		0.57		7.43	290		1600
		5/17/2017	0.30		12	15		0.50	U	7.05	250		2100
		6/20/2017	0.32		11	16	1	0.50	U 1	7.62	270	1	1600
		7/18/2017	0.28		9.3	17	2	0.51	2	7.66	260	2	1600
		8/22/2017	0.30		8.4	17	H	0.52	H	7.48	280	H	1500
		4/19/2018	0.33	B	7.8	20		0.56		7.81	270	B	1700
		10/11/2018	0.301		7.72	20.80		0.498	J	7.97	283		1670

			Appendix III Constituents										
			Boron		Calcium	Chloride		Fluoride		pH	Sulfate		TDS
Analyte Name			mg/L		mg/L	mg/L		mg/L		S.U.	mg/L		mg/L
Background	MW-2016-3	9/29/2016	0.27		23	35		0.50	U	7.42	100		1400
		2/16/2017	0.22		22	37		0.50		7.59	74		1500
		3/17/2017	0.26		15	36		0.56		7.83	59		1500
		4/12/2017	0.29		12	39		0.57		7.58	59		1500
		5/19/2017	0.26		13	33		0.50	U	7.46	78		1800
		6/22/2017	0.25		10	41	1	0.54	1	7.64	47	1	1500
		7/20/2017	0.24		9.7	40	2	0.58	2	7.54	50	2	1600
		8/23/2017	0.25		8.4	37	H	0.60	H	7.41	51	H	1400
		4/19/2018	0.28	B	7.3	37		0.64		7.89	34	B	1500
		10/11/2018	0.257		6.53	37.6		0.548		8.24	33.5		1490
	MW-2016-4	9/29/2016	0.24		11	18		0.58		7.49	370		1700
		2/15/2017	0.23		9.9	19		0.63		7.61	370		1700
		3/17/2017	0.22		10	20		0.58		7.59	360		1700
		4/2/2017	0.25		9.5	20		0.60		7.41	370		1700
		5/19/2017	0.23		8.5	17		0.54		7.36	350		1700
		6/21/2017	0.24		8.1	18	1	0.56	1	7.31	360	1	1700
		7/20/2017	0.22		10	18	2	0.57	2	7.27	320	2	1700
		8/23/2017	0.25		9.7	19	H	0.58	H	7.24	360	H	1600
		4/18/2018	0.25	B	7.6	20		0.62		8.14	350		1700
		10/11/2018	0.248		6.67	20.9		0.567		8.43	358		1730
	MW-2016-5	9/28/2016	0.24		23	7.9		0.50	U	7.93	600		1700
		2/14/2017	0.24		18	8.8		0.52		7.51	600		1900
		3/16/2017	0.25		13	8.2		0.50	U	7.53	590		1800
		4/12/2017	0.25		12	7.9		0.55		7.32	610		1700
		5/18/2017	0.25		11	6.2		0.50	U	7.22	590		1900
		6/21/2017	0.25		9.9	7.2	1	0.50	U 1	7.32	620	1	1900
		7/19/2017	0.23		9.8	6.5	2	0.54	2	7.36	610	2	1900
		8/23/2017	0.24		9.9	7.3	H	0.56	H	7.45	630	H	1700
		4/18/2018	0.27	B	7.8	6.7		0.56		7.79	620		1900
		10/11/2018	0.265		9.58	8.4		0.518		8.18	606		1950

Analyte Name			Boron		Calcium	Chloride		Fluoride		pH	Sulfate		TDS
			Appendix III Constituents										
			mg/L		mg/L	mg/L		mg/L		S.U.	mg/L		mg/L
Background	MW-2016-6	9/28/2016	0.21		43	9.1		0.50		7.69	520		1500
		2/15/2017	0.27		16	6.3		0.50	U	7.55	730		2100
		3/16/2017	0.29		13	15	U	2.50	U	7.58	740		2100
		4/12/2017	0.29		12	5.8		0.50	U	7.67	770		2200
		5/19/2017	0.27		13	4.7		0.50	U	7.39	730		2100
		6/22/2017	0.27		12	5.9	1	0.50	U 1	7.52	710	1	2100
		7/20/2017	0.24		11	5.1	2	0.50	U 2	7.53	720	2	2100
		8/23/2017	0.27		11	5.9	H	0.50	U H	7.49	750	H	2000
		4/19/2018	0.27	B	9.6	5.6		0.48	J	8.39	710		2100
		10/11/2018	0.287		9.78	6.03		0.401	J	7.95	716		1890
	MW-2016-8	9/27/2016	0.25		20	9		0.50	U	7.82	700		2200
		2/13/2017	0.26		22	9.2		0.50	U	7.52	730		2200
		3/16/2017	0.27		15	8.7		0.50	U	7.52	710		2200
		4/11/2017	0.27		14	8.7		0.50	U	7.25	740		2200
		5/18/2017	0.25		11	8		0.50	U	7.87	710		2200
		6/22/2017	0.25		13	8.8	1	0.50	U 1	7.51	700	1	2200
		7/19/2017	0.24		13	7.9	2	0.50	U 2	7.36	700	2	2300
		8/22/2017	0.26		16	8.7	H	0.50	U H	7.49	720	H	2100
		4/18/2018	0.26	B	13	8.2		0.41	J	8.06	720		2200
		10/11/2018	0.267		13.4	8.22		0.37	J	8.43	717		2320

TDS = Total Dissolved Solids
µg/L = micrograms per liter
mg/L = milligrams per liter
S.U. = Standard Units
pCi/L = picoCurie/liter
U = Analyte analyzed for but not detected
F1 = MS and/or MSD Recovery is outside acceptance limits
1 = Data collected on 10-9-17 to fill data gap during original sampling event #6
2 = Data collected 10-11 to 10-12-17 to fill data gap during original sampling event #7
H = Sample was prepped or analyzed beyond the specified holding time
NA = Not sampled or analyzed for
J = Result is less that RL but greater than or equal to the MDL and the concentration is an approximate value

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