2021 Annual Groundwater Monitoring and Corrective Action Report

Sandow Steam Electric Station AX Landfill - Milam County, Texas

Prepared for:

Luminant Generation Company LLC

Prepared by:

Golder Associates USA Inc., Member of WSP

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

January 31, 2022

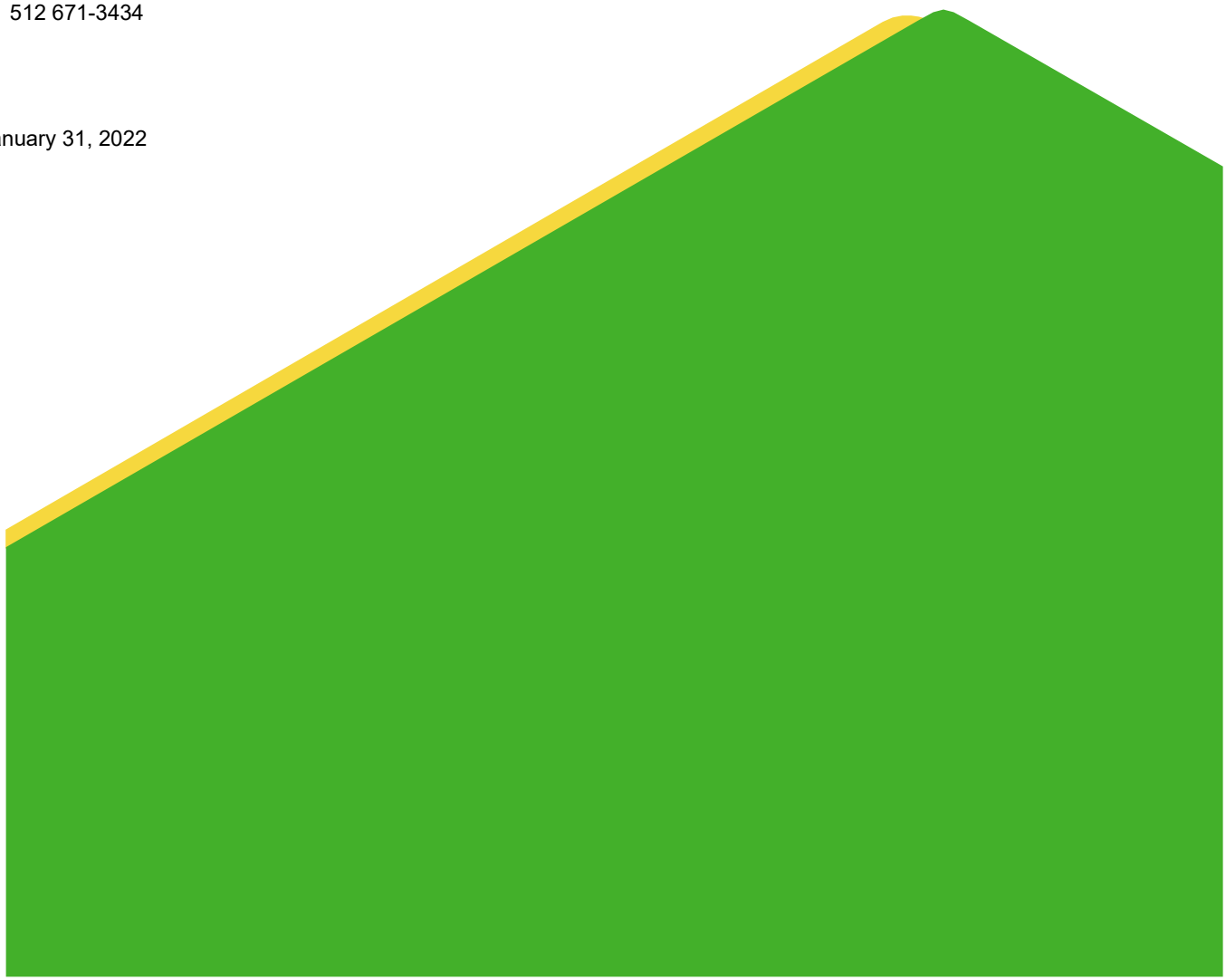


TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

CCR	Coal Combustion Residuals
C.F.R.	Code of Federal Regulations
GWPS	Groundwater Protection Standard
MCL	Maximum Concentration Level
mg/L	Milligrams per Liter
NA	Not Applicable
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
T.A.C	Texas Administrative Code
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

Golder Associates USA Inc. (Golder), Member of WSP, has prepared this report on behalf of Luminant Generation Company LLC (Luminant) to satisfy the 2021 annual groundwater monitoring and corrective action reporting requirements of 40 C.F.R. Part 257 and 30 T.A.C. Chapter 352 for the AX Landfill (the "CCR unit") at the former Sandow Steam Electric Station in Milam County, Texas. The CCR units and CCR monitoring well network are shown on Figure 1.

At the beginning and end of the 2021 reporting period, the CCR unit was operating under a Detection Monitoring Program as described in §257.94. The Detection Monitoring Program for the AX Landfill was established in September 2017. Statistically significant increases (SSIs) above background prediction limits were identified for several Appendix III parameters as part of the 2017 through 2020 Detection Monitoring events; however, Alternate Source Demonstrations were completed which indicated that a source other than the CCR unit caused the SSIs. During 2021, SSIs were also identified for several Appendix III constituents, including for calcium in wells AX-24, AX-26, and AX-27; and sulfate in wells AX-24 and AX-26. Alternate sources for the SSIs identified in the 2021 sample data are being evaluated in accordance with §257.94. If an alternate source is not identified to be the cause of the 2021 SSIs, an Assessment Monitoring Program will be established in accordance with §257.94(e)(2).

1.0 INTRODUCTION

Golder Associates, Inc. (Golder) has prepared this report on behalf of Luminant Generation Company LLC (Luminant) to satisfy the 2021 annual groundwater monitoring and corrective action reporting requirements of the Coal Combustion Residuals (CCR) Rule for the AX Landfill at the former Sandow Steam Electric Station in Milam County, Texas. The CCR units and CCR monitoring well network are shown on Figure 1.

The CCR Rule (40 C.F.R. 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the United States Environmental Protection Agency (USEPA) to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. TCEQ has adopted portions of the federal CCR rule at 30 T.A.C. Chapter 352 (Texas CCR Rule), and USEPA published its final approval of the Texas CCR rule on June 28, 2021. *See* 86 Fed. Reg. 33,892 (June 28, 2021). The Texas CCR Rule became effective on July 28, 2021, and it adopts and incorporates by reference the requirements for the annual groundwater monitoring report located at 40 C.F.R. § 257.90. *See* 30 T.A.C. § 352.901. It further adopts and incorporates by reference the Federal CCR Program requirements for detection and assessment monitoring in 30 T.A.C. §352.941 and 30 T.A.C. §352.951, respectively. Pursuant to 30 T.A.C. § 352.902, this report will be submitted to TCEQ for review no later than 30 days after the report has been placed in the facility's operating record. For existing CCR landfills and surface impoundments, the CCR Rule requires that the owner or operator prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. Per §257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in Appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in Appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a SSL above the groundwater protection standard for one or more constituents listed in Appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in Appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

2.0 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The AX Landfill CCR unit is currently in a Detection Monitoring Program. The initial Detection Monitoring Program groundwater samples were collected from the AX Landfill CCR monitoring well network in October 2017. Subsequent Detection Monitoring Program groundwater samples were collected on a semi-annual basis since that time. Data evaluation is completed using procedures described in the Statistical Analysis Plan (PBW, 2017) to identify statistically significant increases (SSIs) of Appendix III parameters over background concentrations. The Detection Monitoring Program sampling dates and parameters are summarized in the following table:

Detection Monitoring Program Summary

Sampling Dates	Parameters	SSIs	Assessment Monitoring Program Established
October 2017 March 2018 (re-samples)	Appendix III	Yes	No (Alternate Source Demonstration Completed)
March 2018 October 2018	Appendix III	Yes	No (Alternate Source Demonstration Completed)
June 2019 November 2019	Appendix III	Yes	No (Alternate Source Demonstration Completed)
May 2020 November 2020	Appendix III	Yes	To Be Determined (Alternate Source Demonstration Completed)
June 2021 November 2021	Appendix III	Yes	To Be Determined (Alternate Source Currently Being Assessed)

The statistical background values and Appendix III analytical data are presented in Tables 1 and 2, respectively. SSIs of Appendix III parameters were identified during each Detection Monitoring Program sampling event thus far. An initial Alternate Source Demonstration was completed in 2018, which indicated that a source other than the CCR unit caused the SSIs observed in the 2017 sample data and 2018 re-sample data. Similarly, subsequent Alternate Source Demonstrations were completed in 2019 through 2021 based on sample data collected during the previous year. As a result, the AX Landfill has remained in the Detection Monitoring Program. A summary of the Alternate Source Demonstration based on data collected in 2020 is presented in Attachment 1 as required by §257.94(e)(2).

Detection Monitoring Program groundwater samples were collected from the CCR groundwater monitoring network on a semi-annual basis in 2021, as required by the CCR Rule. The analytical data from the 2021 semi-annual Detection Monitoring Program sampling events were evaluated using procedures described in the Statistical Analysis Plan to identify SSIs of Appendix III parameters over background concentrations. SSIs of Appendix III parameters over background concentrations were identified for calcium and sulfate, which are constituents for which SSIs had previously been attributed to alternate sources. Alternate sources for the SSIs identified in the 2021 sample data are being evaluated in accordance with §257.94. If an alternate source is not identified to be the cause of the SSI, an Assessment Monitoring Program will be established in accordance with §257.94(e)(2).

3.0 KEY ACTIONS COMPLETED IN 2021

Semi-annual Detection Monitoring Program groundwater monitoring events were conducted in June and November 2021. The number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and the analytical results for the groundwater samples are summarized in Table 2. A map showing the CCR units and monitoring wells is provided as Figure 1. No wells were installed or decommissioned during 2021.

An Alternate Source Demonstration was completed in March 2021 in accordance with §257.94(e)(2), which documented that a source other than the AX Landfill caused the SSIs detected over background levels during the 2020 Detection Monitoring Program sampling events. A copy of the Alternate Source Demonstration is provided in Attachment 1.

4.0 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the CCR groundwater monitoring program in 2021.

5.0 KEY ACTIVITIES PLANNED FOR 2022

The following key activities are planned for 2022:

- Luminant submitted a registration application to TCEQ under the Texas CCR Rule for the Sandow AX Landfill on January 24, 2022.
- Continue the Detection Monitoring Program in accordance with applicable provisions of 40 C.F.R. §257.95 and 30 T.A.C. §352.941.
- If an alternate source is identified to be the cause of the SSIs observed in 2021, which are described in this report, a written demonstration will be completed within 90 days of SSI determination and included in the following Annual Groundwater Monitoring and Corrective Action Report.

6.0 REFERENCES

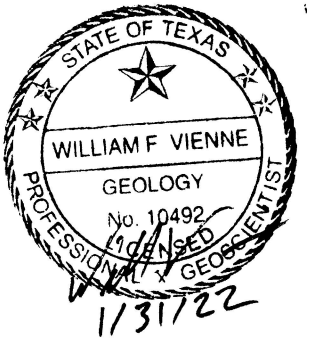
Pastor, Behling & Wheeler, LLC, 2017. Coal Combustion Residual Rule Statistical Analysis Plan, Sandow Steam Electric Station, AX Landfill, Rockdale, Texas.

Signature Page

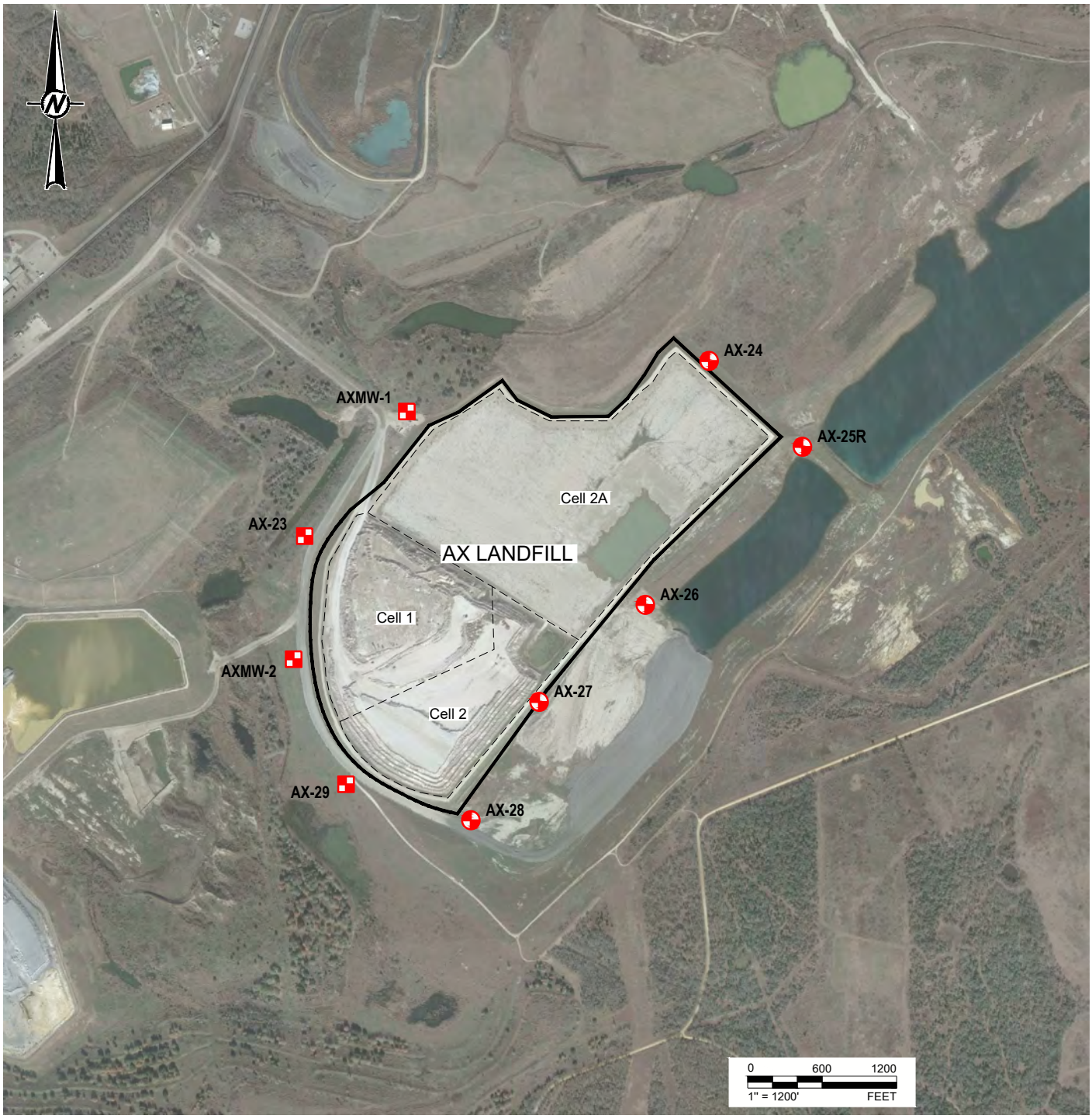
Golder Associates Inc.

Patrick J. Behling
Principal Engineer

William F. Vienne
Senior Hydrogeologist



FIGURES



LEGEND

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

NOTE(S)

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 1/7/18.

CLIENT
LUMINANT

PROJECT
SANDOW 5 GENERATING PLANT
ROCKDALE, TEXAS

TITLE
DETAILED SITE PLAN - AX LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-23
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	REV.	FIGURE
19122262	0	1

TABLES

Table 1
Statistical Background Values
Sandow Steam Electric Station AX Landfill

Sample Location	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Field pH (s.u.)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
Upgradient Wells							
AXMW-1	0.681	569	491	0.4	5.49 7.09	2,660	5,820
AXMW-2	3.62	943	391	1.88	4.6 7.63	3,040	4,940
AX-23	1.1	475	313	0.4	3.24 7.95	1,030	3,090
AX-29	0.432	791	306	0.4	2.73 7.01	1,440	3,370
Downgradient Wells							
AX-24	0.311	273	580	0.4	3.89 9.38	1,010	2,520
AX-25(R)	0.298	262	1,140	0.507	4.69 9.2	795	3,980
AX-26	0.446	915	3,040	0.4	5.07 8.14	1,200	8,300
AX-27	0.281	366	1,020	0.4	6.08 7.3	478	3,620
AX-28	0.393	633	756	0.4	4.67 8.55	2,280	3,790

Table 2
Appendix III Analytical Results
Sandow Steam Electric Station AX Landfill

Sample Location	Date Sampled	B	Ca	Cl	F	Field pH	SO_4	TDS
Upgradient Wells								
AXMW-1	10/03/17	0.46	477	348	<0.1	5.75	1990	3620
	03/21/18	0.50	425	267	0.122 J	5.89	2050	3680
	10/09/18	0.51	473	229	0.37	6.31	2260	3730
	06/27/19	0.80	371	242	0.37	5.10	1720	2810
	11/12/19	1.14	362	138	0.115 J	5.33	1540	2800
	05/19/20	2.27	296	137	<0.100	4.87	1570	2680
	11/11/20	4.08	369	202	0.112 J	5.55	1560	2680
	06/07/21	5.43	293	146	<0.100	4.50	1360	2290
	11/17/21	8.21	292	160	0.181 J	5.85	1470	2600
AXMW-2	10/03/17	2.14	644	207	<0.1	5.93	1990	3640
	03/21/18	2.64	628	218	1.18	5.80	2280	4050
	10/09/18	1.47	562	179	0.84	6.66	1960	3280
	06/27/19	1.75	578	203	1.39	5.87	1720	3280
	11/12/19	0.88	483	147	0.228 J	6.14	1160	2480
	05/19/20	0.74	396	143	<0.100	6.19	1150	2490
	11/11/20	0.67	539	180	<0.100	6.35	1240	2610
	06/07/21	0.58	449	131	<0.100	6.28	1180	2550
	11/17/21	0.622	423	118	0.224 J	6.44	1160	2620
AX-23	10/03/17	0.31	316	184	<0.1	6.43	631	1620
	03/23/18	0.31	309	193	0.77	6.09	655	1730
	10/09/18	0.38	305	210	0.45	7.00	636	1700
	06/27/19	0.31	335	224	0.49	6.19	652	1760
	11/12/19	0.34	304	183	0.186 J	6.28	590	1640
	05/19/20	0.35	277	232	<0.100	6.14	641	1750
	11/11/20	0.35	357	256	0.105 J	6.40	677	1800
	06/09/21	0.335	318	238	0.368 J	6.17	655	1720
	11/17/21	0.278	300	248	0.259 J	6.35	651	1860

Table 2
Appendix III Analytical Results
Sandow Steam Electric Station AX Landfill

Sample Location	Date Sampled	B	Ca	Cl	F	Field pH	SO_4	TDS
AX-29	10/03/17	0.32	392	276	<0.1	6.20	1110	2480
	03/23/18	0.30	356	285	0.81	5.89	1160	2450
	10/09/18	0.36	339	274	0.45	6.99	1060	2390
	06/27/19	0.31	352	275	<1.00	5.85	1110	2460
	11/13/19	0.47	449	281	<0.100	5.80	1210	2850
	05/19/20	0.37	308	261	<0.100	5.85	1050	2560
	11/11/20	0.39	429	320	<0.100	5.96	1190	2700
	06/10/21	0.37	365	245	<0.100	6.17	1090	2580
	11/16/21	0.341	339	297	0.201 J	5.90	1120	2630
Downgradient Wells								
AX-24	10/02/17	0.13	252	307	<0.1	6.12	632	1810
	03/26/18	0.13	254	309	0.279 J	5.82	762	1880
	10/08/18	0.18	260	283	0.59	6.82	759	1840
	07/02/19	0.14	325	244	0.49	5.80	887	2060
	11/13/19	0.20	319	226	<0.100	5.91	752	2040
	05/19/20	0.19	271	256	<0.100	5.87	800	2080
	11/12/20	0.17	368	300	<0.100	5.98	947	2180
	06/09/21	0.166	339	201	<0.100	5.86	1040	2240
	11/18/21	0.153	333	179	0.138 J	6.00	1070	2390
AX-25	10/03/17	0.21	325	586	<0.1	6.37	504	2400
	3/16/2018 resample	--	302	--	--	--	--	--
	03/26/18	0.20	281	583	0.75	6.38	526	2420
	10/08/18	0.23	324	586	1.01	7.09	492	2360
	07/02/19	0.20	384	616	0.87	6.26	608	2590
	11/12/19							
	05/07/20							
AX-25R	05/19/20	0.28	218	573	0.269 J	6.25	592	2470
	11/11/20	0.23	264	515	0.270 J	6.38	524	2210
	06/07/21	0.213	228	355	0.42	6.36	475	2020
	11/16/21	0.197	210	400	0.493	6.50	492	2120

Table 2
Appendix III Analytical Results
Sandow Steam Electric Station AX Landfill

Sample Location	Date Sampled	B	Ca	Cl	F	Field pH	SO_4	TDS
AX-26	10/02/17	0.35	666	1100	<0.1	6.38	945	3740
	03/26/18	0.34	912	1820	<0.1	6.41	1300	4980
	10/08/18	0.40	905	1720	<0.1	7.09	1220	4680
	07/02/19	0.36	409	465	0.45	6.14	643	2380
	11/13/19	0.39	651	1010	<0.100	5.91	853	3350
	05/19/20	0.38	617	1240	<0.100	6.20	838	3830
	11/12/20	0.40	980	2060	<0.100	6.29	1240	5110
	06/09/21	0.383	896	1790	<0.100	5.95	1120	4800
	11/18/21	0.360	939	2230	<0.100	6.13	1280	5930
AX-27	10/02/17	0.21	462	652	<0.1	6.19	569	2490
	3/16/2018 resample	--	453	--	--	--	659	--
	3/16/2018 dup	--	456	--	--	--	648	--
	03/26/18	0.21	438	584	<0.1	6.29	661	2350
	10/08/18	0.25	422	540	0.14	7.17	554	2220
	07/02/19	0.21	379	459	0.59	6.05	520	2090
	11/13/19	0.26	395	465	<0.100	6.05	480	2050
	05/19/20	0.30	329	479	<0.100	6.20	450	1930
	11/12/20	0.29	432	569	<0.100	6.47	522	2080
	06/09/21	0.307	384	464	<0.100	6.03	535	1980
	11/18/21	0.249	390	461	0.204 J	6.47	419	1980
AX-28	10/02/17	0.21	664	384	<0.1	6.25	1670	3350
	3/16/2018 resample	--	634	--	--	--	--	--
	03/23/18	0.20	621	354	<0.1	6.17	1720	3430
	10/08/18	0.31	578	230	0.47	6.87	1710	3300
	10/8/18 dup	0.32	577	233	0.51		1780	3370
	06/27/19	0.30	585	146	0.15	5.87	1870	3320
	11/13/19	0.23	616	235	<0.100	5.57	1820	3560
	05/19/20	0.23	492	153	<0.100	5.97	1870	3250
	11/11/20	0.21	577	126	<0.100	6.09	1810	3200
	06/09/21	0.188	461	80.2	<0.100	5.91	1610	2810
	11/16/21	0.256	466	61.9	0.198 J	5.99	1760	3040

Notes:
1. Abbreviations: mg/L - milligram per liter; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.

ATTACHMENT 1

ALTERNATE SOURCE DEMONSTRATION REPORT

ALTERNATE SOURCE DEMONSTRATION SUMMARY

SANDOW STEAM ELECTRIC STATION – AX LANDFILL

Introduction

This Alternate Source Demonstration Summary was prepared to document that a source other than the AX Landfill (the Site) caused the statistically significant increases (SSIs) over background levels observed during the 2020 Coal Combustion Residual (CCR) Detection Monitoring Program sampling events as required by 40 CFR 257.94(e)(2) (the "CCR Rule").

AX Landfill History and CCR Monitoring Well Network

A Site Plan showing the AX Landfill and vicinity is shown on Figure 1. The AX Landfill consists of Cells 1 and 2 and covers an area of approximately 70 acres (Figure 1). Cell 2A of the AX Landfill was constructed adjacent to Cells 1 and 2, but was never used. Construction of Cell 1 was completed in July 2013 and construction of Cell 2 was completed in October 2015. Placement of Unit No. 5 CCR began in Cell 1 in May 2015 and Cell 2 in September 2016. CCR has never been placed in Cell 2A. The Sandow Steam Electric Station, which was formerly the source of CCR to the AX Landfill, ceased power generation operations in 2018. CCR has not been placed in the AX Landfill since the plant shut down in 2018.

The AX Landfill is constructed within highly heterogeneous overburden spoil material that was previously excavated and backfilled during lignite mining operations at the Sandow Lignite Mine. The uppermost aquifer at the Site occurs under unconfined conditions within the overburden spoil and extends to the base of the spoil, where lignite and/or clay confining units are encountered. An average linear flow velocity of 0.15 feet/day was calculated for the AX Landfill based on aquifer characteristics presented in the Groundwater Monitoring System Certification for the Site (PBW, 2017a).

The CCR groundwater monitoring well system at AX Landfill consists of six monitoring wells (MW-02, MW-05, MW-07, MW-08R, MW-09, and AL-10) that are each screened in the uppermost aquifer at the Site. Groundwater elevations have consistently been highest west of the AX Landfill and lowest east of the AX Landfill, with a groundwater flow direction generally from west to east. Based on the observed groundwater potentiometric surface at the Site, the location of each CCR monitoring well relative to the AX Landfill 1 is as follows:

Upgradient/Background Wells	Downgradient Wells
AXMW-1 AXMW-2 AX-23 AX-29	AX-24 AX-25/25R AX-26 AX-27 AX-28

Previous Detection Monitoring Results

Detection Monitoring Program groundwater data collected from the AX Landfill CCR monitoring well network from 2017 through 2020 are summarized in Table 1. The initial Detection Monitoring Program groundwater samples were collected from the AX Landfill in October 2017. SSIs were observed during the initial sampling event for calcium in wells AX-25, AX-27, and AX-28 and sulfate in well AX-27. SSIs were subsequently observed during the 2018 semi-annual groundwater sampling events for calcium in wells AX-25 and AX-27, sulfate in wells AX-26

and AX-27, and fluoride in wells AX-23, AX-24, AX-25, AX-28, and AX-29. Alternate Source Demonstration Reports (PBW 2018; Golder 2019; Golder 2020) attributed the SSIs to natural variation in groundwater quality due to the heterogeneity of the spoil groundwater system based on: (1) Concentrations of the constituents with SSIs were higher in groundwater samples from other Site wells, including from wells hydraulically upgradient of the AX Landfill, and (2) Groundwater flow velocity calculations indicate that groundwater could not have traveled from the active landfill cells to the wells where SSIs were observed during the time since CCR was first placed in the cells. Based on the results of the Alternate Source Demonstrations, the AX Landfill has remained in the Detection Monitoring Program.

2020 Semi-Annual Detection Monitoring Results

Detection Monitoring Program groundwater samples were collected on a semi-annual basis from the AX Landfill CCR monitoring well network in 2020 in accordance with 40 CFR 257.94. SSIs were observed during the 2020 semi-annual groundwater sampling events in downgradient wells AX-24 (calcium), AX-25R (calcium), AX-26 (calcium and sulfate), and AX-27 (boron, calcium, and sulfate).

Data variability across the CCR monitoring network is very high. Boron, calcium, and sulfate concentrations in downgradient wells where SSIs were indicated have generally been lower than other wells where SSIs were not indicated and/or in background wells. For example, calcium concentrations in downgradient wells AX-24, AX-25R and AX-27 (where SSIs are indicated for calcium) are similar to or lower than calcium concentrations in downgradient well AX-28 where SSIs were not indicated and in upgradient well AXMW-2. The calcium SSI observed in well AX-26 in November 2020 (980 mg/L) is higher than calcium concentrations in other downgradient and upgradient wells; however, this calcium concentration is similar to historical calcium concentrations observed in samples from AX-26 that did not indicate SSIs and, as discussed in the paragraph below, AX-26 is located sufficiently far from the landfill cells containing CCR that groundwater from these areas would not have reached AX-26 by 2020. Concentrations of sulfate in the downgradient wells where SSIs were indicated (AX-26 and AX-27) have consistently been lower than concentrations in downgradient wells where SSIs were not indicated and in upgradient wells. Boron concentrations in downgradient well AX-27 are lower than all boron concentrations in 2020 groundwater samples from all upgradient wells. Based on the high site-wide variability in boron, calcium, and sulfate sample concentrations, the SSIs observed during the 2020 semi-annual monitoring events are attributed to natural variability in groundwater quality related to heterogeneity of the mine spoil rather than a release from the AX Landfill.

This conclusion is further supported by the location of the wells where SSIs were identified relative to Cells 1 and 2. Based on the timing of CCR placement in the AX Landfill and the calculated average linear groundwater velocity (0.15 feet/day) by PBW (2017a), wells AX-24, AX-25R, and AX-26 are all located sufficiently far from Cells 1 and 2 that affected water in contact with the cells would not have reached these wells by the time that the 2020 Detection Monitoring Program groundwater samples were collected. CCR was first placed in Cell 1 in May 2015 and in Cell 2 in September 2016. Using the conservative assumptions that the wells are located directly downgradient of the active cells (Cells 1 and 2) and that chemical adsorption is negligible, the theoretical amount of time for groundwater in contact with the active cells to reach AX-26 (approximately 800 feet from the former active cells) and AX-24 and AX-25 (both approximately 2,500 feet from the former active cells) is 15 and 40-50 years, respectively.

The other downgradient well where an SSI was identified was AX-27 (boron, calcium, and sulfate). AX-27 is located approximately 70 feet from Cell 2. The estimated amount of time it would take groundwater in contact with Cell 2 to reach AX-27 is approximately 1.3 years. Theoretically, groundwater in contact with Cell 2 could have reached AX-27 before the 2020 semi-annual groundwater samples were collected; however, the boron, calcium, and sulfate concentrations observed in the 2020 samples from well AX-27 are similar to those observed

in historical samples collected from the well before groundwater from Cell 2 would have theoretically reached AX-27. Additionally, the boron, calcium, and sulfate concentrations observed in the 2020 samples from well AX-27 are lower than concentrations observed in upgradient wells.

Conclusion

SSIs were identified for boron, calcium, and sulfate in one or more downgradient wells during the 2020 Detection Monitoring Program semi-annual groundwater sampling events at the AX Landfill. However, all observed SSIs are attributed to natural variability in groundwater quality due to the heterogeneity of the mine spoil groundwater system and are not considered evidence of a release from the CCR unit. In accordance with Section 257.94(e)(2), Luminant should continue the Detection Monitoring Program at the unit. Initiation of an Assessment Monitoring Program is not required at this time.

References

Pastor, Behling & Wheeler, LLC (PBW), 2017a. Coal Combustion Residual Rule, Groundwater Monitoring System Certification, Sandow 5 Generating Plant, AX Landfill, Rockdale, Texas. October 16, 2017.

Pastor, Behling & Wheeler, LLC (PBW), 2018. Coal Combustion Residual Rule, Alternate Source Demonstration Report, Sandow 5 Generating Plant, AX Landfill, Rockdale, Texas.

Golder Associates (Golder), 2019. Coal Combustion Residual Rule, Alternate Source Demonstration Report, Sandow 5 Generating Plant, AX Landfill, Rockdale, Texas.

Golder Associates (Golder), 2020. Coal Combustion Residual Rule, Alternate Source Demonstration Report, Sandow 5 Generating Plant, AX Landfill, Rockdale, Texas.

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of Section 257.94(e)(2) of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
GOLDER ASSOCIATES INC.

Table 1
CCR Groundwater Detection Monitoring Data Summary
Sandow Steam Electric Station - AX Landfill

Sample Location	Date Sampled	B		Ca		Cl		F		Field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
Upgradient Wells															
AXMW-1	10/03/17	0.68	0.46	569	477	491	348	0.40	<0.1	5.49 7.09	5.75	2660	1990	5820	3620
	03/21/18		0.50		425		267		0.122 J		5.89		2050		3680
	10/09/18		0.51		473		229		0.37		6.31		2260		3730
	06/27/19		0.80		371		242		0.37		5.10		1720		2810
	11/12/19		1.14		362		138		0.115 J		5.33		1540		2800
	05/19/20		2.27		296		137		<0.100		4.87		1570		2680
	11/11/20		4.08		369		202		0.112 J		5.55		1560		2680
AXMW-2	10/03/17	3.62	2.14	943	644	391	207	1.88	<0.1	4.6 7.63	5.93	3040	1990	4940	3640
	03/21/18		2.64		628		218		1.18		5.80		2280		4050
	10/09/18		1.47		562		179		0.84		6.66		1960		3280
	06/27/19		1.75		578		203		1.39		5.87		1720		3280
	11/12/19		0.88		483		147		0.228 J		6.14		1160		2480
	05/19/20		0.74		396		143		<0.100		6.19		1150		2490
	11/11/20		0.67		539		180		<0.100		6.35		1240		2610
AX-23	10/03/17	1.10	0.31	475	316	313	184	0.40	<0.1	3.24 7.95	6.43	1030	631	3090	1620
	03/23/18		0.31		309		193		0.77		6.09		655		1730
	10/09/18		0.38		305		210		0.45		7.00		636		1700
	06/27/19		0.31		335		224		0.49		6.19		652		1760
	11/12/19		0.34		304		183		0.186 J		6.28		590		1640
	05/19/20		0.35		277		232		<0.100		6.14		641		1750
	11/11/20		0.35		357		256		0.105 J		6.40		677		1800

Table 1
CCR Groundwater Detection Monitoring Data Summary
Sandow Steam Electric Station - AX Landfill

Sample Location	Date Sampled	B		Ca		Cl		F		Field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
AX-29	10/03/17	0.43	0.32	791	392	306	276	0.40	<0.1	2.73 7.01	6.20	1440	1110	3370	2480
	03/23/18		0.30		356		285		0.81		5.89		1160		2450
	10/09/18		0.36		339		274		0.45		6.99		1060		2390
	06/27/19		0.31		352		275		<1.00		5.85		1110		2460
	11/13/19		0.47		449		281		<0.100		5.80		1210		2850
	05/19/20		0.37		308		261		<0.100		5.85		1050		2560
	11/11/20		0.39		429		320		<0.100		5.96		1190		2700
Downgradient Wells															
AX-24	10/02/17	0.31	0.13	273	252	580	307	0.40	<0.1	3.89 9.38	6.12	1010	632	2520	1810
	03/26/18		0.13		254		309		0.279 J		5.82		762		1880
	10/08/18		0.18		260		283		0.59		6.82		759		1840
	07/02/19		0.14		325		244		0.49		5.80		887		2060
	11/13/19		0.20		319		226		<0.100		5.91		752		2040
	05/19/20		0.19		271		256		<0.100		5.87		800		2080
	11/12/20		0.17		368		300		<0.100		5.98		947		2180
AX-25	10/03/17	0.30	0.21	262	325	1140	586	0.51	<0.1	4.69 9.20	6.37	795	504	3980	2400
	03/16/18		--		302		--		--		--		--		--
	03/26/18		0.20		281		583		0.75		6.38		526		2420
	10/08/18		0.23		324		586		1.01		7.09		492		2360
	07/02/19		0.20		384		616		0.87		6.26		608		2590
	11/12/19	Well Damaged													
	05/07/20	Well Plugged and Abandoned													

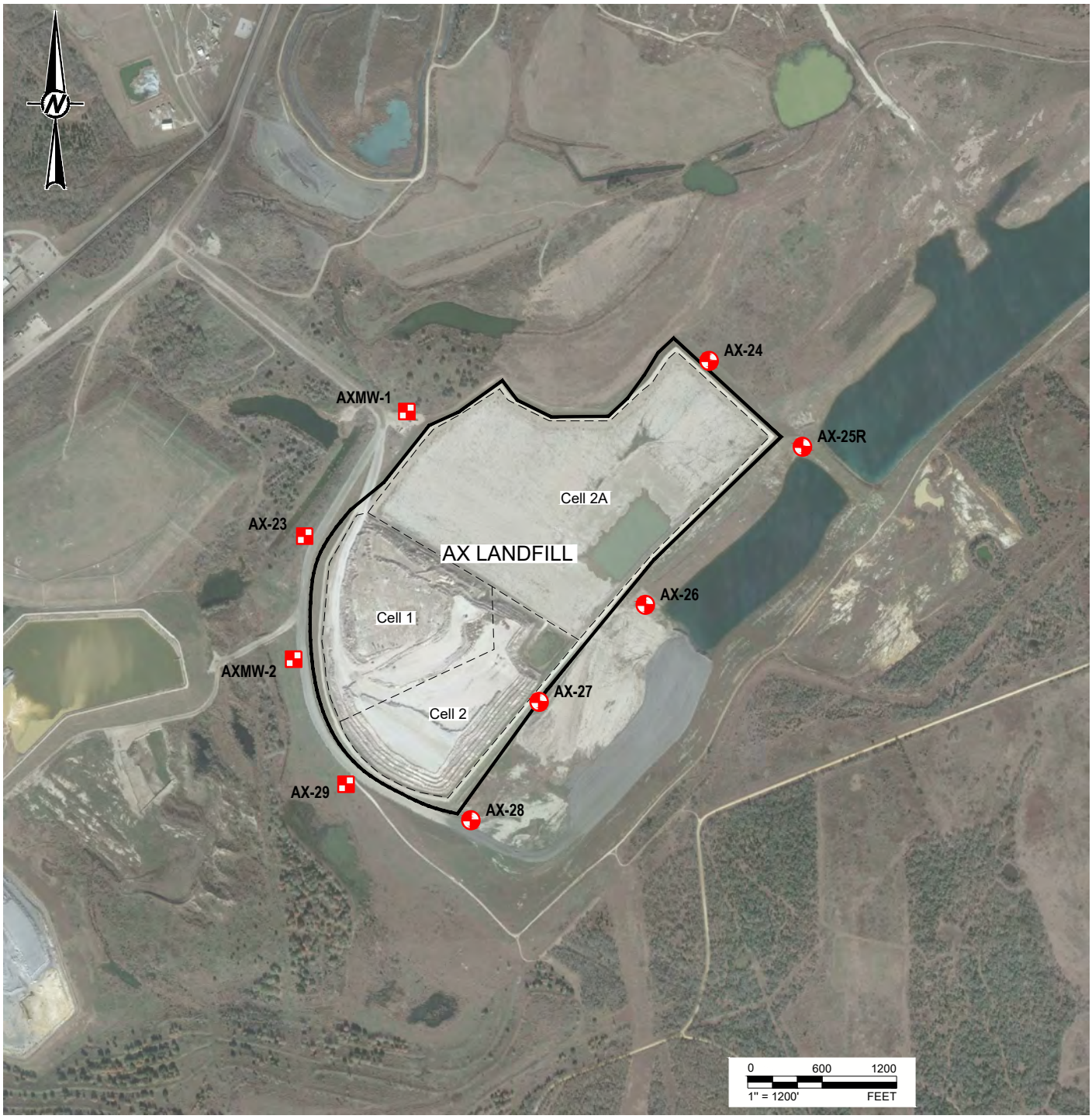
Table 1
CCR Groundwater Detection Monitoring Data Summary
Sandow Steam Electric Station - AX Landfill

Sample Location	Date Sampled	B		Ca		Cl		F		Field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
AX-25R	05/19/20	0.30	0.28	262	218	1140	573	0.51	0.269 J	4.69 9.20	6.25	795.00	592	3980	2470
	11/11/20		0.23		264		515		0.270 J		6.38		524		2210
AX-26	10/02/17	0.45	0.35	915	666	3040	1100	0.40	<0.1	5.07 8.14	6.38	1200	945	8300	3740
	03/26/18		0.34		912		1820		<0.1		6.41		1300		4980
	10/08/18		0.40		905		1720		<0.1		7.09		1220		4680
	07/02/19		0.36		409		465		0.45		6.14		643		2380
	11/13/19		0.39		651		1010		<0.100		5.91		853		3350
	05/19/20		0.38		617		1240		<0.100		6.20		838		3830
	11/12/20		0.40		980		2060		<0.100		6.29		1240		5110
AX-27	10/02/17	0.28	0.21	366	462	1020	652	0.40	<0.1	6.08 7.3	6.19	478	569	3620	2490
	03/16/18		--		453		--		--		--		659		--
	/16/2018 du		--		456		--		--		--		648		--
	03/26/18		0.21		438		584		<0.1		6.29		661		2350
	10/08/18		0.25		422		540		0.14		7.17		554		2220
	07/02/19		0.21		379		459		0.59		6.05		520		2090
	11/13/19		0.26		395		465		<0.100		6.05		480		2050
	05/19/20		0.30		329		479		<0.100		6.20		450		1930
	11/12/20		0.29		432		569		<0.100		6.47		522		2080

Table 1
CCR Groundwater Detection Monitoring Data Summary
Sandow Steam Electric Station - AX Landfill

Sample Location	Date Sampled	B		Ca		Cl		F		Field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
AX-28	10/02/17	0.39	0.21	633	664	756	384	0.40	<0.1	4.67 8.55	6.25	2280	1670	3790	3350
	03/16/18		--		634		--		--		--		--		--
	03/23/18		0.20		621		354		<0.1		6.17		1720		3430
	10/08/18		0.31		578		230		0.47		6.87		1710		3300
	10/8/18 dup		0.32		577		233		0.51				1780		3370
	06/27/19		0.30		585		146		0.15		5.87		1870		3320
	11/13/19		0.23		616		235		<0.100		5.57		1820		3560
	05/19/20		0.23		492		153		<0.100		5.97		1870		3250
	11/11/20		0.21		577		126		<0.100		6.09		1810		3200

Notes:
Notes:
1. Abbreviations: mg/L - milligram per liter; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.



LEGEND

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

NOTE(S)

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 1/7/18.

CLIENT
LUMINANT

PROJECT
SANDOW 5 GENERATING PLANT
ROCKDALE, TEXAS

TITLE
DETAILED SITE PLAN - AX LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-23
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	REV.	FIGURE
19122262	0	1

golder.com