Prepared for
Illinois Power Generating Company

Date
January 31, 2021

Project No.
1940074923

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

NEWTON LANDFILL 2, NEWTON POWER STATION

RAMBOLL Bright ideas. Sustainable change.

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON LANDFILL 2, NEWTON POWER STATION

Project name	**Newton Power Station**
Project no.	**1940074923**
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Prepared by	**Kristen L. Theesfeld**
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Approved by	**Lauren D. Cook**
Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

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ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
LF2	Landfill 2
SAP	Sampling and Analysis Plan
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.90(e) for the Newton Landfill 2 (LF2) located at Newton Power Station near Newton, Illinois.

Groundwater is being monitored at Newton LF2 in accordance with the Detection Monitoring Program requirements specified in 40 C.F.R. § 257.94.

No changes were made to the monitoring system in 2020 (no wells were installed or decommissioned).

The following Statistically Significant Increases (SSIs) of 40 C.F.R. Part 257 Appendix III parameter concentrations greater than background concentrations were determined:

- Boron at wells G208, G220, G222, G223, and R217D
- Calcium at well R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at wells G208 and G220
- Total Dissolved Solids at wells G06D, G222, G223, and R217D

Alternate Source Demonstrations (ASDs) were completed for the SSIs referenced above and Newton LF2 remains in the Detection Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll on behalf of Illinois Power Generating Company, to provide the information required by 40 C.F.R. § 257.90(e) for Newton LF2 located at Newton Power Station near Newton, Illinois.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the annual report must 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 SSI relative to background levels).
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 SSI over background for one or more constituents listed in Appendix III of §257 pursuant to §257.94(e):
      A. Identify those constituents listed in Appendix III of §257 and the names of the monitoring wells associated with the SSI(s).
      B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

iv. If it was determined that there was a Statistically Significant Level (SSL) above the Groundwater Protection Standard (GWPS) for one or more constituents listed in Appendix IV of §257 pursuant to §257.95(g) include all of the following:

   A. Identify those constituents listed in Appendix IV of §257 and the names of the monitoring wells associated with the SSL(s).

   B. Provide the date when the Corrective Measures Assessment (CMA) was initiated for the CCR unit.

   C. Provide the date when the public meeting was held for CMA for the CCR unit.

   D. Provide the date when the CMA 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.

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

This report provides the required information for Newton LF2 for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the monitoring program status in calendar year 2020, and Newton LF2 remains in the Detection Monitoring Program in accordance with 40 C.F.R. § 257.94.

3. KEY ACTIONS COMPLETED IN 2020

The Detection Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in Figure 1. No changes were made to the monitoring system in 2020. In general, one groundwater sample was collected from each background and downgradient well during each monitoring event.[1] All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (NRT/OBG, 2017a). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2020, and analytical results for the October 2019 sampling event, are presented in Table 1. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017b) to determine any SSIs of Appendix III parameters relative to background concentrations.

Statistical background values are provided in Table 2.

Potential alternate sources were evaluated as outlined in the 40 C.F.R. § 257.94(e)(2). ASDs were completed and certified by a qualified professional engineer. The dates the ASDs were completed are provided in Table A. The ASDs are included in Appendix A.

[1] Sampling was limited to G06D, G048MG, G203, G208, G222, G223, G224, and R217D during the May-June 2020 sampling event, and G201, G202, G208, G222, and G223, during the October 2020 sampling event to confirm Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event to confirm SSIs, as allowed by the Statistical Analysis Plan.

Table A – 2019–2020 Detection Monitoring Program Summary

Sampling Date	Analytical Data Receipt Date	Parameters Collected	SSI(s)	SSI(s) Determination Date	ASD Completion Date
August 21 - 22, 2019	October 28, 2019	Appendix III	Boron at wells G208, G220, G222, and G223; Calcium at well R217D; Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D; Fluoride at wells G208 and G220; Total Dissolved Solids at wells G222 and R217D	January 27, 2020	April 27, 2020
February 4 - 19, 2020	April 15, 2020	Appendix III	Boron at wells G208, G220, G222, G223, and R217D; Calcium at well R217D; Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D; Fluoride at well G220; Total Dissolved Solids at wells G06D, G222, G223, and R217D	July 14, 2020	October 12, 2020
May 20-21 , 2020; June 11, 2020 [1]	June 19, 2020	Appendix III Greater than Background [2]			
July 28-29, 2020	October 15, 2020	Appendix III	TBD	TBD	TBD
October 28, 2020 [3]	November 3, 2020	Appendix III Greater than Background [2]			

Notes:

NA: Not Applicable
TBD: To Be Determined
1. Sampling was limited to G06D, G048MG, G203, G208, G222, G223, G224, and R217D during the May-June 2020 sampling event to confirm Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event to confirm SSIs, as allowed by the Statistical Analysis Plan.
2. Groundwater sample analysis was limited to Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event to confirm SSIs, as allowed by the Statistical Analysis Plan.
3. Sampling was limited to G201, G202, G208, G222, and G223 during the October 2020 sampling event to confirm Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event to confirm SSIs, as allowed by the Statistical Analysis Plan.

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2020. Groundwater samples were collected and analyzed in accordance with the Sampling and Analysis Plan (NRT/OBG, 2017a), and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2021.
- Complete evaluation of analytical data from the downgradient wells, using background data to determine whether an SSI of Appendix III parameters detected at concentrations greater than background concentrations has occurred.
- If an SSI is identified, potential alternate sources (i.e., a source other than the CCR unit caused the SSI or that that SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is demonstrated to be the cause of the SSI, a written demonstration will be completed within 90 days of SSI determination and included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.
- If an alternate source(s) is not identified to be the cause of the SSI, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 as may apply in 2021 (e.g., Assessment Monitoring) will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

Natural Resource Technology, an OBG Company (NRT/OBG), 2017b. Sampling and Analysis Plan, Newton Landfill 2, Newton Power Station, Newton, Illinois, Project No. 2285, Revision 0, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017a, Statistical Analysis Plan, Coffeen Power Station, Newton Power Station, Illinois Power Generating Company, October 17, 2017.

TABLES

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER STATION
502 - LANDFILL 2
NEWTON, IL

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft) 6020A	Groundwater Elevation (ft NAVD88) 6020A	Boron, total (mg/L) 6020A	Calcium, total (mg/L) 6020A	Chloride, total (mg/L) 9251	Fluoride, total (mg/L) 9214	pH (field) (STD) SM4500 H+B	Sulfate, total (mg/L) 9036	Total Dissolved Solids (mg/L) SM 2540C
G06D Downgradient	38.927226	-88.296504	8/21/2019	28.5	503.19							
			8/22/2019			0.18	110	57	0.74	7.4	1.9	820
			2/3/2020	28.22	503.47							
			2/4/2020			0.17	110	56	0.704	7.1	1.6	900
			6/11/2020	28.23	503.46					6.9		890
			7/27/2020	28.75	502.94							
			7/28/2020			0.18	110	58	0.924	7.3	2	810
G48MG Background	38.939256	-88.896017	8/21/2019	17.9	527.63							
			8/22/2019			0.14	38	26	0.657	7	110	600
			2/3/2020	18.76	526.77							
			2/19/2020			0.056	70	20	0.386	7.3	46	560
			6/11/2020							7.4		480
			7/27/2020	18.99	526.54							
			7/28/2020			0.077	57	23	0.426	7.4	27	480
G201 Background	38.937174	-88.294405	8/21/2019	15.06	529.79							
			8/22/2019			0.12	180	4.2	0.76	7.3	600	1000
			2/3/2020	19.5	525.35							
			2/4/2020			0.18	130	34	1.03	7.1	500	1400
			10/22/2020	18.65	526.2							
			10/28/2020			0.12	260	4.4	0.77	7.4	560	1100
G202 Downgradient	38.930876	-88.290559	8/21/2019	48	491.64							
			8/22/2019			0.12	120	61	0.51	7.2	53	680
			2/3/2020	46.47	493.17							
			2/4/2020			0.1	94	60	0.553	7.3	94	860
			10/22/2020	47.97	491.67							
			10/28/2020			0.11	140	59	0.449	7.5	100	840
G203 Downgradient	38.928597	-88.292217	8/21/2019	38.97	494.05							
			8/22/2019			0.09	130	52	0.443	7.0	150	780
			2/3/2020	40.28	492.74							
			2/4/2020			0.076	130	57	0.373	7.3	140	930
			5/21/2020	42.01	491.49					7.3		650
			7/27/2020	41.03	491.99							
			7/28/2020			0.083	140	57	0.33	7.5	160	820

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER STATION
502 - LANDFILL 2
NEWTON, IL

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft) 6020A	Groundwater Elevation (ft NAVD88) 6020A	Boron, total (mg/L) 6020A	Calcium, total (mg/L) 6020A	Chloride, total (mg/L) 9251	Fluoride, total (mg/L) 9214	pH (field) (STD) SM4500 H+B	Sulfate, total (mg/L) 9036	Total Dissolved Solids (mg/L) SM 2540C
G208 Downgradient	38.929632	-88.298182	8/21/2019	26.88	508.06							
			8/22/2019			0.21	110	45	1.07	7.5	2.7	800
			2/3/2020	25.57	509.37							
			2/5/2020			0.19	110	54	0.707	7.1	1.6	820
			5/20/2020	24.84	510.57					7.2		760
			7/27/2020	26.25	508.69							
			7/29/2020			0.2	100	52	1.14	7.2	<1	750
			10/22/2020	24.98	509.96							
			10/28/2020						0.939	7.2		
G220 Downgradient	38.928412	-88.29951	8/21/2019	17.64	516.89	0.31	110	37	1.24	7.0	33	800
			2/3/2020	18.11	516.42							
			2/4/2020			0.25	100	40	1.21	7.3	17	950
			5/20/2020	17.36	517.65					7.2		710
			7/27/2020	18.75	515.78							
			7/28/2020			0.26	120	42	1.43	7.1	13	770
G222 Downgradient	38.927194	-88.299669	8/21/2019	15.93	518.3	0.23	140	69	0.982	7.1	130	1100
			2/3/2020	16	518.23							
			2/4/2020			0.21	130	74	0.893	7.4	120	1200
			5/20/2020	14.43	520.24					7.3		1000
			7/27/2020	15.03	519.2							
			7/28/2020			0.22	140	74	1.1	7.1	130	1200
			10/22/2020	16.05	518.18							
			10/28/2020						0.742	7.4		
G223 Downgradient	38.93016	-88.293451	8/21/2019	33.27	500.29							
			8/22/2019			0.27	140	130	0.716	7.2	55	980
			2/3/2020	32.81	500.75							
			2/4/2020			0.23	160	150	0.603	7.0	210	1500
			5/20/2020	33.01	500.97					6.9		1700
			7/27/2020	33.06	500.5							
			7/28/2020			0.25	230	240	0.843	6.8	510	1900
			10/22/2020	33.01	500.55							
			10/28/2020						0.838	6.9		

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER STATION
502 - LANDFILL 2
NEWTON, IL

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft) 6020A	Groundwater Elevation (ft NAVD88) 6020A	Boron, total (mg/L) 6020A	Calcium, total (mg/L) 6020A	Chloride, total (mg/L) 9251	Fluoride, total (mg/L) 9214	pH (field) (STD) SM4500 H+B	Sulfate, total (mg/L) 9036	Total Dissolved Solids (mg/L) SM 2540C
G224 Downgradient	38.931767	-88.292396	8/21/2019	42.3	491.97							
			8/22/2019			0.095	120	50	0.465	7.3	130	740
			2/3/2020	41.39	492.88							
			2/4/2020			0.09	140	53	0.396	7.5	140	880
			5/21/2020	41.92	492.78					7.4		710
			7/27/2020	42.16	492.11							
			7/28/2020			0.093	120	54	0.455	7.2	140	740
R217D Downgradient	38.932191	-88.290118	8/21/2019	20.15	518.03	0.17	210	45	0.644	7.0	710	1600
			2/3/2020	19.33								
			2/5/2020			0.2	750	90	<0.25	6.6	2200	3900
			5/20/2020	19.21	519.36		570			6.6	740	3400
			7/27/2020	19.36	518.82							
			7/28/2020			0.17	620	110	0.263	6.7	2200	3800

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
4-digit numbers below parameter represent SW-846 analytical methods and alpha-numeric values that begin with SM represent Standard Methods for the Examination of Water and Wastewater.

TABLE 2.
STATISTICAL BACKGROUND VALUES
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER STATION
502 - LANDFILL 2
NEWTON, ILLINOIS
DETECTION MONITORING PROGRAM

Parameter	Statistical Background Value (UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.18
Calcium (mg/L)	160
Chloride (mg/L)	34
Fluoride (mg/L)	1.037
pH (S.U.)	6.6 / 8.1
Sulfate (mg/L)	760
Total Dissolved Solids (mg/L)	1005

[O: RAB 12/23/19, C: KLT 12/26/19]

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
S.U. = Standard Units
UPL = Upper Prediction Limit

FIGURES

BACKGROUND MONITORING WELL LOCATION
DOWNGRADIENT MONITORING WELL LOCATION
CCR MONITORED UNIT

0 300 600 Feet

MONITORING WELL LOCATION MAP
NEWTON LANDFILL 2
UNIT ID:502

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

Intended for
Illinois Power Generating Company

Date
April 27, 2020

Project No.
74923

40 C.F.R. § 257.94(e)(2): ALTERNATE SOURCE DEMONSTRATION

NEWTON PHASE II LANDFILL (LF2)

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CERTIFICATIONS

I, Nicole M. Pagano, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Professional Geologist
196-000750
Illinois
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 27, 2020

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 27, 2020

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FIGURES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
cm/s	centimeters per second
GMF	Gypsum Management Facility
HDPE	high-density polyethylene
IEPA	Illinois Environmental Protection Agency
LOE	Line of Evidence
mg/L	milligrams per liter
msl	mean sea level
NRT/OBG	Natural Resource Technology, an OBG Company
Site	Newton Power Station
SSI	Statistically Significant Increase
UPL	Upper Prediction Limit

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.94(e)(2) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of a Statistically Significant Increase (SSI) over background for groundwater constituents listed in Appendix III of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSI(s), or that the SSI(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Illinois Power Generating Company, by O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Newton Phase II Landfill (LF2), located near Newton, IL.

The most recent Detection Monitoring sampling event (D5) was completed on August 21 and August 22, 2019, and analytical data were received on October 28, 2019. Analytical data from D5 were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations. That evaluation identified SSIs at downgradient monitoring wells as follows:

- Boron at wells G208, G220, G222, and G223
- Calcium at well R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at wells G208 and G220
- Total Dissolved Solids (TDS) at wells G222 and R217D

Pursuant to 40 C.F.R. § 257.94(e)(2), the following lines of evidence demonstrate that sources other than the Newton LF2 were the cause of the boron, calcium, chloride, fluoride, and TDS SSIs listed above. This ASD was completed by April 27, 2020, within 90 days of determination of the SSIs (January 27, 2020), as required by 40 C.F.R. § 257.94(e)(2).

2. BACKGROUND

2.1 Site location and Description

The Newton Power Station (Site) is located in Jasper County in the southeastern part of central Illinois, approximately 7 miles southwest of the town of Newton. The plant is located on the north side of Newton Lake. The area is bounded by Newton Lake and agricultural land to the west, south, and east, and agricultural land to the north. Beyond the lake is additional agricultural land.

2.2 Description of Phase II Landfill CCR Unit

The Phase II Landfill (LF2) includes three lined disposal cells (Figure 1). LF2 Cells 1 and 2, encompass approximately 12 acres, are adjacent to each other and located south and east of the Phase I Landfill (LF1). LF2 Cell 3 encompasses approximately 7 acres and is located approximately 1,100 feet west of Cells 1 and 2. All three cells of LF2 are constructed with composite liners and leachate collection systems that exceed the landfill liner performance standards of 40 CFR § 257.70. Cell 3 is inactive and has not received CCR since constructed in 2011.

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during monitoring well installation.

Quaternary deposits in the Newton area consist mainly of diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits occurring at Newton Power Station include the following units beginning at the ground surface:

- Ash/Fill Units – CCR and fill within the various CCR Units.
- Upper Confining Unit – Low permeability clays and silts, including the Peoria Silt (Loess Unit) in upland areas and the Cahokia Formation in the flood plain and channel areas to the south and east, underlain by the Sangamon Soil, and the predominantly clay diamictons of the Hagarstown (Till) and Vandalia (Till) Members of the Glasford Formation .
- Uppermost Aquifer – Thin to moderately thick (3 to 17 ft), moderate to high permeability sand, silty sand, and sandy silt/clay units of the Mulberry Grove Member of the Glasford Formation.
- Lower Confining Unit – Thick, very low permeability silty clay diamictons of the Smithboro (Till) Member of the Glasford Formation and the silty clay diamictons of the Banner Formation.

The bedrock beneath the unconsolidated deposits consists of Pennsylvanian-age Mattoon Formation (Willman et al., 1967) that is mostly shale near the bedrock surface but is characterized at depth by a complex sequence of shales, thin limestones, coals, underclays, and several sandstones (Willman et al., 1975). The erosional surface of the Pennsylvanian-age Mattoon Formation bedrock ranges widely in depth in the vicinity of the Site but is typically encountered at 90 to 120 ft below ground surface (bgs).

Groundwater elevations across LF2 ranged from approximately 495 to 518 ft msl during D5 (Figure 1). The groundwater elevation contours shown on Figure 1 were measured on August 21, 2019. Overall groundwater flow beneath LF2, within the Uppermost Aquifer, is

southward toward Newton Lake, but with flow converging to the south-southeast along the major axis of LF2 Cells 1 and 2, and a predominantly eastward flow near LF2 Cell 3. Based on groundwater flow directions near LF2, groundwater beneath LF2 Cells 1 and 2 does not influence groundwater beneath LF2 Cell 3.

2.4 Groundwater and Landfill Monitoring

The Uppermost Aquifer monitoring system for LF2 Cells 1, 2, and 3 is shown on Figure 1 and described below.

Monitoring wells G201 and G48MG are used to monitor background groundwater quality for LF2 (all cells). Groundwater quality at LF2 Cells 1 and 2 is monitored using wells G202, G203, G223, G224, and R217D (which replaced well G217D in October 2017). Groundwater quality at LF2 Cell 3 is monitored using wells G06D, G208, G220, and G222. Leachate from LF2 is monitored using leachate sample location L301 (Figure 1).

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.94(e)(2), this ASD demonstrates that sources other than LF2 caused the SSI(s), or that the SSI(s) was a result of natural variation in groundwater quality. This ASD is based on the following lines of evidence (LOE):

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. The ionic composition of groundwater downgradient of LF2 Cells 1 and 2 is similar to the ionic composition of groundwater downgradient of LF2 Cell 3 (where no CCR material has been placed).
5. Groundwater quality in monitoring wells downgradient of LF2 Cells 1 and 2 is statistically similar to groundwater quality in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).

These lines of evidence are described and supported in greater detail below.

3.1 LOE #1: LF2 Composite Liner Design

LF2 Cells 1 and 2 were constructed and began receiving CCR in 1997. Currently, a portion of LF2 Cell 2 is in operation. No CCR has been placed in LF2 Cell 3 .

The constructed liner and leachate collection system for LF2 Cells 1, 2, and 3 include the following design components from top to bottom:

- Soil cover for liner frost protection
- 10-ounce-per-square-yard geotextile separation layer between the leachate management system and the frost protection soil cover
- 1-foot thick sand drainage layer
- 60 mil high-density polyethylene geomembrane
- Three-foot-thick compacted, low-permeability soil having a maximum hydraulic conductivity of 1.0×10^{-7} centimeters per second (cm/sec)

These components exceed the landfill liner performance standards of 40 C.F.R. § 257. The landfill design criteria were intended to provide protection to the Uppermost Aquifer. Therefore, the presence of the composite liner suggests that LF2 is not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

3.2 LOE #2: No CCR material has been placed in LF2 Cell 3

LF2 Cell 3 has never contained CCR; therefore, it cannot be the source of the CCR constituents boron, chloride, fluoride, or TDS detected in Cell 3 groundwater monitoring wells (G06D, G208, G220, and G222).

3.3 LOE #3: The ionic composition of groundwater is different than the ionic composition of leachate

Piper diagrams graphically represent ionic composition of aqueous solutions. A Piper diagram displays the position of water samples with respect to their major cation and anion content on the two lower triangular portions of the diagram, providing the information which, when combined on the central, diamond-shaped portion of the diagram, identify composition categories or groupings (hydrochemical facies). Figure A, below, is a Piper diagram that displays the ionic composition of samples collected from the background and downgradient monitoring wells associated with LF2, and leachate sampling location L301 associated with LF2, in Quarter 3 2019.

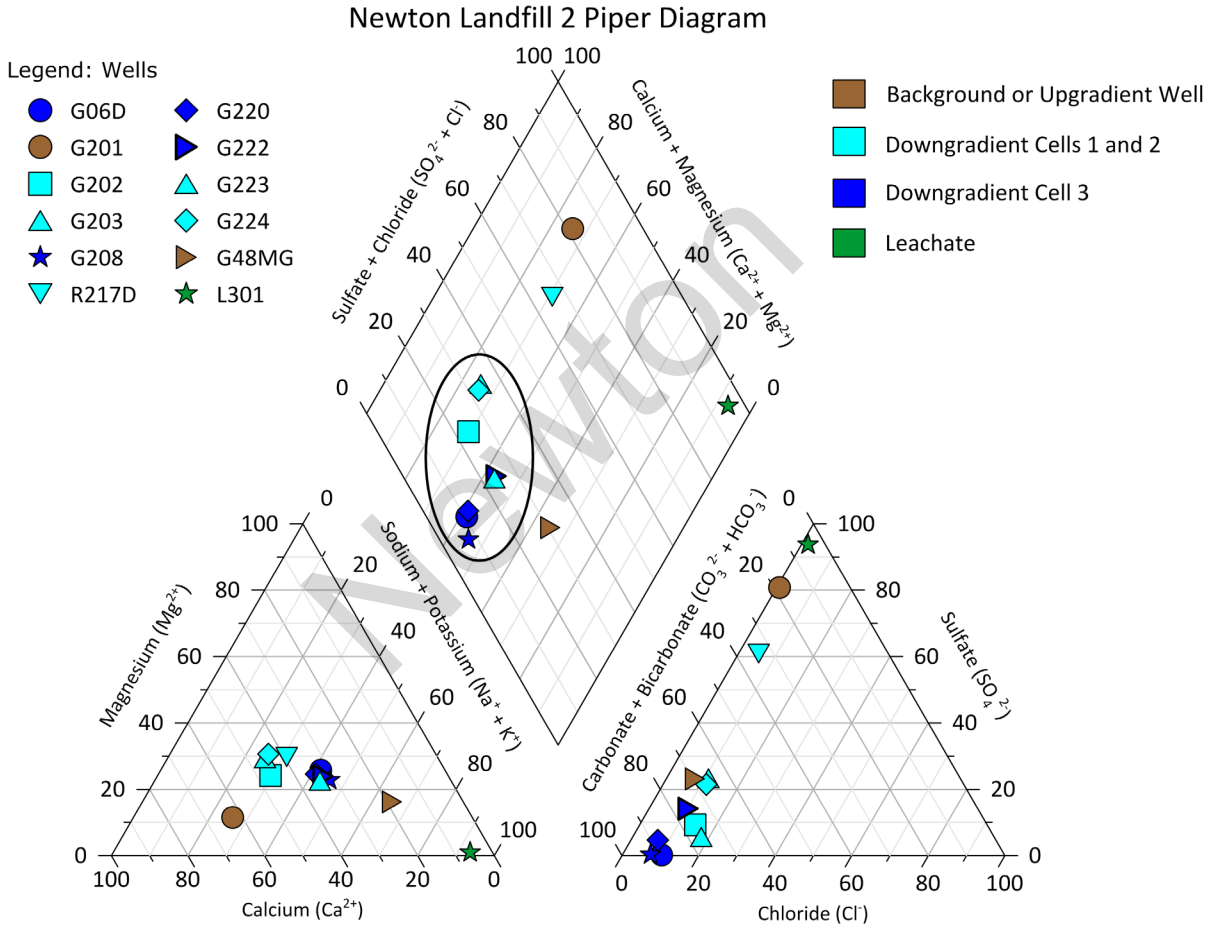

Figure A. Piper Diagram. Shows Ionic Composition of Samples of Groundwater Associated with LF2 in Q3 2019.

It is evident from the Piper diagram (Figure A) that leachate from LF2 (L301; green symbol) is in the sodium-chloride hydrochemical facies, while the LF2 groundwater samples (blue and cyan symbols) are predominantly in the calcium-bicarbonate hydrochemical facies (black grouping) with the exception of groundwater sample R217D which is in the calcium-sulfate hydrochemical facies. Therefore, downgradient groundwater samples associated with LF2 have a different ionic composition than leachate, indicating that leachate is not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

3.4 LOE #4: The Ionic Composition of Groundwater Downgradient of LF2 Cells 1 and 2 Is Similar to the Ionic Composition of Groundwater Downgradient of LF2 Cell 3 (Where No CCR Material Has Been Placed)

As illustrated in the Piper diagram (Figure A), the ionic composition of all LF2 Cell 1, 2, and 3 groundwater samples (blue and cyan symbols) are similar and primarily cluster into a single distinct hydrochemical facies (calcium-bicarbonate; black grouping). The only exception is R217D, which is in the calcium-sulfate facies (along with background well G201). Furthermore, the groundwater flow direction indicates that Cell 3 wells are not influenced by Cells 1 and 2 (Figure 1). The similarity in ionic composition of groundwater downgradient of LF2 Cell 3 and LF2 Cells 1 and 2, coupled with the facts that Cell 3 has never contained CCR and groundwater beneath Cell 3 is not influenced by Cells 1 and 2, indicate that LF2 Cells 1 and 2 are not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

3.5 LOE #5: Groundwater Quality in Monitoring Wells Downgradient of LF2 Cells 1 and 2 Is Statistically Similar to Groundwater Quality in Monitoring Wells Downgradient of LF2 Cell 3 (Where No CCR Material Has Been Placed)

Box plots graphically represent the first quartile, median, and third quartile of a given dataset using lines to construct a box where the lower line, midline and upper line of the box represent the values of the first quartile, median, and third quartile, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of the box plot. Outliers are represented by single points plotted outside of the range of the whiskers. Boron, chloride, and TDS SSIs were identified at all LF2 cells (LF2 Cells 1, 2, and 3) during the D5 sampling event, whereas other SSIs were only identified at either LF2 Cells 1 and 2, or LF2 Cell 3. As noted above, groundwater flow direction indicates that Cell 3 wells are not influenced by Cells 1 and 2, and Cell 3 has never contained CCR. Figures B, C, and D display the boron, chloride and TDS data, respectively, for downgradient groundwater at LF2; triangle symbols identify outlier values that are at least 1.5 times the interquartile range (IQR) and "x" symbols identify outlier values that are at least 3 times the IQR.

3.5.1 Boron

Box plots of the boron concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure B.

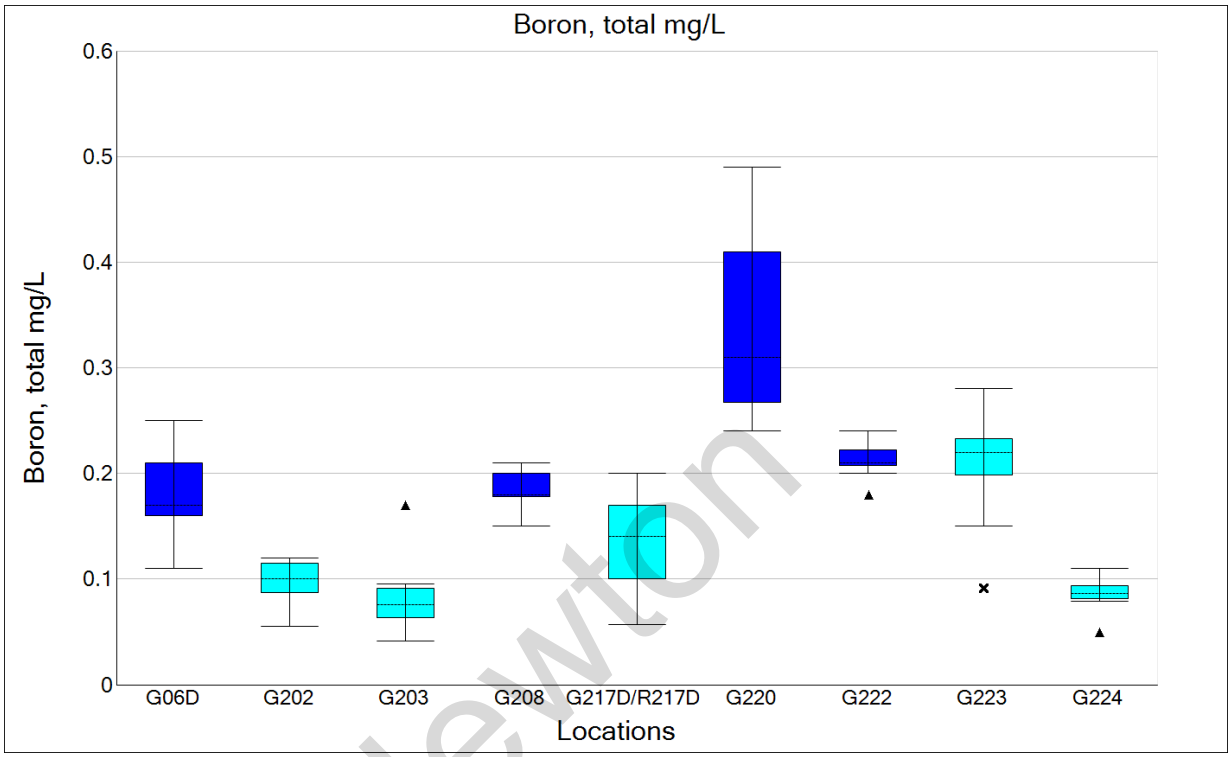

Figure B. Boron Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum boron concentrations in wells downgradient of LF2 Cell 3 ranged from 0.11 to 0.49 milligrams per liter (mg/L). The minimum and maximum boron concentrations in wells downgradient of LF2 Cells 1 and 2 ranged from 0.041 to 0.28 mg/L. Boron concentrations downgradient of LF2 Cells 1 and 2 were within or below the range of concentrations observed at wells downgradient of LF2 Cell 3.

3.5.2 Chloride

Box plots of the chloride concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure C below.

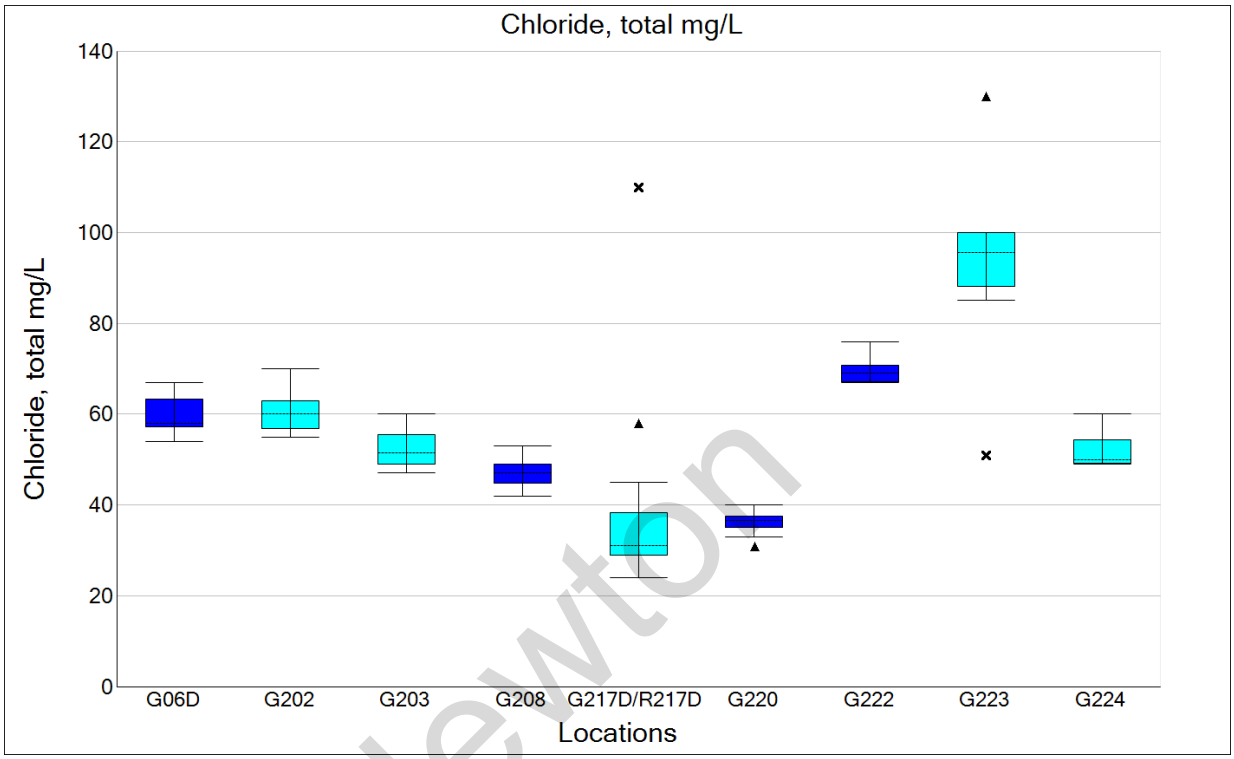

Figure C. Chloride Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum chloride concentrations in wells downgradient of LF2 Cell 3 range from 31 to 76 mg/L. The minimum and maximum chloride concentrations in wells downgradient of LF2 Cells 1 and 2 range from 24 to 130 mg/L.

Chloride concentrations downgradient of LF2 Cells 1 and 2 are generally within or below the range of concentrations observed at wells downgradient of LF2 Cell 3. The exception is monitoring well G223 and potential statistical outlier concentrations at G217D/R217D (illustrated with black symbols outside of the whiskers in Figure C).

3.5.3 Total Dissolved Solids

Box plots of the TDS concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure D below.

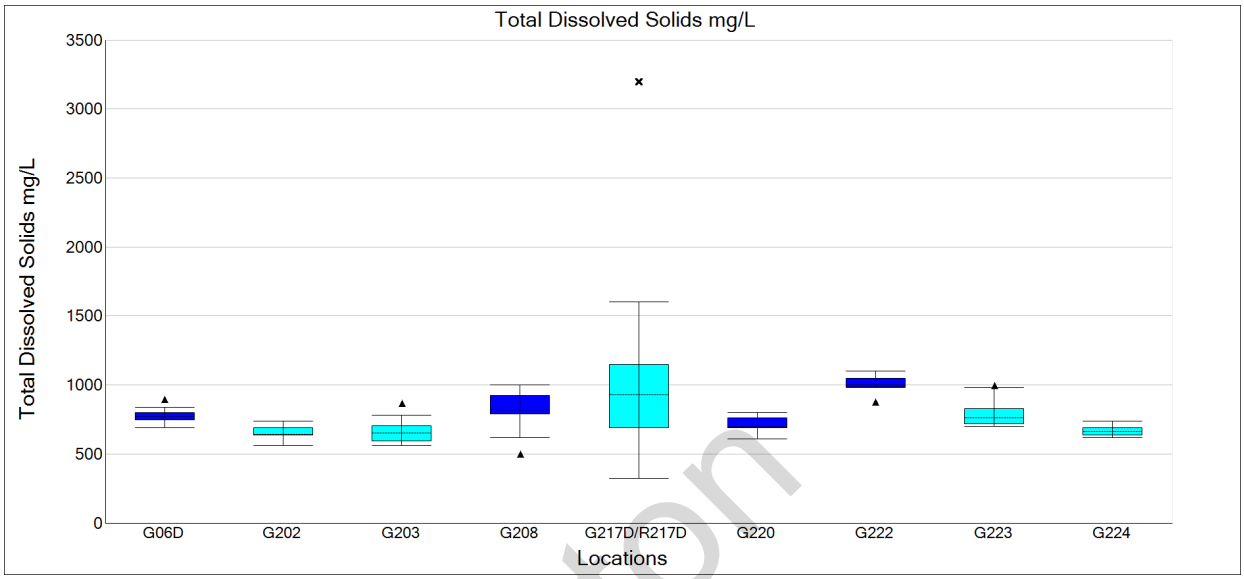

Figure D. Total Dissolved Solids Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum TDS concentrations in wells downgradient of LF2 Cell 3 range from 500 to 1100 mg/L. The minimum and maximum TDS concentrations in wells downgradient of LF2 Cells 1 and 2 range from 320 to 3200 mg/L.

The minimum and maximum TDS concentrations in wells downgradient of LF2 Cells 1 and 2 range from 320 to 3200 mg/L.

TDS concentrations downgradient of LF2 Cells 1 and 2 are generally within or below the range of concentrations observed at wells downgradient of LF2 Cell 3. The exception is monitoring well G217D/R217D which had two TDS concentrations greater than 1100 mg/L, one of which is a potential statistical outlier (illustrated with black symbols outside of the whiskers in Figure D).

The similarity of groundwater quality downgradient of LF2 Cell 3 and groundwater quality downgradient of LF2 Cells 1 and 2, as represented by the ranges of boron, chloride, and TDS concentrations (Figures B, C, and D respectively), coupled with the fact that no CCR material has been placed in LF2 Cell 3, suggests that LF2 Cells 1 and 2 are not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

4. CONCLUSIONS

Based on the six lines of evidence below, it has been demonstrated that the boron SSIs at G208, G220, G222, and G223; the calcium SSI at R217D; the chloride SSIs at G06D, G202, G203, G208, G220, G222, G223, G224, and R217D; the fluoride SSIs at G208 and G220; and the TDS SSIs at G222 and R217D are not due to Newton LF2 but are from a source other than the CCR unit being monitored:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. The ionic composition of groundwater downgradient of LF2 Cells 1 and 2 is similar to the ionic composition of groundwater downgradient of LF2 Cell 3 (where no CCR material has been placed).
5. Groundwater quality in monitoring wells downgradient of LF2 Cells 1 and 2 is statistically similar to groundwater quality in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).
6. This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.94(e)(2) that the SSIs observed during D5 were not due to the LF2. Therefore, an assessment monitoring program is not required, and the Newton Landfill 2 will remain in detection monitoring.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.94(e)(2) that the SSIs observed during D5 were not due to the LF2. Therefore, an assessment monitoring program is not required, and the Newton Landfill 2 will remain in detection monitoring.

5. REFERENCES

Lineback, J., 1979, Quaternary Deposits of Illinois: Illinois State Geological Survey map, scale 1:500,000.

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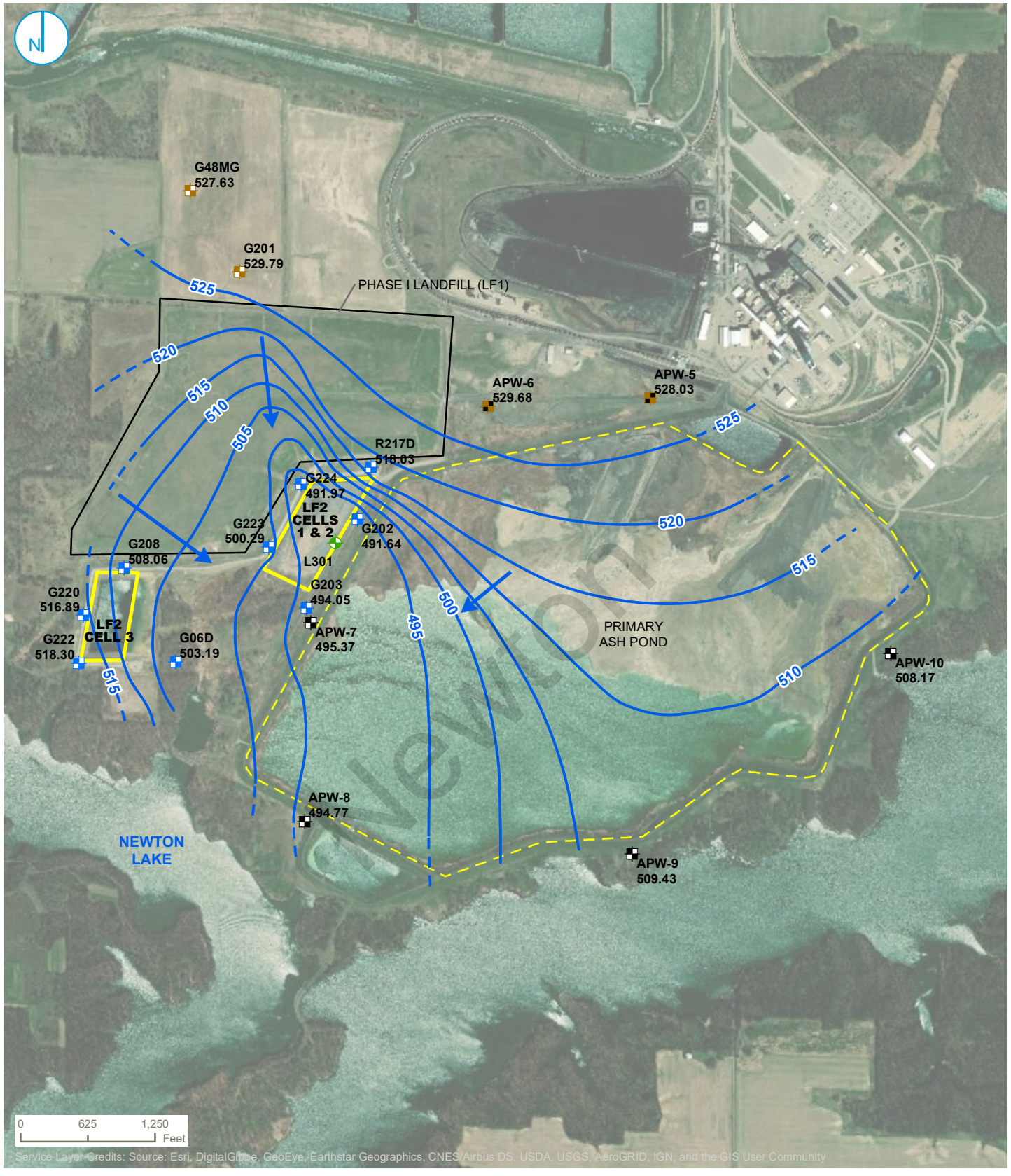
Natural Resource Technology, an OBG Company (NRT/OBG), 2017b, Hydrogeologic Monitoring Plan, Newton Primary Ash Pond – CCR Unit ID 501, Newton Landfill 2 – CCR Unit ID 502, Newton Power Station, Canton, Illinois, Illinois Power Generating Company, October 17, 2017.

Willman, H.B., J.C. Frye, J.A. Simon, K.E. Clegg, D.H. Swann, E. Atherton, C. Collinson, J.A. Lineback, T.C. Buschbach, and H.B. Willman, 1967, Geologic Map of Illinois: Illinois State Geological Survey map, scale 1:500,000.

Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975, Handbook of Illinois Stratigraphy: Illinois State Geological Survey, Bulletin 95, 261 p.

FIGURES



Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Newton\Figure 1_SampLoc and GWC Map LF2_D5.mxd

PROJECT: 169000XXXX | DATED: 4/3/2020 | DESIGNER: STOLZSD

- LF2 CCR MONITORING WELL
- LF2 BACKGROUND CCR MONITORING WELL
- PRIMARY ASH POND CCR MONITORING WELL
- PRIMARY ASH POND BACKGROUND CCR MONITORING WELL
- LF2 LEACHATE SAMPLE LOCATION
- GROUNDWATER ELEVATION CONTOUR (5-FOOT INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- LF2 CCR UNIT BOUNDARY
- PRIMARY ASH POND CCR UNIT BOUNDARY
- LF1 UNIT BOUNDARY

SAMPLING LOCATION AND GROUNDWATER ELEVATION CONTOUR MAP AUGUST 21, 2019

NEWTON PHASE II LANDFILL (LF2) (UNIT ID: 502)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Intended for
Illinois Power Generating Company

Date
October 12, 2020

Project No.
1940074923

40 C.F.R. § 257.94(e)(2): ALTERNATE SOURCE DEMONSTRATION

NEWTON PHASE II LANDFILL (LF2)

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Nicole M. Pagano, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Professional Geologist
196-000750
Illinois
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 12, 2020

I, Anne Frances Ackerman, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Anne Frances Ackerman
Qualified Professional Engineer
062-060586
Illinois
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 12, 2020

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CONTENTS

FIGURES (IN TEXT)

FIGURES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
cm/s	centimeters per second
f/k/a	formerly known as
IEPA	Illinois Environmental Protection Agency
IQR	interquartile range
LF2	Newton Phase II Landfill
LOE	line of evidence
mg/L	milligrams per liter
msl	mean sea level
NRT/OBG	Natural Resource Technology, an OBG Company
Site	Newton Power Station
SSI	Statistically Significant Increase
TDS	total dissolved solids
UPL	Upper Prediction Limit

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.94(e)(2) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of a Statistically Significant Increase (SSI) over background for groundwater constituents listed in Appendix III of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSI(s), or that the SSI(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Illinois Power Generating Company, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc., to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Newton Phase II Landfill (LF2), located near Newton, IL.

A background total dissolved solids (TDS) concentration for one of the eight baseline sampling events from 2015-2017 was revised by the lab shortly after the initial report was released, but inadvertently omitted from the database until realized during a database QC in 2020. Including this data point caused a change in the distribution of the background TDS data from normal to non-normal, prompting a change in the way that the background Upper Prediction Limit (UPL) is calculated and resulting in a reduction of the UPL from 1,005 milligrams per liter (mg/L) to 860 mg/L.

Because the corrected TDS UPL is lower than the one used to determine SSIs through the D5 sampling event, there were unreported TDS SSIs during these events as follows:

- Well G222 during the D2 sampling event (Q2 2018)
- Well G222 during the D3 sampling event (Q4 2018)
- Wells G06D, G203, G222, and G223 during the D4 sampling event (Q1 2019)
- Well G223 during the D5 sampling event (Q3 2019)

These wells all had one or more SSIs for other parameters during these sampling events, and ASDs for those SSIs were completed [self-implementing program]. The lines of evidence (LOE) presented in these ASDs address the unreported TDS SSIs as well as the reported SSIs for other parameters. Therefore, the previous ASDs support the conclusion that the unreported TDS SSIs are not caused by LF2.

The most recent Detection Monitoring sampling event (Detection Monitoring Round 6 [D6]) was completed on February 4, 5, 6 and 19, 2020, and analytical data were received on April 15, 2020. Analytical data from D6 were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017) to determine any SSIs of Appendix III parameters over background concentrations. That evaluation identified SSIs at downgradient monitoring wells as follows:

- Boron at wells G208, G220, G222, G223, and R217D
- Calcium at well R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G220
- Sulfate at R217D

- TDS at wells G06D, G203, G220, G222, G223, G224, and R217D

In accordance with the Statistical Analysis Plan, wells G202, G203, G208, G220, G222, G223, G224, and R217D were resampled on May 20-21 (as part of the Illinois Environmental Protection Agency [IEPA] quarterly sampling event) and well G06D was resampled on June 11, 2020 and analyzed only for TDS (all wells), calcium (R217D), and sulfate (R217D) to confirm the SSIs. Following evaluation of analytical data from the resample event, the following SSIs remained:

- Boron at wells G208, G220, G222, G223, and R217D
- Calcium at well R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G220
- TDS at wells G06D, G222, G223, and R217D

Pursuant to 40 C.F.R. § 257.94(e)(2), the following LOEs demonstrate that sources other than LF2 were the cause of the boron, calcium, chloride, fluoride, and TDS SSIs listed above. This ASD was completed by October 12, 2020, within 90 days of determination of the SSIs (July 14, 2020), as required by 40 C.F.R. § 257.94(e)(2).

2. BACKGROUND

2.1 Site location and Description

The Newton Power Station (Site) is located in Jasper County in the southeastern part of central Illinois, approximately 7 miles southwest of the town of Newton. The plant is located on the north side of Newton Lake. The area is bounded by Newton Lake and agricultural land to the west, south, and east, and agricultural land to the north. Beyond the lake is additional agricultural land.

2.2 Description of Phase II Landfill CCR Unit

LF2 includes three lined disposal cells (Figure 1). LF2 Cells 1 and 2, encompassing approximately 12 acres, are adjacent to each other and located south and east of the Phase I Landfill (LF1). LF2 Cell 3 encompasses approximately 7 acres and is located approximately 1,100 feet west of Cells 1 and 2. All three cells of LF2 are constructed with composite liners and leachate collection systems that exceed the landfill liner performance standards of 40 CFR § 257.70. Cell 3 is inactive and has not received CCR since it was constructed in 2011.

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during monitoring well installation.

Quaternary deposits in the Newton area consist mainly of diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits occurring at Newton Power Station include the following units beginning at the ground surface:

- Upper Confining Unit – Low permeability clays and silts, including the Peoria Silt (Loess Unit) in upland areas and the Cahokia Formation in the flood plain and channel areas to the south and east, underlain by the Sangamon Soil, and the predominantly clay diamictons of the Hagarstown (Till) and Vandalia (Till) Members of the Glasford Formation.
- Uppermost Aquifer – Thin to moderately thick (3 to 17 feet), moderate to high permeability sand, silty sand, and sandy silt/clay units of the Mulberry Grove Member of the Glasford Formation.
- Lower Confining Unit – Thick, very low permeability silty clay diamictons of the Smithboro (Till) Member of the Glasford Formation and the silty clay diamictons of the Banner Formation.

The bedrock beneath the unconsolidated deposits consists of Pennsylvanian-age Mattoon Formation (Willman et al., 1967) that is mostly shale near the bedrock surface but is characterized at depth by a complex sequence of shales, thin limestones, coals, underclays, and several sandstones (Willman et al., 1975). The erosional surface of the Pennsylvanian-age Mattoon Formation bedrock ranges widely in depth in the vicinity of the Site but is typically encountered at 90 to 120 feet below ground surface (bgs).

Groundwater elevations across LF2 ranged from approximately 493 to 519 feet mean sea level (msl) during D6 (Figure 1). The groundwater elevation contours shown on Figure 1 were measured on February 3, 2020. Overall groundwater flow beneath LF2, within the Uppermost Aquifer, is southward toward Newton Lake, but with flow converging to the south-southeast along the major

axis of LF2 Cells 1 and 2, and a predominantly eastward flow near LF2 Cell 3. Based on groundwater flow directions near LF2, groundwater beneath LF2 Cells 1 and 2 does not influence groundwater beneath LF2 Cell 3.

2.4 Groundwater and Landfill Monitoring

The Uppermost Aquifer monitoring system for LF2 Cells 1, 2, and 3 is shown on Figure 1.

Monitoring wells G201 and G48MG are used to monitor background groundwater quality for LF2 (all cells). Groundwater quality at LF2 Cells 1 and 2 is monitored using wells G202, G203, G223, G224, and R217D (which replaced well G217D in October 2017). Groundwater quality at LF2 Cell 3 is monitored using wells G06D, G208, G220, and G222. Leachate from LF2 is monitored using leachate sample location L301 (Figure 1).

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.94(e)(2), this ASD demonstrates that sources other than LF2 caused the SSI(s), or that the SSI(s) was a result of natural variation in groundwater quality. This ASD is based on the following LOE:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. The ionic composition of groundwater downgradient of LF2 Cells 1 and 2 is similar to the ionic composition of groundwater downgradient of LF2 Cell 3 (where no CCR material has been placed).
5. Groundwater quality in monitoring wells downgradient of LF2 Cells 1 and 2 is statistically similar to groundwater quality in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).

These LOEs are described and supported in greater detail below.

3.1 LOE #1: LF2 Composite Liner Design

LF2 Cells 1 and 2 were constructed and began receiving CCR in 1997. Currently, a portion of LF2 Cell 2 is in operation. No CCR has been placed in LF2 Cell 3.

The constructed liner and leachate collection system for LF2 Cells 1, 2, and 3 include the following design components from top to bottom:

- Soil cover for liner frost protection
- 10-ounce-per-square-yard geotextile separation layer between the leachate management system and the frost protection soil cover
- 1-foot thick sand drainage layer
- 60-millimeter high-density polyethylene geomembrane
- Three-foot-thick compacted, low-permeability soil having a maximum hydraulic conductivity of 1.0×10^{-7} centimeters per second (cm/s)

These components exceed the landfill liner design criteria of 40 C.F.R. § 257. The landfill design criteria were intended to provide protection to the Uppermost Aquifer. Therefore, the presence of the composite liner suggests that LF2 is not contributing CCR constituents to the groundwater in the vicinity of LF2.

3.2 LOE #2: No CCR material has been placed in LF2 Cell 3

LF2 Cell 3 has never contained CCR; therefore, it cannot be the source of the CCR constituents boron, chloride, fluoride, or TDS detected in Cell 3 groundwater monitoring wells (G06D, G208, G220, and G222).

3.3 LOE #3: The ionic composition of groundwater is different than the ionic composition of leachate

Piper diagrams graphically represent ionic composition of aqueous solutions. A Piper diagram displays the position of water samples with respect to their major cation and anion content on the two lower triangular portions of the diagram, providing the information which, when combined on the central, diamond-shaped portion of the diagram, identify composition categories or groupings (hydrochemical facies). Figure A, below, is a Piper diagram that displays the ionic composition of samples collected from the background and downgradient monitoring wells associated with LF2, and leachate sampling location L301 associated with LF2, in the D6 sampling event.

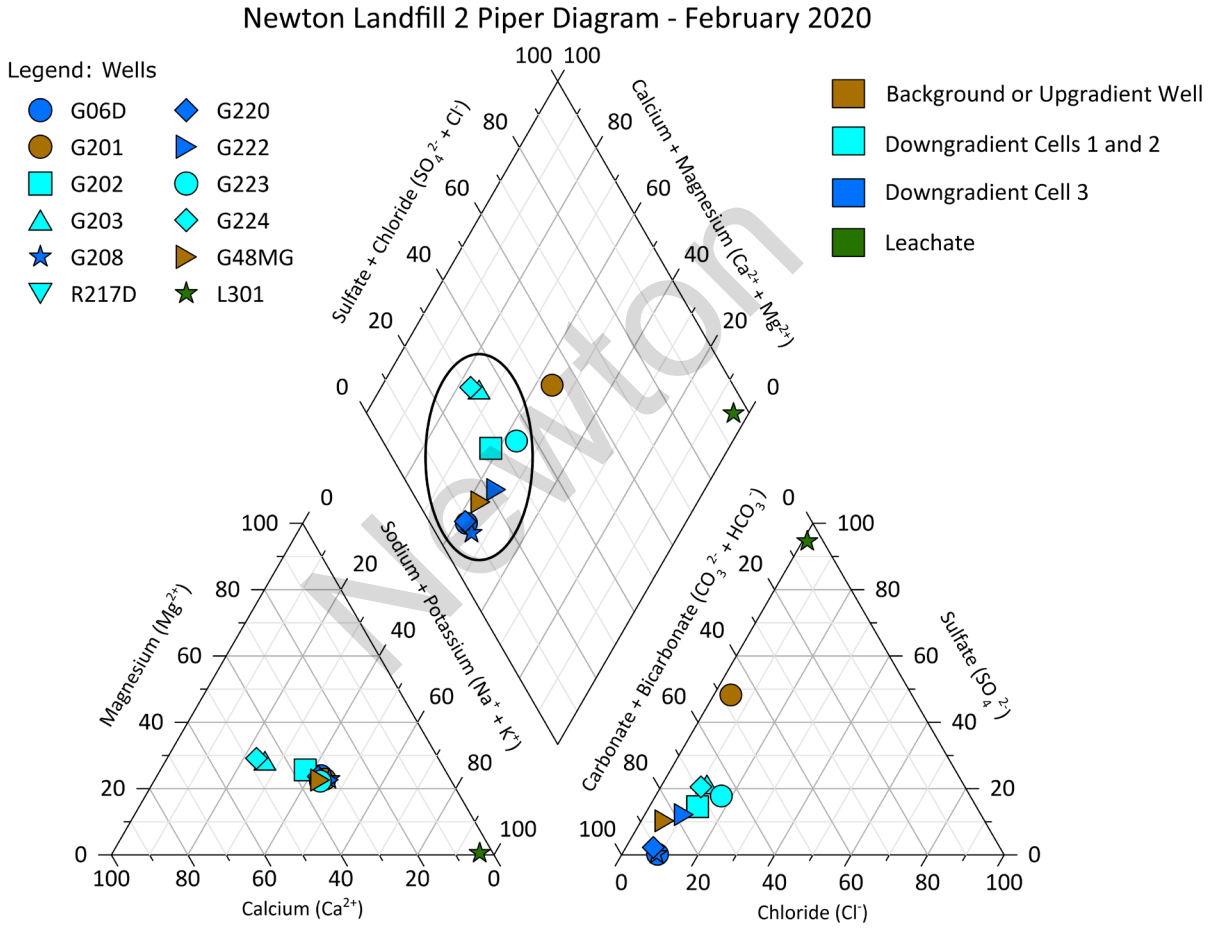

Figure A. Piper Diagram. Shows Ionic Composition of Samples of Groundwater and Leachate Associated with LF2 During D6 Sampling Event.

It is evident from the Piper diagram (Figure A) that leachate from LF2 (L301; green symbol) is in the sodium-chloride hydrochemical facies, while the LF2 groundwater samples (blue and cyan symbols) are predominantly in the calcium-bicarbonate hydrochemical facies (black grouping). Therefore, downgradient groundwater samples associated with LF2 have a different ionic composition than leachate, indicating that leachate is not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

3.4 LOE #4: The Ionic Composition of Groundwater Downgradient of LF2 Cells 1 and 2 Is Similar to the Ionic Composition of Groundwater Downgradient of LF2 Cell 3 (Where No CCR Material Has Been Placed)

As illustrated in the Piper diagram (Figure A), the ionic composition of all LF2 Cell 1, 2, and 3 groundwater samples (blue and cyan symbols) are similar and primarily cluster into a single distinct hydrochemical facies (calcium-bicarbonate; black grouping). Furthermore, the groundwater flow direction indicates that Cell 3 wells are not influenced by Cells 1 and 2 (Figure 1). The similarity in ionic composition of groundwater downgradient of LF2 Cell 3 and LF2 Cells 1 and 2, coupled with the facts that Cell 3 has never contained CCR and groundwater beneath Cell 3 is not influenced by Cells 1 and 2, indicate that LF2 Cells 1 and 2 are not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

3.5 LOE #5: Groundwater Quality in Monitoring Wells Downgradient of LF2 Cells 1 and 2 Is Statistically Similar to Groundwater Quality in Monitoring Wells Downgradient of LF2 Cell 3 (Where No CCR Material Has Been Placed)

Box plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of (*i.e.*, below and above) the box. The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers. Boron, chloride, and TDS SSIs were identified at all LF2 cells (LF2 Cells 1, 2, and 3) during the D6 sampling event, whereas other SSIs were only identified at either LF2 Cells 1 and 2, or LF2 Cell 3. As noted above, groundwater flow direction indicates that Cell 3 wells are not influenced by Cells 1 and 2, and Cell 3 has never contained CCR.

3.5.1 Boron

Box plots of the boron concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure B.

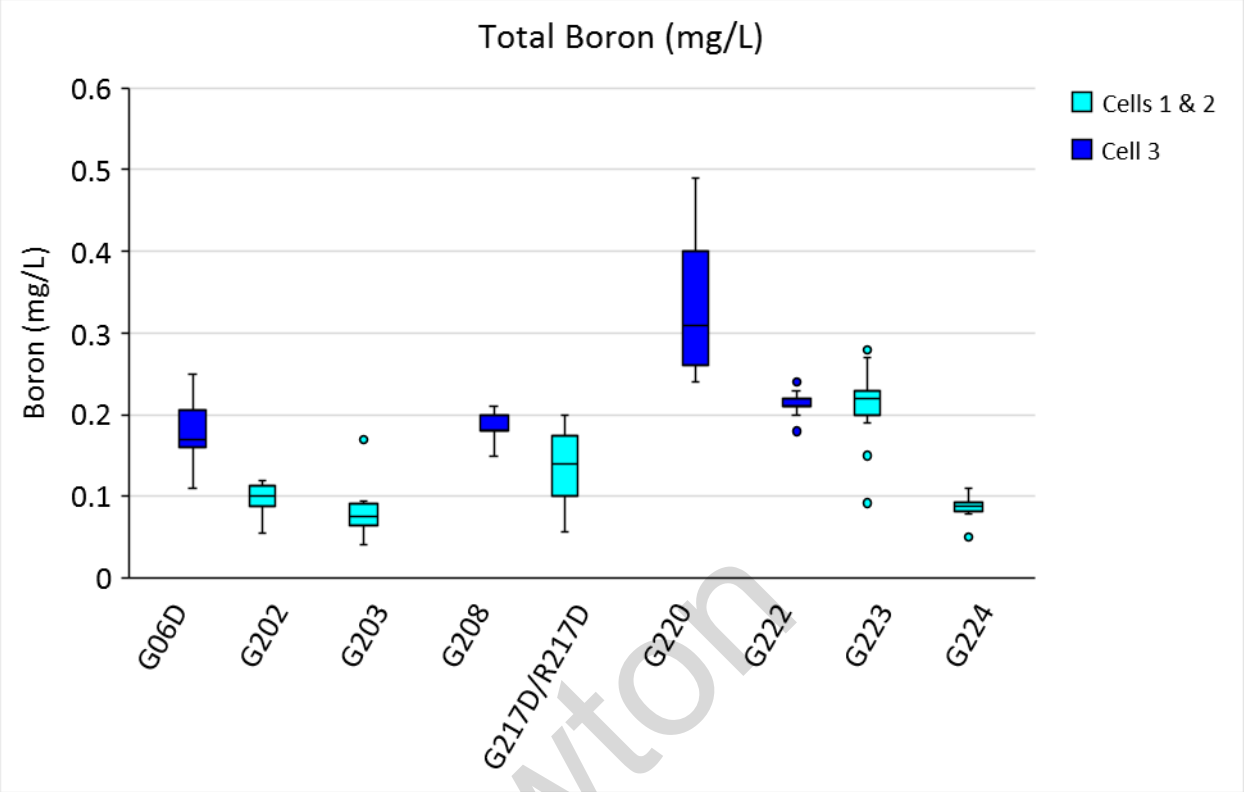

Figure B. Boron Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum boron concentrations in wells downgradient of LF2 Cell 3 ranged from 0.11 to 0.49 mg/L. The minimum and maximum boron concentrations in wells downgradient of LF2 Cells 1 and 2 ranged from 0.041 to 0.28 mg/L. Boron concentrations downgradient of LF2 Cells 1 and 2 were within or below the range of concentrations observed at wells downgradient of LF2 Cell 3.

3.5.2 Chloride

Box plots of the chloride concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure C below.

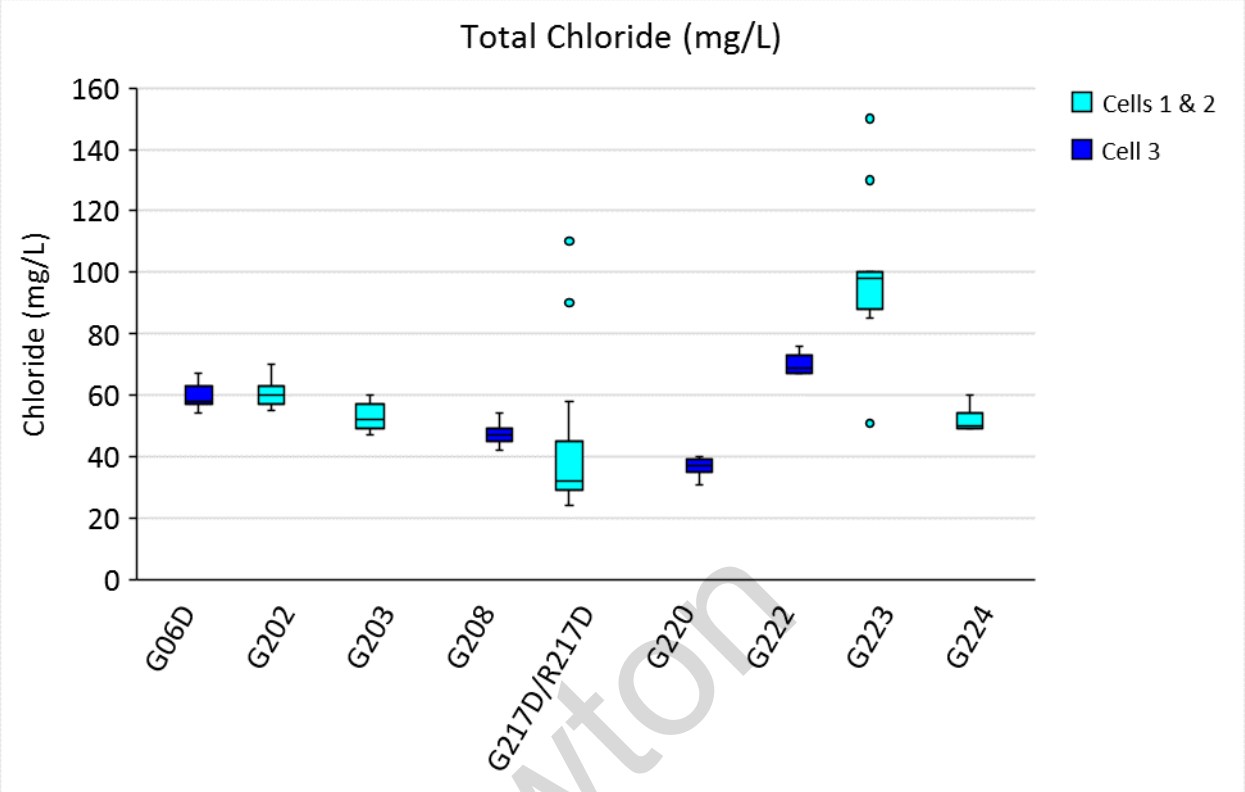

Figure C. Chloride Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum chloride concentrations in wells downgradient of LF2 Cell 3 range from 31 mg/L to 76 mg/L. The minimum and maximum chloride concentrations in wells downgradient of LF2 Cells 1 and 2 range from 24 mg/L to 150 mg/L.

Chloride concentrations downgradient of LF2 Cells 1 and 2 are generally within or below the range of concentrations observed at wells downgradient of LF2 Cell 3. The exceptions are monitoring well G223 and potential statistical outlier concentrations only at G217D/R217D (illustrated with filled symbols outside of the whiskers in Figure C).

3.5.3 Total Dissolved Solids

Box plots of the TDS concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure D below.

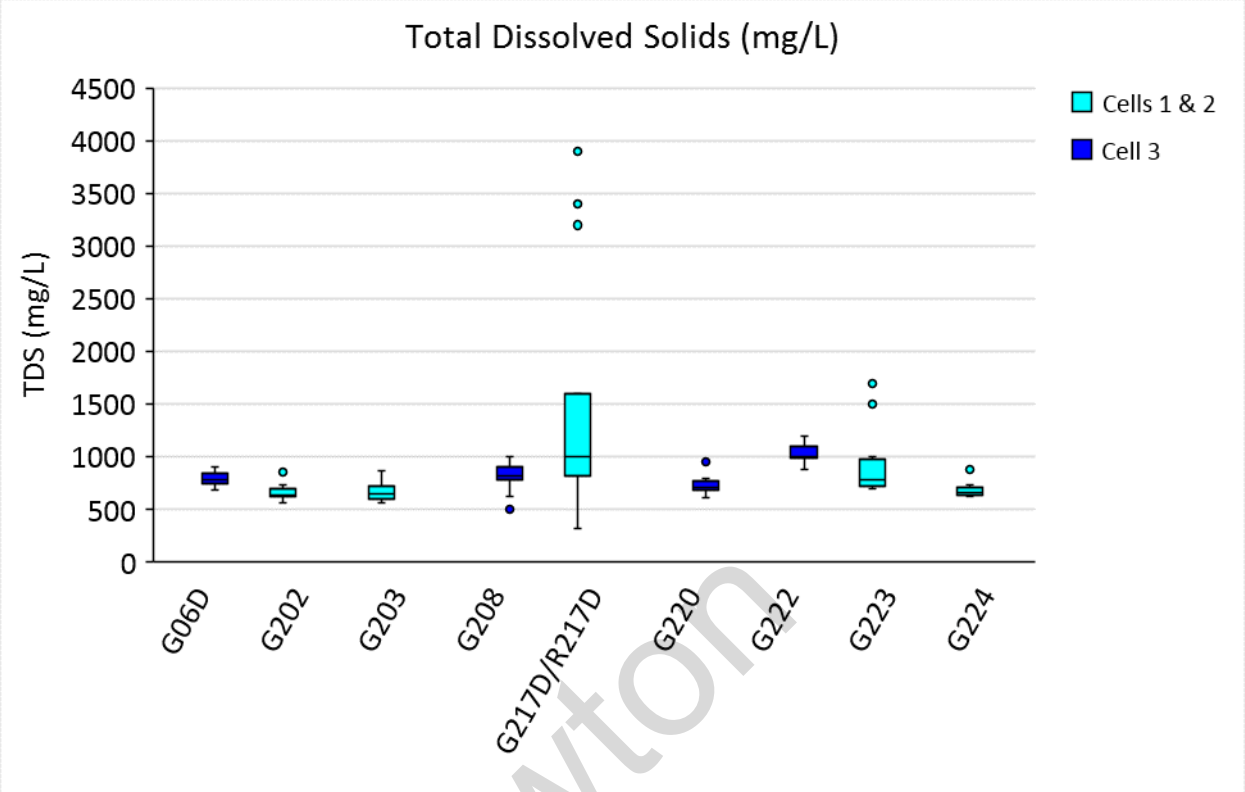

Figure D. Total Dissolved Solids Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum TDS concentrations in wells downgradient of LF2 Cell 3 range from 500 to 1200 mg/L. The minimum and maximum TDS concentrations in wells downgradient of LF2 Cells 1 and 2 range from 320 mg/L to 3900 mg/L.

TDS concentrations downgradient of LF2 Cells 1 and 2 are generally within or below the range of concentrations observed at wells downgradient of LF2 Cell 3. The exceptions (*i.e.*, have concentrations greater than 1200 mg/L) are three data points at monitoring well G217D/R217D (two of which are potential statistical outliers, illustrated with filled symbols outside of the whiskers in Figure D) and one at monitoring well G223 (which is also a potential statistical outlier).

The similarity of groundwater quality downgradient of LF2 Cell 3 and groundwater quality downgradient of LF2 Cells 1 and 2, as represented by the ranges of boron, chloride, and TDS concentrations (Figures B, C, and D respectively), coupled with the fact that no CCR material has been placed in LF2 Cell 3, suggests that LF2 Cells 1 and 2 are not the source of CCR constituents detected in the LF2 groundwater monitoring wells.

4. CONCLUSIONS

Based on the five LOE below, it has been demonstrated that the boron SSIs at G208, G220, G222, G223, and R217D; the calcium SSI at R217D; the chloride SSIs at G06D, G202, G203, G208, G220, G222, G223, G224, and R217D; the fluoride SSI at G220; and the TDS SSIs at G06D, G222, G223 and R217D are not due to LF2 but are from a source other than the CCR unit being monitored:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. The ionic composition of groundwater downgradient of LF2 Cells 1 and 2 is similar to the ionic composition of groundwater downgradient of LF2 Cell 3 (where no CCR material has been placed).
5. Groundwater quality in monitoring wells downgradient of LF2 Cells 1 and 2 is statistically similar to groundwater quality in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.94(e)(2) that the SSIs observed during D6 were not due to the LF2. Therefore, an assessment monitoring program is not required, and the Newton Landfill 2 will remain in detection monitoring.

5. REFERENCES

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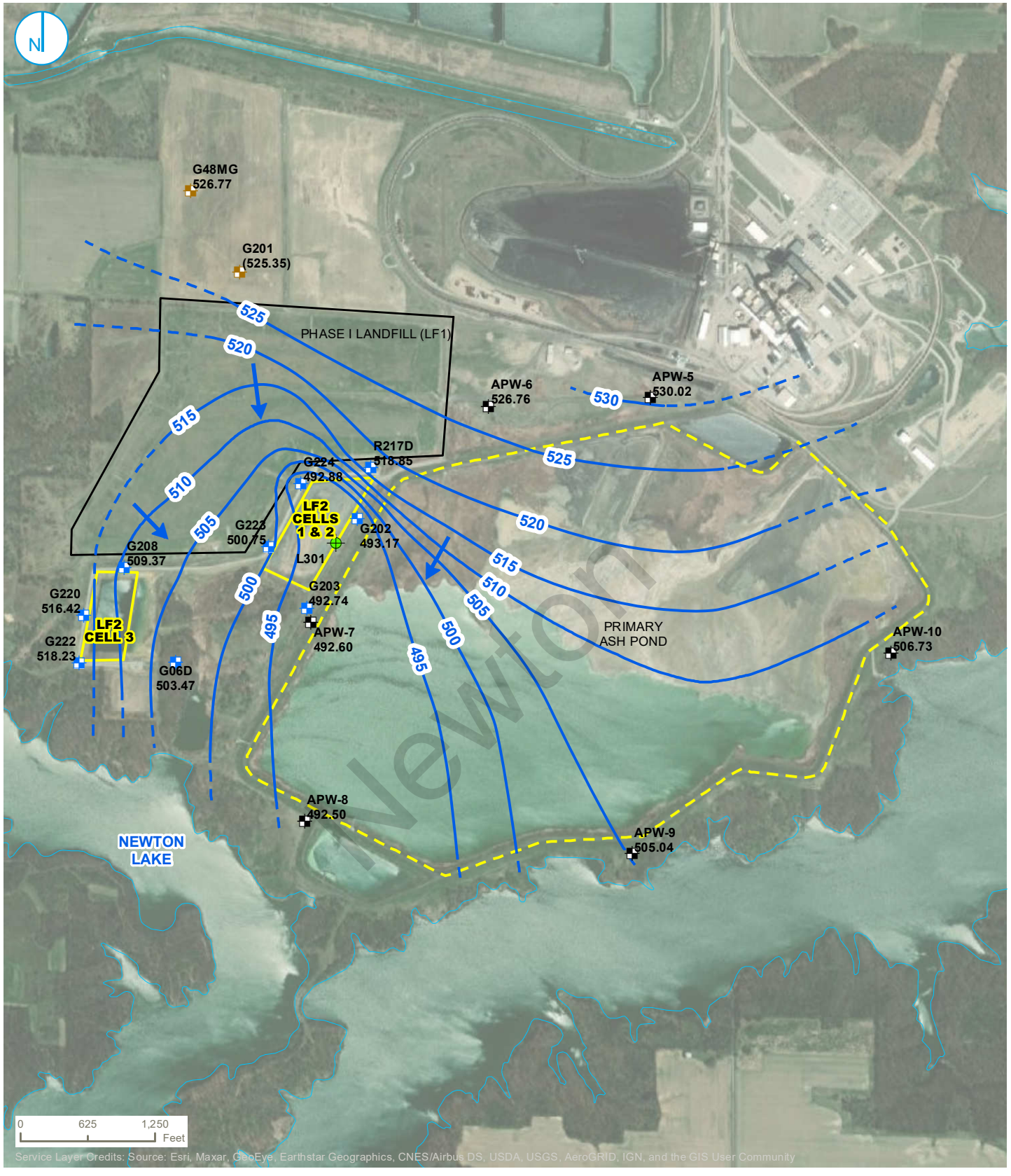
Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975, Handbook of Illinois Stratigraphy: Illinois State Geological Survey, Bulletin 95, 261 p.

FIGURES



Y:\Mapping\Projects\22\22851\MXD\Alt_Source_Dem\Newton\Figure 1_SampLoc and GWC Map LF2_D6.mxd

PROJECT: 169000XXXX | DATED: 7/6/2020 | DESIGNER: galanmmc

- LF2 DOWNGRADIENT MONITORING WELL
- LF2 UPGRADIENT MONITORING WELL
- PRIMARY ASH POND CCR RULE MONITORING
- LF2 LEACHATE SAMPLE LOCATION
- GROUNDWATER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- LF2 CCR UNIT BOUNDARY
- PRIMARY ASH POND CCR UNIT BOUNDARY
- LF1 UNIT BOUNDARY

SAMPLING LOCATION AND GROUNDWATER ELEVATION CONTOUR MAP FEBRUARY 3, 2020

NEWTON PHASE II LANDFILL (LF2) (UNIT ID: 502)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL