Intended for
WEC Business Services, LLC

Date
January 31, 2021

Project No.
1940100325

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CALEDONIA ASH LANDFILL

RAMBOLL Bright ideas. Sustainable change.

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL

Project name	**Ash Landfill Database Management, Sampling, and Reporting**
Project no.	**1940100325**
Recipient	**WEC Business Services, LLC**
Document type	**CCR Rule Annual Report**
Revision	**0**
Date	**January 31, 2021**
Prepared by	**Glenn R. Luke, PE**
Checked by	**Nathaniel R. Keller, PG**
Approved by	**Bob Meidl**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ASD	Alternate Source Demonstration
B	Boron
Ca	Calcium
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
mg/L	milligrams per liter
NRT	Natural Resource Technology, an OBG Company
OBG	O'Brien & Gere Engineers, Inc.
Ramboll	Ramboll Americas Engineering Solutions, Inc
SO_4	Sulfate
SSI	Statistically Significant Increase
TBD	To be Determined
TDS	Total Dissolved Solids

2020 MONITORING PROGRAM SUMMARY

The Caledonia Ash Landfill operated in the Detection Monitoring Program in accordance with Title 40 of the Code of Federal Regulations (40 CFR) 257.94 for the calendar year 2020. In 2020, groundwater analytical data was evaluated for statistically significant increases (SSIs) over background concentrations for Appendix III constituents in groundwater monitoring wells at the Caledonia Ash Landfill. The following constituents and wells had SSIs detected in 2020:

- Boron – W08D, W09D, W10D, W49, and W50
- Calcium – W08D
- Sulfate – W08D, W09D, W10D, W49, and W50
- Total Dissolved Solids (TDS) – W08D

Alternate Source Demonstrations (ASDs) prepared in 2020 or in prior years provide justification that the SSIs observed during the Detection Monitoring Program were not due to a release from the CCR unit but were either from an error in sampling or analysis or from naturally occurring conditions (e.g. natural variation in groundwater quality).

The Caledonia Ash Landfill remains in the Detection Monitoring Program in accordance with 40 CFR 257.94.

1. INTRODUCTION

This report has been prepared on behalf of We Energies by Ramboll Americas Engineering Solutions, Inc. (Ramboll) to provide the information required by Title 40 of the Code of Federal Regulations (40 CFR) 257.90(e) for the Caledonia Ash Landfill located in Caledonia, Wisconsin.

In accordance with 40 CFR 257.90(e), the owner or operator of an existing coal combustion residual (CCR) unit must prepare an annual groundwater monitoring and corrective action report (Annual Report) for the preceding calendar year. The Annual Report must document the status of the groundwater monitoring and corrective action program for the CCR unit and summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project 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 40 CFR 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 40 CFR 257.90 through 257.98.

This report provides the required information for the Caledonia Ash Landfill for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The Caledonia Ash Landfill remained in Detection Monitoring (40 CFR 257.94) during 2020. Detection Monitoring Program sampling dates and parameters collected are provided in Table 1. Analytical results from the two sampling rounds collected and those statistically analyzed in 2020 (Detection Monitoring Round 5) are included in Table 2.

In accordance with 40 CFR 257.93(h)(2), the *Statistical Analysis Plan, Caledonia Ash Landfill* (Natural Resource Technology, an OBG Company, 2017), and within 90 days of completing sampling and analysis (receipt of data); analytical data was evaluated for statistically significant increases (SSIs) over background concentrations for Appendix III constituents in groundwater monitoring wells at the Caledonia Ash Landfill. SSIs and the SSI determination dates are provided in Table 1.

40 CFR 257.94(e)(2) allows 90 days to demonstrate that a SSI was caused by a source other than the CCR unit or resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (i.e., an alternate source demonstration). An alternate source demonstration (ASD) was completed for the Caledonia Ash Landfill on the date provided in Table 1. The ASD document for 2020 is provided in Appendix A.

Table 1. Detection Monitoring Program Summary

Detection Round	Sampling Date	Parameters Collected	Data Received	SSI Determination Date	SSI Parameters	Resample Date	ASD Date
5	11/4/19-11/5/19	Appendix III	12/12/19	3/11/20	B, Ca, SO_4, TDS	NA	4/15/18[1]
6	5/4/20-5/5/20	Appendix III	5/27/20	8/25/20	B, Ca, SO_4, TDS	8/31/20	11/23/20
7	11/9/20-11/11/20	Appendix III	12/16/20	TBD Before 3/16/21	TBD	TBD	TBD

B – Boron
Ca – Calcium
NA – Not applicable
SO_4 – Sulfate
TBD – To Be Determined
TDS – Total Dissolved Solids

1. The April 15, 2018 ASD for Caledonia Ash Landfill provided a description, data, and pertinent information supporting an alternate source for the wells and parameters with SSIs in Detection Monitoring Rounds 5-6. Data resulting in SSIs above background are consistent with analytical results observed in previous detection monitoring rounds.

The Caledonia Ash Landfill remains in the Detection Monitoring Program in accordance with 40 CFR 257.94.

3. KEY ACTIONS COMPLETED IN 2020

Two groundwater sampling events were completed in 2020 as part of the Detection Monitoring Program, Rounds 6 and 7. One groundwater sample was collected from each background and downgradient well in the monitoring system during each event. One resampling event was completed in accordance with the *Statistical Analysis Plan, Caledonia Ash Landfill* (Natural Resource Technology, an OBG Company, 2017). Sampling dates are summarized in Table 1. All samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (Natural Resource Technology, an OBG Company, 2017) prepared for the Caledonia Ash Landfill. All monitoring data obtained under 40 CFR 257.90 through 257.98 (as applicable) in 2020 are presented in Table 2.

A map showing the groundwater monitoring system, including the CCR unit and all background (upgradient) and downgradient monitoring wells with well identification numbers, for the Caledonia Ash Landfill is presented on Figure 1. There were no changes to the monitoring system in 2020.

Statistical evaluation, including SSI determinations, of analytical data from the Detection Monitoring Program for November 4-5, 2019 (Detection Monitoring Round 5) and May 4-5, 2020 (Detection Monitoring Round 6) were completed in 2020 and within 90 days of receipt of the analytical data. Statistical evaluation of analytical data was performed in accordance with the *Statistical Analysis Plan, Caledonia Ash Landfill* (Natural Resource Technology, an OBG Company, 2017).

An Alternate Source Demonstration for Detection Monitoring Round 6, dated November 23, 2020, was prepared for the Caledonia Ash Landfill in 2020 and is provided in Appendix A. The ASD was prepared in accordance with 40 CFR 257.94(e)(2) and provides a description, data, and pertinent information to support an alternate source for wells and parameters with SSIs at the Caledonia Ash Landfill. The ASD provides justification that the SSIs observed during the Detection Monitoring Program were not due to a release from the CCR unit but were either from an error in sampling or analysis or from naturally occurring conditions (e.g. natural variation in groundwater quality).

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE PROBLEMS

No problems were encountered during implementation of the Detection Monitoring Program during 2020. Groundwater samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (Natural Resource Technology, an OBG Company, 2017) prepared for the Caledonia Ash Landfill, and all data was accepted.

5. KEY ACTIVITIES FOR 2021

The following key activities are planned for 2021:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the 2nd and 4th quarters of 2021.
- Complete statistical evaluation of analytical data from the downgradient wells, using background data to determine whether a SSI over background concentrations has occurred for Appendix III parameters.
- 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 the SSI determination and will be included in the annual groundwater monitoring and corrective action report for 2021.
  - If an alternate source(s) is not identified to be the cause of the SSI, the applicable requirements of 40 CFR 257.94 through 257.98 (e.g., assessment monitoring) will apply in 2021, including associated recordkeeping/notifications required by 40 CFR 257.105 through 257.108.

6. REFERENCES

Natural Resource Technology, an OBG Company, 2017, *Sampling and Analysis Plan Revision 2, Caledonia Ash Landfill, Caledonia, Wisconsin, September 29, 2017.*

Natural Resource Technology, an OBG Company, 2017, *Statistical Analysis Plan, Caledonia Ash Landfill, Caledonia, Wisconsin, October 17, 2017.*

TABLES

Caledonia CCR
Table 2. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/01/2019 to 12/31/2020

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W08D	11/4/2019	AE41843	0.440	48.000	10.000	1.000	7.400	200.000
	5/5/2020	AE45611	0.491	52.800	9.700	0.840	7.500	200.000
	11/10/2020	AE49635	0.481	50.800	10.000	1.300	7.650	220.000
W09D	11/4/2019	AE41842	0.390	18.000	3.600	1.300	7.900	33.000
	5/5/2020	AE45609	0.429	19.000	3.700	1.300	7.900	34.000
	8/31/2020	AE48108	0.418				7.850	
	11/9/2020	AE49634	0.446	19.900	3.500	1.500	8.020	34.000
W10D	11/5/2019	AE41847	0.410	20.000	3.700	1.200	8.000	40.000
	5/4/2020	AE45607	0.441	21.300	3.800	1.300	7.800	41.000
	11/10/2020	AE49637	0.444	21.600	4.000	1.500	7.850	44.000
W46D	11/4/2019	AE41841	0.360	24.000	5.000	1.100	7.500	35.000
	5/4/2020	AE45604	0.409	25.900	5.300	1.100	7.600	35.000
	11/9/2020	AE49633	0.394	25.300	4.800	1.300	7.600	35.000
W48	11/5/2019	AE41845	0.370	25.000	3.500	0.880	7.800	<0.140
	5/4/2020	AE45605	0.403	27.600	3.600	0.910	7.900	0.740
	11/10/2020	AE49638	0.400	27.600	3.700	1.000	7.940	0.380
W49	11/5/2019	AE41846	0.430	16.000	4.200	1.300	8.000	50.000
	5/5/2020	AE45608	0.463	17.700	4.200	1.300	7.700	22.000
	11/11/2020	AE49640	0.442	15.400	5.400	1.400	7.800	46.000
W50	11/5/2019	AE41848	0.490	28.000	5.900	0.990	7.700	73.000
	5/5/2020	AE45610	0.534	29.900	5.600	1.100	7.500	60.000
	11/11/2020	AE49639	0.540	29.800	5.500	1.300	7.590	75.000

Caledonia CCR
Table 2. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/01/2019 to 12/31/2020

Well Id	Date Sampled	Lab Id	TDS, mg/L
W08D	11/4/2019	AE41843	430.000
	5/5/2020	AE45611	450.000
	11/10/2020	AE49635	410.000
W09D	11/4/2019	AE41842	150.000
	5/5/2020	AE45609	160.000
	11/9/2020	AE49634	82.000
W10D	11/5/2019	AE41847	180.000
	5/4/2020	AE45607	190.000
	11/10/2020	AE49637	150.000
W46D	11/4/2019	AE41841	200.000
	5/4/2020	AE45604	170.000
	11/9/2020	AE49633	200.000
W48	11/5/2019	AE41845	190.000
	5/4/2020	AE45605	210.000
	11/10/2020	AE49638	220.000
W49	11/5/2019	AE41846	180.000
	5/5/2020	AE45608	190.000
	11/11/2020	AE49640	230.000
W50	11/5/2019	AE41848	260.000
	5/5/2020	AE45610	240.000
	11/11/2020	AE49639	250.000

FIGURES

CCR RULE BACKGROUND MONITORING WELL LOCATION
CCR RULE DOWNGRADIENT MONITORING WELL LOCATION
CCR RULE UPGRADIENT MONITORING WELL LOCATION

0 250 500 Feet

GROUNDWATER SAMPLING WELL LOCATION MAP

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
WE ENERGIES CALEDONIA ASH LANDFILL
CALEDONIA, WISCONSIN

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

RAMBOLL

APPENDIX A
ALTERNATE SOURCE DEMONSTRATIONS (ASD): *40 CFR SECTION 257.94(E)(2) ALTERNATE SOURCE DEMONSTRATION (ASD) DETECTION MONITORING ROUND 6, WE ENERGIES CALEDONIA ASH LANDFILL*

RAMBOLL

ENVIRONMENT
& HEALTH

Mr. Bob Meidl
WEC Business Services, LLC
333 W. Everett Street – A231
Milwaukee, WI 53203

RE: 40 CFR Section 257.94(e)(2) Alternate Source Demonstration (ASD) Detection Monitoring Round 6, We Energies Caledonia Ash Landfill

Dear Mr. Meidl:

November 23, 2020

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
www.ramboll.com

Ref. 71202

This document has been prepared by Ramboll Americas Engineering Solutions, Inc. (Ramboll) to provide pertinent information for an alternate source demonstration (ASD) as allowed by 40 CFR Section 257.94(e)(2) for the We Energies Caledonia Ash Landfill, located in the Caledonia, Wisconsin.

The sixth semi-annual detection monitoring samples (Detection Monitoring Round 6) were collected on May 5, 2020 for which analytical data was received on May 27, 2020. Analytical data is presented in the attached Table 1. In accordance with 40 CFR Section 257.93(h)(2), statistical analysis of the data from Detection Monitoring Round 6 to identify statistically significant increases (SSIs) of 40 CFR Part 257 Subpart D Appendix III parameters over background concentrations was completed within 90 days of receipt of the analytical data (August 25, 2020). The statistical determination identified the following SSIs at downgradient monitoring wells:

- Boron above the background prediction interval at W08D, W09D, W10D, W49, and W50
- Calcium above the background prediction interval at W08D
- Sulfate above the background prediction interval at W08D, W09D, W10D, and W50
- Total dissolved solids (TDS) above the background prediction interval at W08D

The SSIs above background identified during Detection Monitoring Round 6 are consistent with Detection Monitoring Rounds 1-5 with the exception of boron at W09D. Boron was detected at a concentration indicative of a SSI above background at W09D during Detection Monitoring Rounds 2, 3, and 4, but the well was resampled and the SSI was not confirmed, as documented in ASDs dated November 27, 2018, May 28, 2019, and December 22, 2019. (OBG 2018b, 2019a, and 2019b)

For the wells and parameters listed above that are consistent with Detection Monitoring Rounds 1-5, *Alternate Source Demonstration, Caledonia Ash Landfill, Caledonia, Wisconsin*; dated April 15, 2018 (OBG, 2018a), prepared in accordance with 40 CFR Section 257.94(e)(2) provides a description, data, and pertinent information supporting an alternate source that applies to the wells and parameters with SSIs in Detection Monitoring Rounds 1-5. The ASD supports the

position that the SSIs observed during the Detection Monitoring Rounds 1-5 were not due to a release from the CCR unit but were from naturally occurring conditions and anthropogenic impacts in the area of the Caledonia Ash Landfill.

40 CFR Section 257.94(e)(2) allows 90 days to demonstrate that an SSI was caused by a source other than the CCR unit or resulted from an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Accordingly, an alternate source demonstration for boron at well W09D was evaluated and completed within 90 days of the SSI determination, by November 23, 2020.

To verify the SSI in Detection Monitoring Round 6, well W09D was resampled on August 31, 2020 and analyzed for only the SSI parameter (boron), in accordance the *Statistical Analysis Plan, Caledonia Ash Landfill* (OBG, 2017). Analytical results were received on September 17, 2020 and are included in Table 1. The concentration of boron at W09D (0.418 mg/L) remained above the background prediction interval (0.401 mg/L). This document has been prepared on behalf of We Energies by Ramboll to provide pertinent information for an ASD as allowed by 40 CFR Section 257.94(e)(2) for the Caledonia Ash Landfill located in Caledonia, Wisconsin.

BACKGROUND

During Detection Monitoring Round 1, SSIs were reported for boron at monitoring wells W08D, W10D, W49, and W50. The concentrations detected in these wells (both historically and recently) are consistent with the concentrations reported in W09D during detection Monitoring Round 6. As allowed by 40 CFR Section 257.94(e)(2), the April 15, 2018 ASD (OBG, 2018a) was prepared to demonstrate that sources other than Caledonia Ash Landfill (the CCR Unit) caused the SSIs or that the apparent SSIs were a result of natural variation in groundwater quality. Lines of evidence included in the previous ASD were as follows:

- Landfill Design and Hydrogeology: The first portions of the Caledonia Ash Landfill were constructed in 1990 with a 5-foot clay liner with leachate collection, and since 2010 construction of additional cells have been completed with a composite 4-foot thick compacted clay liner and a 60-mil HDPE geomembrane. A leachate collection system underlies all portions of the landfill. The landfill also overlies a significant thickness of the Oak Creek Formation, which has very low permeability.
- Aquifer Geochemistry: The distribution of naturally occurring inorganic compounds and elements in the Silurian Dolomite is variable. In addition, differing geochemical and equilibrium conditions result in the naturally occurring presence of inorganic chemical concentrations that are unrelated to the Caledonia Ash Landfill. The naturally occurring variation in groundwater quality within the dolomite is supported by substantial groundwater sampling and investigation that has been previously completed in this portion of Wisconsin to identify potential sources of constituents detected in groundwater, including molybdenum. These investigations have provided information regarding the variability of naturally occurring concentrations of collocated inorganic constituents in the uppermost aquifer.

In Detection Monitoring Round 6, concentrations of boron in W09D exceeded the background prediction interval during both the semi-annual sampling event, and the resample event but as stated previously, the values were consistent with other downgradient wells. W09D is located downgradient of the Unit and screened at elevations similar to other downgradient monitoring wells (Figure 1). Because W09D is located in the same stratigraphic unit in the vicinity of other downgradient wells, reporting of an SSI for boron at this location is consistent with other downgradient locations, and also attributable to naturally occurring conditions and/or anthropogenic impacts in the area of the Caledonia Ash Landfill. A summary of the of the lines of evidence from the April 15, 2018 ASD (OBG, 2018) is repeated below with specific discussion of W09D included, as appropriate.

LANDFILL DESIGN AND HYDROGEOLOGY

This ASD and prior ASDs are supported by the fact that the Caledonia Ash Landfill was constructed with either a five-foot thick compacted clay liner or a 60-mil high density polyethylene (HDPE) liner overlying four feet of compacted clay as a liner. Precipitation and/or leachate that collects on top of the liner is removed by a leachate collection system and managed in accordance with the landfills operating permit. Leachate levels are monitored within the landfill and the system includes high level alarms to notify the landfill operators if leachate levels exceed predetermined levels. The system is flushed annually as part of regular operation and maintenance. System monitoring and reporting indicate that the leachate collection system is functioning as designed and indicate there is not significant leachate migration into underlying materials.

In the unlikely event that leachate was not captured by the collection system, the landfill and liner system overlie approximately 100 feet of silty clay and the potential for downward migration of leachate into the bedrock is limited by the low hydraulic conductivity of the Oak Creek Formation. Simpkins and Bradbury (1992) calculated downward velocities of 0.3 to 0.5 cm/yr in the Oak Creek Formation. At the highest velocities, it would require over 3,000 years for leachate to migrate through 50 feet of the Oak Creek Formation (a conservative thickness after removing potential sand lenses and fractured clay near the surface), but the Caledonia Ash Landfill has only been active for 20 years, indicating the SSIs are attributable to another source.

AQUIFER GEOCHEMISTRY

The geochemical signature of an aquifer system is a function of the mineralogy of aquifer host rocks, as well as the source and history of fluids that have flowed through the aquifer. Both of these factors have had an effect on groundwater quality in Wisconsin (Luzcaj, 2015). Elevated concentrations of boron and sulfate can be indicative of CCR impacts; however, these compounds are also present at variable concentrations within the bedrock aquifer. Regional studies have been completed to identify sources of molybdenum in private wells near the Caledonia Ash Landfill (WDNR, 2013, and Harkness et al, 2017), and these studies also investigated the occurrence of boron and tritium to determine if molybdenum was present due to the beneficial reuse of CCRs in the area.

As illustrated in the previous April 15, 2018 ASD (OBG, 2018), both investigations support a geogenic source of boron either in the dolomite aquifer itself, or from interactions of groundwater with the underlying Maquoketa Shale. This conclusion was developed using boron isotope and tritium analyses to determine the age of the groundwater in the aquifer and provide a isotopic signature to evaluate potential sources of molybdenum (and boron). The reports infer that elevated sulfate and sodium concentrations occur with boron because of the groundwater residence time and interactions with the host rock. In summary, the study data indicates naturally occurring groundwater, unimpacted by CCRs, may exhibit higher concentrations of boron, sodium, sulfate, and other compounds as a result of chemical interactions of groundwater with sulfide minerals as a result of long residence times within the Silurian Dolomite (i.e. uppermost aquifer). W12D is a monitoring well associated with and located downgradient of the Caledonia Ash Landfill that has similar concentrations to monitoring wells included in the CCR monitoring network. This well was included in the isotope and tritium analyses performed for these regional studies. The tritium results and the isotopic signature indicated that groundwater at this location was not impacted by CCR leachate. Boron concentrations above the background prediction interval in Detection Monitoring Round 1 at downgradient locations W08D, W10D, W49, and W50 were evaluated with respect to aquifer geochemistry and were also demonstrated to be a result of the above conditions. This ASD demonstrates that boron

concentrations at W09D, which are consistent with other downgradient wells that have already been evaluated, are also a result of these conditions.

The general water chemistry comparing leachate to background and downgradient groundwater quality is displayed in the Piper diagram below (Figure A). Background groundwater samples are generally moderate calcium/magnesium (major cations) and a strong bicarbonate/carbonate (major anions) type water, with downgradient wells being slightly stronger in sodium/potassium cations with the exception of well W08D, which are a stronger chloride-sulfate anion water rather than carbonate-bicarbonate. Leachate samples collected from the CCR Unit indicate a moderate calcium/magnesium and strong sulfate type water, with the percent calcium higher and magnesium lower when compared to groundwater. Note that in this diagram W09D plots nearest the background wells when compared to other downgradient well locations.

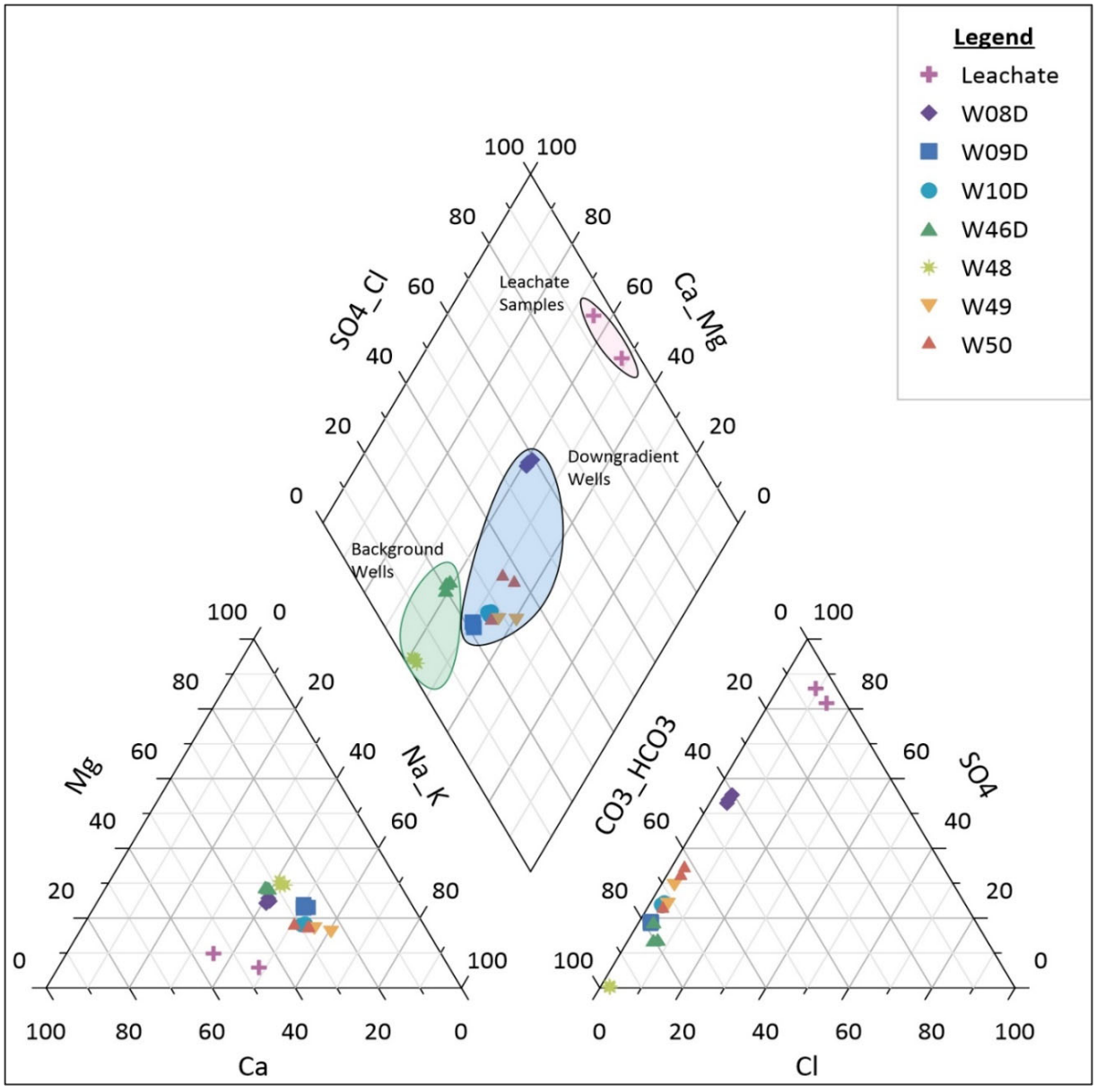


Figure A. Piper Diagram of Groundwater Quality Near Caledonia Ash Landfill

Concentrations of boron in monitoring wells are summarized in Figure B. Concentrations in W09D are within the range and generally lower than those detected in other downgradient monitoring wells. As shown in Figure C, concentrations of boron are consistent and there are no significant trends observed.

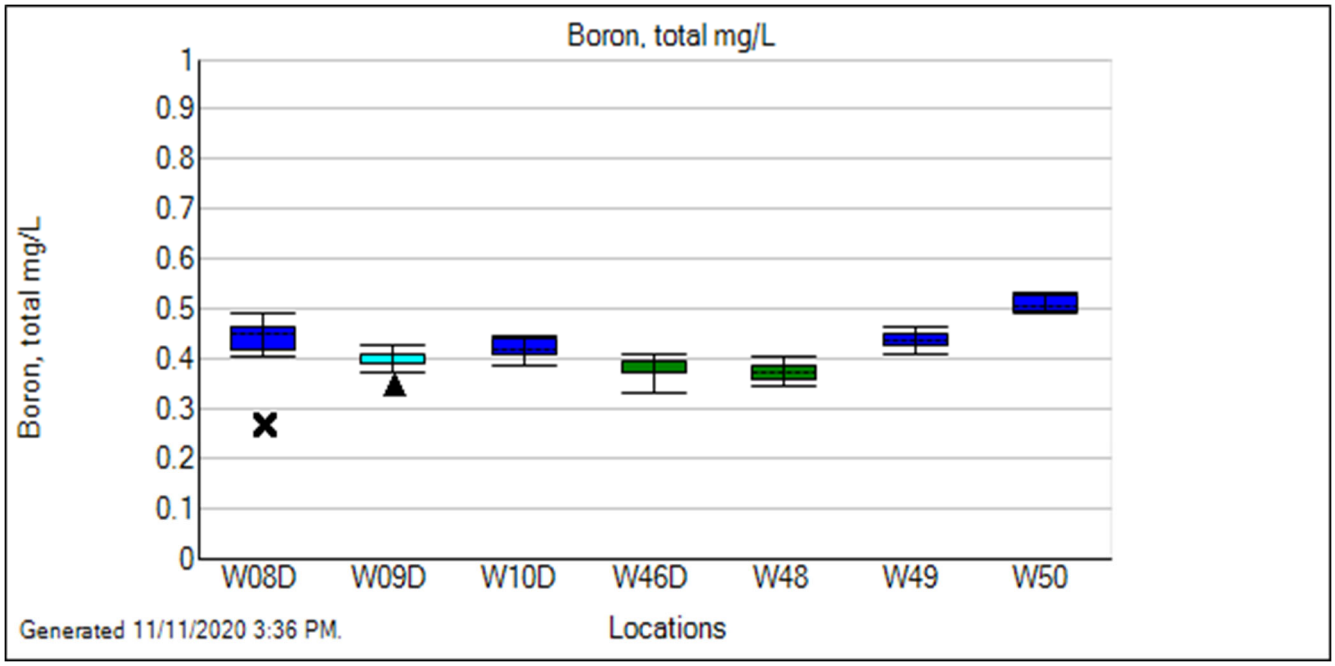


Figure B. Boron Concentrations at Caledonia Ash Landfill

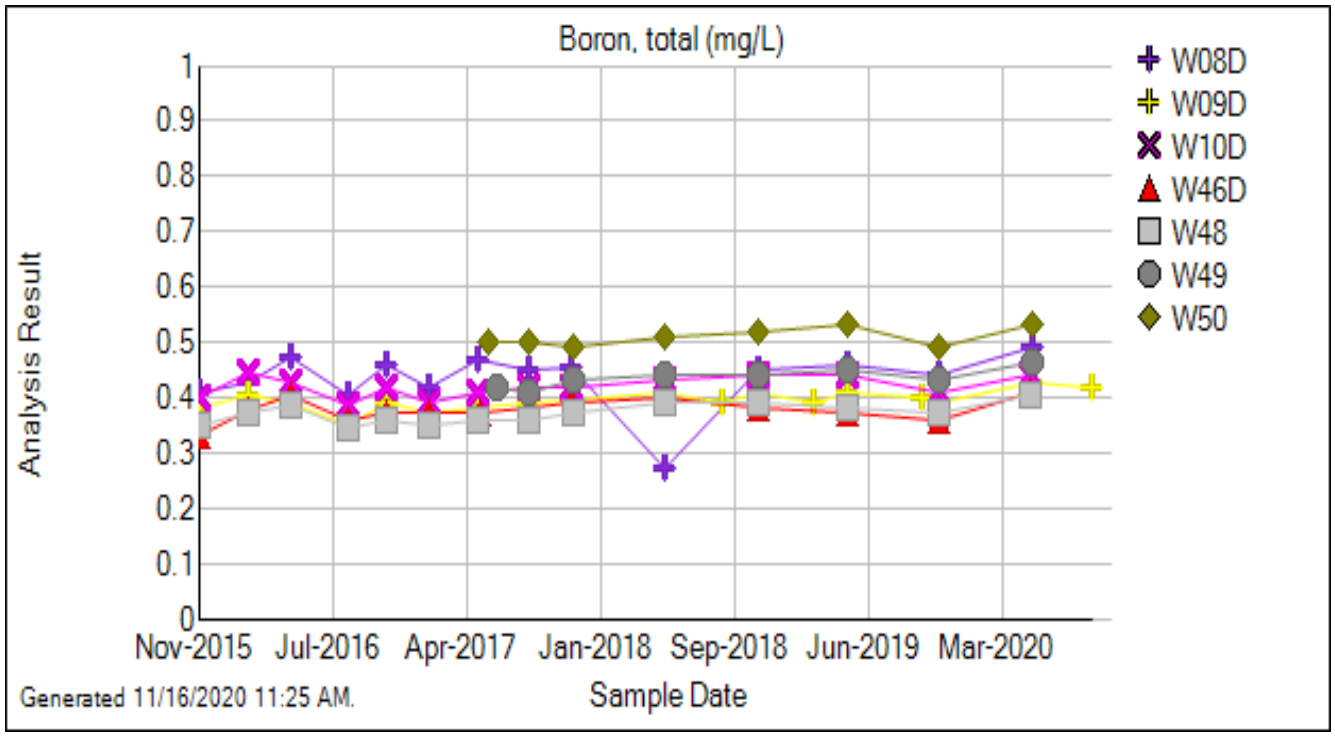


Figure C. Time Series Graph of Boron Concentrations at Caledonia Ash Landfill

As in the April 15, 2018 ASD (OBG, 2018a), the boron concentrations are plotted versus the midpoint of the screen elevation on Figure D. The highest concentrations occur near an elevation of 522.5 at W12D (which was used as a point of comparison due to the inclusion in the regional studies), which was shown not to be impacted by CCR using boron isotopes and tritium analysis, and then decline at higher and lower elevations. Downgradient wells W08D, W09D, W10D, W49 and W50 fall within the range between background and W12D, although the concentrations are closer to background levels in wells W09D, W10D, and W49.than the higher concentrations measured inW12D or W50.

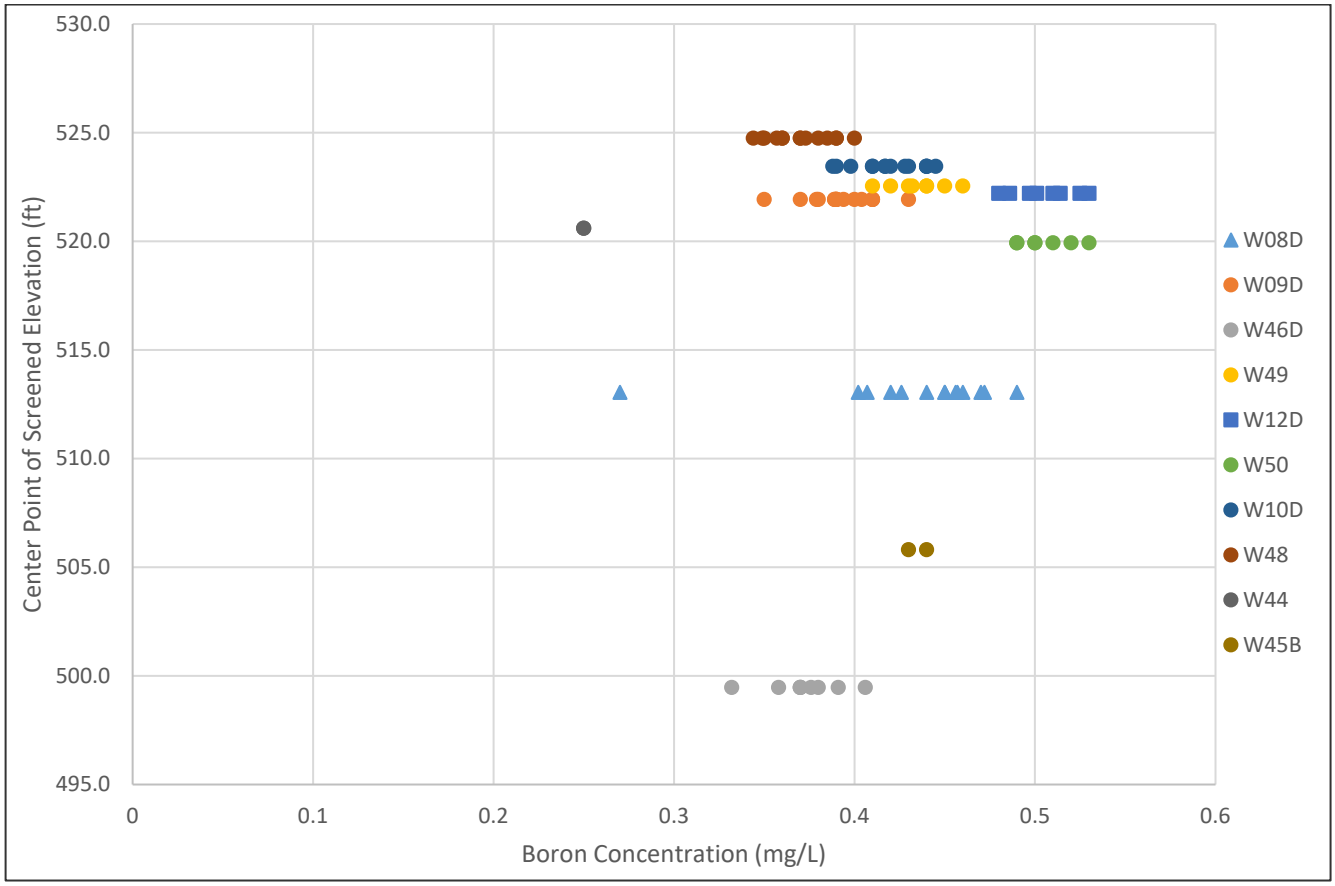


Figure D. Screened Elevations and Boron Concentrations of Monitoring Wells

The location of W09D, like W10D, W49, and W50, is located on the northern upslope of the bedrock valley (Figure 2). The bedrock surface was eroded to the southwest of W09D W10D and W49, and west of W50. The lower bedrock surface within the valley located to the southwest and west of these wells also corresponds to the upgradient groundwater flow direction. The higher bedrock elevations within which wells W09D, W10D, W49, and W50 are screened (midpoint screen elevations of 520 to 522.5 ft) are over 20 feet higher in elevation than the midpoint screen elevation of background well W46D, which is near the base of the bedrock erosional valley. The slightly elevated concentrations of boron and sulfate in the higher elevation downgradient wells versus lower elevation upgradient well appears to be from varying geologic and geochemical conditions within these different bedrock horizons. Similar to the regional investigations previously discussed and detailed in Section 2.2.2 of the April 15, 2018 ASD, this may also indicate the dolomite formation transitions in this area, resulting in changes to chemical composition of the groundwater both vertically and laterally, and is accentuated by the bedrock valley between the upgradient and downgradient wells.

In addition to the observations discussed above, the field parameters measured at W09D and W10D, indicate slightly less reducing conditions and declining pH (Figure E and Attachment 1). These conditions may elevate boron concentrations with respect to background and provides evidence that the ash landfill is not a source because ash leachate is alkaline which would result in increasing pH measurements.

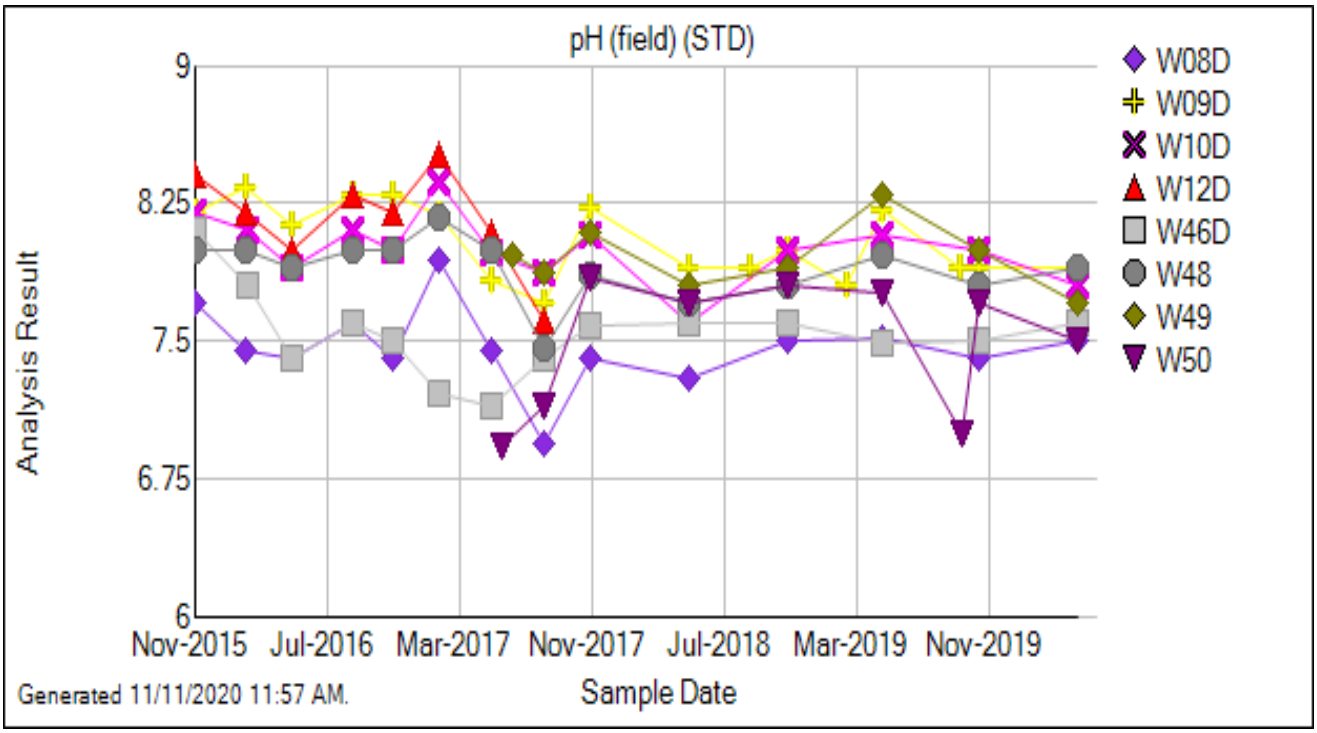


Figure E. pH Measurements in Monitoring Wells at Caledonia Ash Landfill

CONCLUSIONS AND CERTIFICATION

This document has been prepared on behalf of We Energies by Ramboll to provide pertinent information for an ASD as allowed by 40 CFR Section 257.94(e)(2) for the Caledonia Ash Landfill located in Caledonia, Wisconsin. The sixth detection monitoring event was completed on May 4, 2020 and SSI determinations were completed within 90 days of receipt of the analytical reports (August 23, 2020). The determination identified the following SSIs (concentrations greater than background prediction intervals) at downgradient monitoring wells:

- Boron at wells W08D, W09D, W10D, W49, and W50
- Sulfate at wells W08D, W09D, W10D, and W50
- Calcium at wells W08D
- TDS at wells W08D

40 CFR Section 257.94(e)(2) allows the owner or operator 90 days from the date of determination to demonstrate that a source other than the CCR unit caused the SSI, or that the apparent SSI was from a source other than the CCR unit, or that the SSI resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Pursuant to 40 CFR Section 257.94(e)(2), previous documents (OBG, 2018, 2019a, and 2019b) have demonstrated that sources other than the Caledonia Ash Landfill were the cause of the SSIs listed above with the exception of boron at W09D. This ASD was prepared to demonstrate that boron concentrations in W09D, similar to other downgradient locations, are attributed to sources other than the Caledonia Ash Landfill and was completed within 90 days of determination of the SSIs (August 23, 2020) as required by 40 CFR Section 257.94(e)(2).

Pursuant to 40 CFR Section 257.94(e)(2), the following lines of evidence were presented in this report to demonstrate that the boron SSI reported in W09D is due to alternate sources consistent with other downgradient wells and summarized as follows:

- Landfill Design and Hydrogeology
- Aquifer Geochemistry

The preceding information serves as the ASD prepared in accordance with 40 CFR Section 257.94(e)(2) and supports the position that the SSI reported during Detection Monitoring Round 6 were not due to a release from the CCR unit but were from either an error in sampling or analysis or naturally occurring conditions (e.g. natural variation in groundwater quality). Therefore, no further action (i.e. assessment monitoring) is warranted and the Caledonia Ash Landfill will remain in detection monitoring.

If you have any questions regarding this document, please do not hesitate to contact us.

Sincerely,

Glenn R. Luke, PE
Managing Engineer
Professional Engineer No. 42834-6
State of Wisconsin
Ramboll Americas Engineering Solutions, Inc.
Date: November 23, 2020

I, Glenn R. Luke, a qualified professional engineer in good standing in the State of Wisconsin, certify that enclosed information 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.

Nathaniel R. Keller, PG
Senior Hydrogeologist
Professional Geologist No. 1283-013
State of Wisconsin
Ramboll Americas Engineering Solutions, Inc.
Date: November 23, 2020

I, Nathaniel R. Keller, a qualified professional geologist, certify that the enclosed information 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.

Tables

Figures (In Text)

Figures (Attached)

Attachments

REFERENCES

OBG, 2017, *Statistical Analysis Plan, Caledonia Ash Landfill, Caledonia, Wisconsin*, October 17, 2017.

OBG, 2018a, *Alternate Source Demonstration, Caledonia Ash Landfill, Caledonia, Wisconsin*, April 15, 2018.

OBG, 2018b, *40 CFR Section 257.94(e)(2) Alternate Source Demonstration (ASD) Detection Monitoring Round 2, We Energies Caledonia Ash Landfill*, November 27, 2018.

OBG, 2019a, *40 CFR Section 257.94(e)(2) Alternate Source Demonstration (ASD) Detection Monitoring Round 3, We Energies Caledonia Ash Landfill*, May 28, 2019.

OBG, 2019b, *40 CFR Section 257.94(e)(2) Alternate Source Demonstration (ASD) Detection Monitoring Round 4, We Energies Caledonia Ash Landfill*, December 22, 2019.

TABLES

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W08D	11/11/2015	40124666006	0.407	52.500	13.000	1.000	7.700	181.000
	2/16/2016	40128456003	0.426	54.700	11.500	0.720	7.440	191.000
	5/11/2016	40132272002	0.472	57.600	11.600	0.760	7.400	196.000
	8/30/2016	40137606003	0.402	58.200	10.400	0.710	7.600	177.000
	11/14/2016	40142064003	0.457	57.000	12.900	1.100	7.400	204.000
	2/8/2017	40145548002	0.420	51.800	11.000	0.860	7.940	201.000
	5/15/2017	40150143005	0.470	51.400	10.600	0.910	7.450	204.000
	8/22/2017	40155549007	0.450	48.900	10.800	1.100	6.940	203.000
	11/14/2017	40161125002	0.456	49.100	11.900	1.100	7.410	222.000
	5/16/2018	AE27556	0.270	51.000	10.000	0.960	7.300	200.000
	11/14/2018	AE31851	0.450	50.000	10.000	0.950	7.500	210.000
	5/8/2019	AE37963	0.460	51.000	10.000	1.100	7.520	230.000
	11/4/2019	AE41843	0.440	48.000	10.000	1.000	7.400	200.000
	5/5/2020	AE45611	0.491	52.800	9.700	0.840	7.500	200.000
W09D	11/11/2015	40124666005	0.379	19.900	4.600	1.300	8.200	30.400
	2/16/2016	40128456004	0.404	18.600	4.900	1.300	8.340	31.200
	5/11/2016	40132272003	0.389	18.800	4.900	1.400	8.130	32.300
	8/30/2016	40137606004	0.350	19.900	4.100	1.300	8.300	31.500
	11/14/2016	40142064004	0.389	18.900	3.900	1.400	8.300	33.900
	2/8/2017	40145548003	0.370	18.400	4.000	1.300	8.190	33.500

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W09D	5/15/2017	40150143006	0.380	17.900	3.800	1.400	7.830	33.400
	8/22/2017	40155549008	0.390	17.700	3.800	1.300	7.700	31.800
	11/14/2017	40161125003	0.394	18.600	4.900	1.400	8.230	32.200
	5/16/2018	AE27554	0.410	19.000	3.400	1.200	7.900	32.000
	9/7/2018	AE30278	0.390				7.900	
	11/14/2018	AE31849	0.410	19.000	3.400	1.200	8.000	34.000
	3/5/2019	AE34023	0.390				7.800	
	5/8/2019	AE37960	0.410	18.000	3.700	1.300	8.210	37.000
	10/2/2019	AE40913	0.400				7.900	
	11/4/2019	AE41842	0.390	18.000	3.600	1.300	7.900	33.000
	5/5/2020	AE45609	0.429	19.000	3.700	1.300	7.900	34.000
	8/31/2020	AE48108	0.418				7.850	
W10D	11/11/2015	40124666004	0.398	22.700	4.700	1.200	8.200	38.800
	2/17/2016	40128456007	0.445	23.300	6.300	1.200	8.100	43.000
	5/11/2016	40132272005	0.428	21.600	6.500	1.300	7.900	46.000
	8/30/2016	40137606005	0.388	21.800	4.700	1.300	8.100	41.600
	11/14/2016	40142064005	0.417	21.600	4.400	1.400	8.000	44.000
	2/8/2017	40145548005	0.390	20.500	4.300	1.300	8.360	41.700
	5/15/2017	40150143007	0.410	20.300	4.200	1.400	7.980	43.000
	8/22/2017	40155549009	0.420	20.700	4.200	1.300	7.870	40.800
	11/14/2017	40161125004	0.417	20.400	4.300	1.400	8.070	44.500

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W10D	5/16/2018	AE27553	0.430	21.000	3.500	1.200	7.600	41.000
	11/15/2018	AE31854	0.440	21.000	3.500	1.200	8.000	43.000
	5/8/2019	AE37959	0.440	21.000	4.000	1.200	8.070	46.000
	11/5/2019	AE41847	0.410	20.000	3.700	1.200	8.000	40.000
	5/4/2020	AE45607	0.441	21.300	3.800	1.300	7.800	41.000
W48	11/11/2015	40124666002	0.349	27.200	4.600	0.900	8.000	2.300
	2/16/2016	40128456002	0.373	24.900	5.000	0.900	8.000	3.000
	5/11/2016	40132272006	0.385	26.700	4.900	0.980	7.900	2.600
	8/30/2016	40137606001	0.344	28.100	4.100	0.900	8.000	<2.000
	11/14/2016	40142064006	0.357	26.500	4.100	0.990	8.000	<1.000
	2/8/2017	40145548001	0.350	26.300	4.000	0.930	8.170	1.300
	5/15/2017	40150143004	0.360	25.100	3.800	0.950	7.990	<1.000
	8/21/2017	40155549006	0.360	27.300	3.800	0.920	7.460	<1.000
	11/15/2017	40161125005	0.370	27.400	4.100	1.000	7.860	<1.000
	5/16/2018	AE27551	0.390	27.000	3.500	0.850	7.700	0.620
	11/15/2018	AE31852	0.390	26.000	3.500	0.820	7.800	0.560
	5/8/2019	AE37957	0.380	27.000	3.700	0.970	7.960	2.500
	11/5/2019	AE41845	0.370	25.000	3.500	0.880	7.800	<0.140
	5/4/2020	AE45605	0.403	27.600	3.600	0.910	7.900	0.740
W49	6/21/2017	40152212001	0.420	40.600	6.500	1.200	7.970	44.900
	8/22/2017	40155549012	0.410	24.900	6.300	1.300	7.870	46.100

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W49	11/15/2017	40161125007	0.432	19.500	5.800	1.500	8.090	51.600
	5/16/2018	AE27557	0.440	18.000	5.000	1.200	7.800	47.000
	11/15/2018	AE31853	0.440	20.000	4.900	1.000	7.900	43.000
	5/8/2019	AE37958	0.450	16.000	4.600	1.400	8.300	54.000
	11/5/2019	AE41846	0.430	16.000	4.200	1.300	8.000	50.000
	5/5/2020	AE45608	0.463	17.700	4.200	1.300	7.700	22.000
W50	6/2/2017	40151093001	0.500	30.800	6.500	1.200	6.920	51.300
	8/22/2017	40155549013	0.500	25.900	5.400	1.200	7.150	75.200
	11/15/2017	40161125008	0.490	26.200	5.800	1.300	7.840	80.800
	5/16/2018	AE27555	0.510	28.000	5.400	1.100	7.700	75.000
	11/15/2018	AE31855	0.520	27.000	5.700	1.000	7.800	76.000
	5/8/2019	AE37962	0.530	30.000	6.800	1.100	7.760	83.000
	10/3/2019	AE41032					7.000	
	11/5/2019	AE41848	0.490	28.000	5.900	0.990	7.700	73.000
	5/5/2020	AE45610	0.534	29.900	5.600	1.100	7.500	60.000

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

Well Id	Date Sampled	Lab Id	TDS, mg/L
W08D	11/11/2015	40124666006	432.000
	2/16/2016	40128456003	460.000
	5/11/2016	40132272002	446.000
	8/30/2016	40137606003	484.000
	11/14/2016	40142064003	510.000
	2/8/2017	40145548002	454.000
	5/15/2017	40150143005	448.000
	8/22/2017	40155549007	444.000
	11/14/2017	40161125002	416.000
	5/16/2018	AE27556	440.000
	11/14/2018	AE31851	430.000
	5/8/2019	AE37963	440.000
	11/4/2019	AE41843	430.000
	5/5/2020	AE45611	450.000
W09D	11/11/2015	40124666005	202.000
	2/16/2016	40128456004	198.000
	5/11/2016	40132272003	194.000
	8/30/2016	40137606004	206.000
	11/14/2016	40142064004	206.000
	2/8/2017	40145548003	192.000

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			TDS, mg/L
W09D	5/15/2017	40150143006	200.000
	8/22/2017	40155549008	208.000
	11/14/2017	40161125003	170.000
	5/16/2018	AE27554	180.000
	11/14/2018	AE31849	160.000
	5/8/2019	AE37960	190.000
	11/4/2019	AE41842	150.000
	5/5/2020	AE45609	160.000
W10D	11/11/2015	40124666004	222.000
	2/17/2016	40128456007	190.000
	5/11/2016	40132272005	206.000
	8/30/2016	40137606005	232.000
	11/14/2016	40142064005	210.000
	2/8/2017	40145548005	192.000
	5/15/2017	40150143007	196.000
	8/22/2017	40155549009	222.000
	11/14/2017	40161125004	180.000
	5/16/2018	AE27553	180.000
	11/15/2018	AE31854	160.000
	5/8/2019	AE37959	190.000
	11/5/2019	AE41847	180.000

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			TDS, mg/L
W10D	5/4/2020	AE45607	190.000
W48	11/11/2015	40124666002	254.000
	2/16/2016	40128456002	222.000
	5/11/2016	40132272006	224.000
	8/30/2016	40137606001	242.000
	11/14/2016	40142064006	238.000
	2/8/2017	40145548001	224.000
	5/15/2017	40150143004	236.000
	8/21/2017	40155549006	254.000
	11/15/2017	40161125005	244.000
	5/16/2018	AE27551	200.000
	11/15/2018	AE31852	130.000
	5/8/2019	AE37957	220.000
	11/5/2019	AE41845	190.000
	5/4/2020	AE45605	210.000
W49	6/21/2017	40152212001	236.000
	8/22/2017	40155549012	216.000
	11/15/2017	40161125007	210.000
	5/16/2018	AE27557	180.000
	11/15/2018	AE31853	170.000
	5/8/2019	AE37958	210.000

Caledonia CCR
Table 1. Caledonia Ash Landfill: Appendix III Analytical Results

Date Range: 11/11/2015 to 08/31/2020

			TDS, mg/L
W49	11/5/2019	AE41846	180.000
	5/5/2020	AE45608	190.000
W50	6/2/2017	40151093001	270.000
	8/22/2017	40155549013	256.000
	11/15/2017	40161125008	260.000
	5/16/2018	AE27555	250.000
	11/15/2018	AE31855	220.000
	5/8/2019	AE37962	270.000
	10/3/2019	AE41032	260.000
	11/5/2019	AE41848	260.000
	5/5/2020	AE45610	240.000

FIGURES

CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

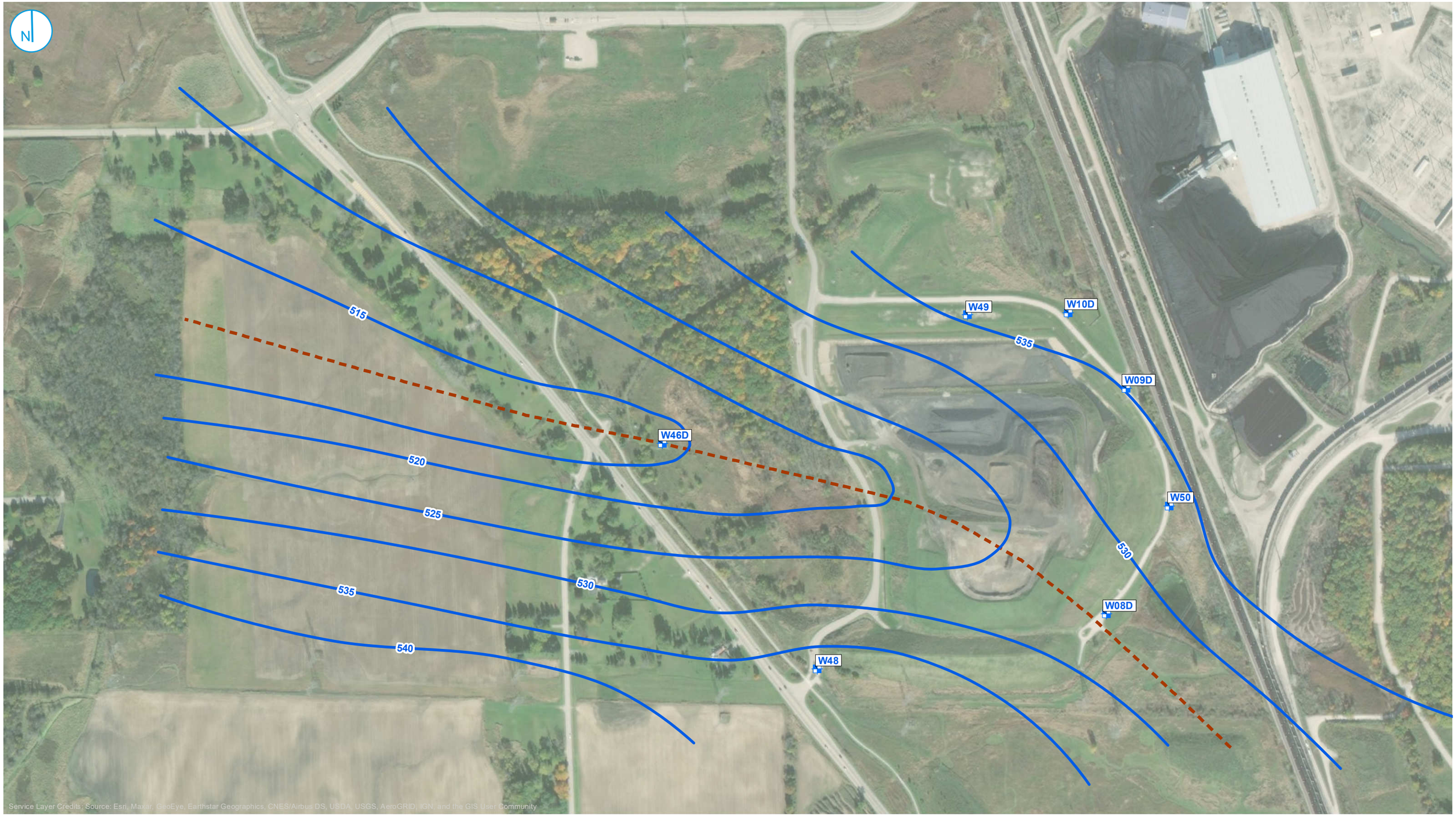
0 250 500 Feet

GROUNDWATER FLOW CONTOURS
MAY 4, 2020

FIGURE 1

ALTERNATE SOURCE DEMONSTRATION
CALEDONIA ASH LANDFILL
CALEDONIA, WI

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



BEDROCK UNIT (UPPERMOST AQUIFER) CCR MONITORING WELL LOCATION

TOP OF AQUIFER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)

APPROXIMATE CENTERLINE OF BEDROCK VALLEY

0 200 400 Feet

TOP OF UPPERMOST AQUIFER - SILURIAN DOLOMITE

ALTERNATE SOURCE DEMONSTRATION
CALEDONIA ASH LANDFILL
CALEDONIA, WI

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

ATTACHMENTS

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W08D**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.028	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-0.441
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	None

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W09D**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.338	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-2.008
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	Downward

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W10D**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.169	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-1.712
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	Downward

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W12D**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	-0.001	STD per period
R-Squared error of fit:	0.240	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	-0.001	STD per period
Lower Confidence Limit of Slope, M1:	-0.002	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-0.997
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	None

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W48**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.114	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-1.892
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	Downward

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W49**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.011	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.000	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	-0.124
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	None

Caledonia CCR
Mann-Kendall Trend Analysis

User Supplied Information

Location ID:	**W50**	**Parameter Code:**	**00400**
Location Class:		**Parameter:**	**pH (field)**
Location Type:		**Units:**	**STD**
Confidence Level:	**95.00%**		

Date Range: 11/11/2015 to 05/05/2020

Trend Analysis

Trend of the least squares straight line

Slope (fitted to data):	0.000	STD per period
R-Squared error of fit:	0.052	

Sen's Non-parametric estimate of the slope (two-tailed test)

Median Slope:	0.000	STD per period
Lower Confidence Limit of Slope, M1:	0.000	STD per period
Upper Confidence Limit of Slope, M2+1:	0.001	STD per period

Non-parametric Mann-Kendall Test for Trend

S Statistic:	0.000
Z test:	1.645
At the 95.0 % Confidence Level (two-tailed test):	None