Annual Groundwater Monitoring Report

DTE Electric Company
Range Road Coal Combustion Residual Landfill

3600 Range Road
China Township, Michigan

January 2018

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Prepared For
DTE Electric Company

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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the DTE Electric Company (DTE Electric) Range Road Coal Combustion Residual Landfill (RRLF) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), prepared this Annual Groundwater Monitoring Report (Annual Report) for the RRLF CCR unit on behalf of DTE Electric. This Annual Report was prepared in accordance with the requirements of §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the October 2017 semiannual groundwater monitoring event for the RRLF CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels.

Potential SSIs over background limits were noted for chloride in one or more downgradient wells for the October 2017 monitoring event. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels. Based on the hydrogeology at the Site, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the RRLF CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. Due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

According to §257.94(e), if the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, establish an assessment monitoring program **<or>** demonstrate that:

- A source other than the CCR unit caused the SSI, or
- The SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

In response to the potential chloride SSIs over background limits noted during the October 2017 monitoring event, DTE Electric plans to collect a resample for each of the potential SSIs and prepare an Alternative Source Demonstration (ASD) to evaluate the SSIs and demonstrate that natural variation within the uppermost aquifer is the cause of the SSIs.

Section 1
Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the DTE Electric Company (DTE Electric) Range Road Coal Combustion Residual Landfill (RRLF) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), prepared this Annual Groundwater Monitoring Report (Annual Report) for the RRLF CCR unit on behalf of DTE Electric. This Annual Report was prepared in accordance with the requirements of §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the October 2017 semiannual groundwater monitoring event for the RRLF CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Range Road Landfill* (QAPP) (TRC, July 2016; revised August 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan – DTE Electric Company Range Road Coal Combustion Residual Landfill* (Stats Plan) (TRC, October 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) of detection monitoring parameters compared to background levels.

1.2 Site Overview

The RRLF is located in Section 12, Township 4 North, Range 16 East, 3600 Range Road, China Township in St. Clair County, Michigan. The site occupies approximately 514 acres one-half mile west of the St. Clair River and one mile north of the Belle River Power Plant. Prior to Detroit Edison's operations commencing in the 1950s, the RRLF property was used as farmland. The property has been used continuously as a coal ash landfill since Detroit Edison Company (now DTE Electric) began coal ash landfilling operations at the RRLF in the 1950s and is constructed over a natural confining, low permeability clay-rich soil base that serves as an

underlying soil barrier. The RRLF property consists of approximately 514 acres of which approximately 402 acres are designated for landfill development. CCR currently occupies approximately 200 acres of the RRLF and the landfill is estimated to have several decades of capacity remaining.

The RRLF is a licensed Type III solid waste disposal facility in accordance with Michigan's regulations, and is owned and operated by DTE Electric. The disposal facility currently accepts coal ash from DTE Electric's St. Clair and Belle River power plants and has historically accepted coal ash from the former DTE Electric Harbor Beach and Marysville power plants. The RRLF is operated under the current operating license number 9395 in accordance with Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended.

1.3 Geology/Hydrogeology

The RRLF CCR unit is located approximately one-half mile west of the St. Clair River. In general, the RRLF is initially underlain by 86 to as much as 188 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits, although on the eastern portion and northwest corner of RRLF some thin partially saturated silty sand near-surface deposits are present. These deposits are not laterally contiguous, are not in communication with the deeper uppermost aquifer, do not yield a useable quantity of groundwater, and thus are not considered an aquifer per the CCR Rule. On a significant portion of the RRLF, there is a bedrock valley that trends from the northeast corner to the south central area of the site. The valley is incised in the Bedford and/or Antrim Shale bedrock and filled with unconsolidated glacial deposits consisting of clay, silt, sand and/or gravel. Based on historical oil well logs from the RRLF area, the bedrock valley extends to depths of up to 303 feet below ground surface (ft bgs). Along the western portion of the RRLF, clay-rich till is present continuously to the top of the underlying Bedford or Antrim Shale bedrock in the area of SB-16-01 and SB-16-02 (Figure 1), creating a no flow boundary.

Groundwater within the uppermost aquifer sand/gravel is confined and protected from CCR constituents by the overlying clay-rich aquitard. The top of the sand/gravel uppermost aquifer encountered at each of the CCR monitoring wells and soil borings is at significantly different elevations across the RRLF that, where present, is first encountered at depths ranging from 86 to 196 ft bgs, immediately beneath the overlying clay-rich aquitard. The variability in boring/well depths is a consequence of the heterogeneity of the glacial deposits and is driven by the limited continuity of the coarse-grained sand and gravel outwash within the overlying/encapsulating fine-grained, silty clay till that confines the uppermost aquifer. In addition, there is an apparent lack of interconnection and/or significant vertical variation between the various uppermost aquifer sand and/or gravel units encountered across the RRLF CCR unit.

Given the horizontally expansive clay with substantial vertical thickness, the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the RRLF CCR unit varying up to 100 feet vertically), the no-flow boundary to the west, and the lack of hydraulic interconnectedness of the uppermost aquifers encountered at the site in some areas, it is not appropriate to infer horizontal flow direction or gradients across the site. In addition, the elevation of leachate beneath the CCR within the RRLF and surface water managed in the perimeter ditch network is approximately 10 to 20 feet above the potentiometric surface elevations in the uppermost aquifer. This shows that if the leachate and/or potentially CCR affected groundwater were able to penetrate the clay-rich underlying confining till, that it would travel radially away from the RRLF. However, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the RRLF CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations that began in the 1950s.

Because the uppermost aquifer is not uniformly present across the site, there are no apparent hydraulically upgradient wells, and the uppermost aquifer, where present, is isolated by a laterally contiguous silty-clay unit that significantly impedes vertical groundwater flow thus preventing the uppermost aquifer from potentially being affected by CCR, monitoring of the RRLF CCR unit using interwell statistical methods (upgradient to downgradient) is not likely appropriate. Instead, based on these hydrogeologic conditions, intrawell statistical approaches are a more appropriate method to evaluate groundwater data statistically. Consequently, intrawell statistical tests are being used during detection monitoring as outlined in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the RRLF CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company Range Road Coal Combustion Residual Landfill* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the RRLF CCR unit currently consists of seven monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

As discussed in the Stats Plan, intrawell statistical methods for RRLF were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the variability in the presence of the uppermost aquifer across the site, and presence of no flow boundary on the west side of the aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). An intrawell statistical approach requires that each of the downgradient wells doubles as the background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background dataset from that same well. Monitoring wells MW-16-01 through MW-16-07 are located around the north, east and south perimeter of the RRLF and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of seven background/downgradient monitoring wells).

2.2 Background Sampling

Background groundwater monitoring was conducted at the RRLF CCR unit from August 2016 through September 2017 in accordance with the QAPP. Data collection included eight background data collection events of static water elevation measurements, analysis for parameters required in the CCR Rule's Appendix III and Appendix IV to Part 257, and field parameters (dissolved oxygen, oxidation reduction potential, pH, specific conductivity, temperature, and turbidity) from all seven monitoring wells installed for the RRLF CCR unit, in addition to several supplemental sampling events at select locations. The supplemental background sampling events were conducted for a subset of monitoring wells in August and September 2017 to expand the background data set and confirm analytical results; one additional event from MW-16-04, and four additional events from monitoring well MW-16-07. The groundwater samples were analyzed by TestAmerica Laboratories, Inc. (TestAmerica).

Background data are included in Appendix A Tables 1 through 3, where: Table 1 is a summary of static water elevation data; Table 2 is a summary of groundwater analytical data compared to potentially relevant criteria; and Table 3 is a summary of field data. In addition to the data tables, groundwater potentiometric elevation data are summarized for each background monitoring event in Appendix A Figure 1.

2.3 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field reading), sulfate, and total dissolved solids (TDS) and were analyzed in accordance with the sampling and analysis plan included within the QAPP. In addition to pH, the collected field parameters included dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity.

2.3.1 Data Summary

The initial semiannual groundwater detection monitoring event for 2017 was performed during October 3 through October 5, 2017, by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all seven monitoring well locations. Groundwater samples were collected from the seven detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the October 2017 event is provided on Table 1 (static groundwater elevation data), Table 2 (analytical results), and Table 3 (field data).

2.3.2 Data Quality Review

Data from each round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. Particular data non-conformances are summarized in Appendix B.

2.3.3 Groundwater Flow Rate and Direction

As presented in the GWMS Report, and mentioned above, given the horizontally expansive clay with substantial vertical thickness, the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the RRLF CCR unit varying up to 100 feet vertically), the no-flow boundary to the west, and the lack of hydraulic interconnectedness of the uppermost aquifers encountered at the site in

some areas, it is not appropriate to infer horizontal flow direction or gradients across the site. Groundwater elevations measured across the Site during the October 2017 sampling event are provided on Table 1 and are summarized in plan view on Figure 3.

Groundwater elevation data collected during the most recent sampling event show that groundwater conditions within the uppermost aquifer are consistent with previous monitoring events, and continue to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the RRLF CCR unit.

Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the collection of at least eight background monitoring events using data collected from each of the seven established detection monitoring wells (MW-16-01 through MW-16-07). The statistical evaluation of the background data is presented in detail in Appendix C. The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the RRLF CCR unit by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-01 through MW-16-07) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-01 is compared to the background limit developed using the background dataset from MW-16-01, and so forth). The comparisons are presented on Table 4.

The statistical evaluation of the October 2017 Appendix III indicator parameters shows potential SSIs over background for:

- Chloride at MW-16-03, MW-16-06, and MW-16-07.

There were no SSIs compared to background for boron, calcium, fluoride, pH, sulfate or TDS.

Section 4
Conclusions and Recommendations

Potential SSIs over background limits were noted for chloride in one or more downgradient wells during the October 2017 monitoring event. This is the initial detection monitoring event; therefore, it is the initial identification of a potential SSI over background levels. As discussed above, and in the GWMS Report, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the RRLF CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. Due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

According to §257.94(e), in the event that the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, establish an assessment monitoring program **<or>** demonstrate that:

- A source other than the CCR unit caused the SSI, or
- The SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

The owner or operator must complete a written demonstration (i.e., Alternative Source Demonstration, ASD), of the above within 90 days of confirming the SSI. Based on the outcome of the ASD the following steps will be taken:

- If a successful ASD is completed, a certification from a qualified professional engineer is required, and the CCR unit may continue with detection monitoring.
- If a successful ASD is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under §257.95. The facility must also include the ASD in the annual groundwater monitoring and corrective action report required by §257.90(e), in addition to the certification by a qualified professional engineer.

In response to the potential SSIs over background limits noted for October 2017, DTE Electric plans to collect a resample for each of the potential SSIs and prepare an ASD within 90-days to evaluate the SSIs. The SSI is likely the result of temporal variability that was not captured in the background data set, given the short duration of time that the background data set was collected, but this will be further evaluated during the ASD process.

No corrective actions were performed in 2017. The next semiannual monitoring event at the RRLF is scheduled for the second calendar quarter of 2018.

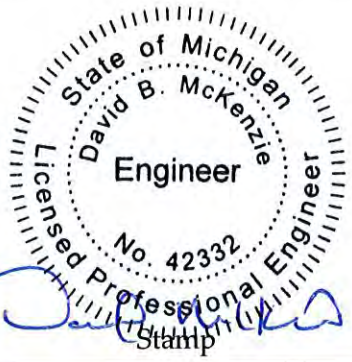
Section 5
Groundwater Monitoring Report Certification

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.90(e) requires that the owner or operator of an existing CCR unit prepare an annual groundwater monitoring and corrective action report.

Annual Groundwater Monitoring Report Certification
Range Road Landfill
China Township, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the RRLF CCR unit has been prepared to meet the requirements of Title 40 CFR §257.90(e) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.90(e).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2019	 Stamp
Company: TRC Engineers Michigan, Inc.	Date: 1/30/18	

Section 6
References

TRC Environmental Corporation. July 2016; Revised March and August 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Range Road Landfill, 3600 Range Road, China Township, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report – DTE Electric Company Range Road Coal Combustion Residual Landfill, 3600 Range Road, China Township, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – DTE Electric Company Range Road Coal Combustion Residual Landfill, 3600 Range Road, China Township, Michigan. Prepared for DTE Electric Company.

Tables

Table 1
Summary of Groundwater Elevation Data – October 2017
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Date Installed	1/13/2016		1/27/2016		2/1/2016		5/24/2016		5/13/2016		5/10/2016		5/13/2016	
TOC Elevation	595.35		598.44		597.69		596.87		601.97		600.68		589.34	
Geologic Unit of Screened interval	Sand with Silt		Silty Sand with Gravel		Silty Gravel with Sand		Silty Sand		Gravel with Sand		Sand		Sand	
Screened Interval Elevation	390.7 to 385.7		393.8 to 388.8		432.1 to 427.1		414.1 to 409.1		476.6 to 471.6		508.0 to 503.0		494.4 to 489.4	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
10/3/2017	19.00	576.35	21.16	577.28	20.37	577.32	19.73	577.14	27.89	574.08	24.01	576.67	16.25	573.09

Notes:

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet below top of casing.

Table 2
Summary of Groundwater Analytical Data – October 2017
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-01	MW-16-02	MW-16-03	MW-16-04	MW-16-05	MW-16-06	MW-16-07
Sample Date:		10/3/2017	10/3/2017	10/3/2017	10/5/2017	10/3/2017	10/3/2017	10/5/2017
Constituent	Unit							
Appendix III								
Boron	ug/L	470	980	950	980	1,100	910	790
Calcium	ug/L	79,000	21,000	18,000	64,000	18,000	28,000	46,000
Chloride	mg/L	760	720	570	3,200	620	610	350
Fluoride	mg/L	0.90	2.0	2.2	1.5	1.9	1.5	1.2
pH, Field	SU	7.6	8.2	8.0	8.2	8.1	7.8	7.7
Sulfate	mg/L	34	< 1.0	< 1.0	< 5.0	< 1.0	23	15
Total Dissolved Solids	mg/L	1,300	1,200	990	4,900	1,000	990	700

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total

unless otherwise specified.

Table 3
Summary of Field Data – October 2017
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	10/3/2017	0.13	-125.3	7.6	2,321	12.85	1.46
MW-16-02	10/3/2017	0.09	-244.0	8.2	2,222	12.98	0.99
MW-16-03	10/3/2017	0.12	-177.1	8.0	1,931	13.35	1.15
MW-16-04	10/5/2017	0.43	-191.7	8.2	8,912	11.61	51.1
MW-16-05	10/3/2017	0.21	-160.7	8.1	2,017	12.57	1.46
MW-16-06	10/3/2017	0.22	-156.1	7.8	1,874	13.35	1.31
MW-16-07	10/5/2017	0.20	-163.6	7.7	1,229	12.51	49.5

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric turbidity units.

Table 4
Comparison of Appendix III Parameter Results to Background Limits – October 2017
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Sample Date:		10/3/2017		10/3/2017		10/3/2017		10/5/2017		10/3/2017		10/3/2017		10/5/2017	
Constituent	Unit	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL
Appendix III															
Boron	ug/L	470	560	980	1,100	950	1,200	980	1,100	1,100	1,400	910	1,200	790	950
Calcium	ug/L	79,000	89,000	21,000	24,000	18,000	21,000	64,000	67,000	18,000	19,000	28,000	31,000	46,000	66,000
Chloride	mg/L	760	770	720	720	**570**	550	3,200	3,600	620	620	**610**	590	**350**	330
Fluoride	mg/L	0.90	0.95	2.0	2.1	2.2	2.3	1.5	1.6	1.9	1.9	1.5	1.6	1.2	1.3
pH, Field	SU	7.6	7.1 - 8.4	8.2	8.2 - 9.0	8.0	8.0 - 8.8	8.2	7.5 - 8.5	8.1	8.0 - 8.9	7.8	7.6 - 8.4	7.7	7.2 - 8.3
Sulfate	mg/L	34	43	< 1.0	10	< 1.0	10	< 5.0	50	< 1.0	10	23	31	15	120
Total Dissolved Solids	mg/L	1,300	1,300	1,200	1,200	990	1,200	4,900	5,300	1,000	1,200	990	1,100	700	770

Notes:

ug/L - micrograms per liter.

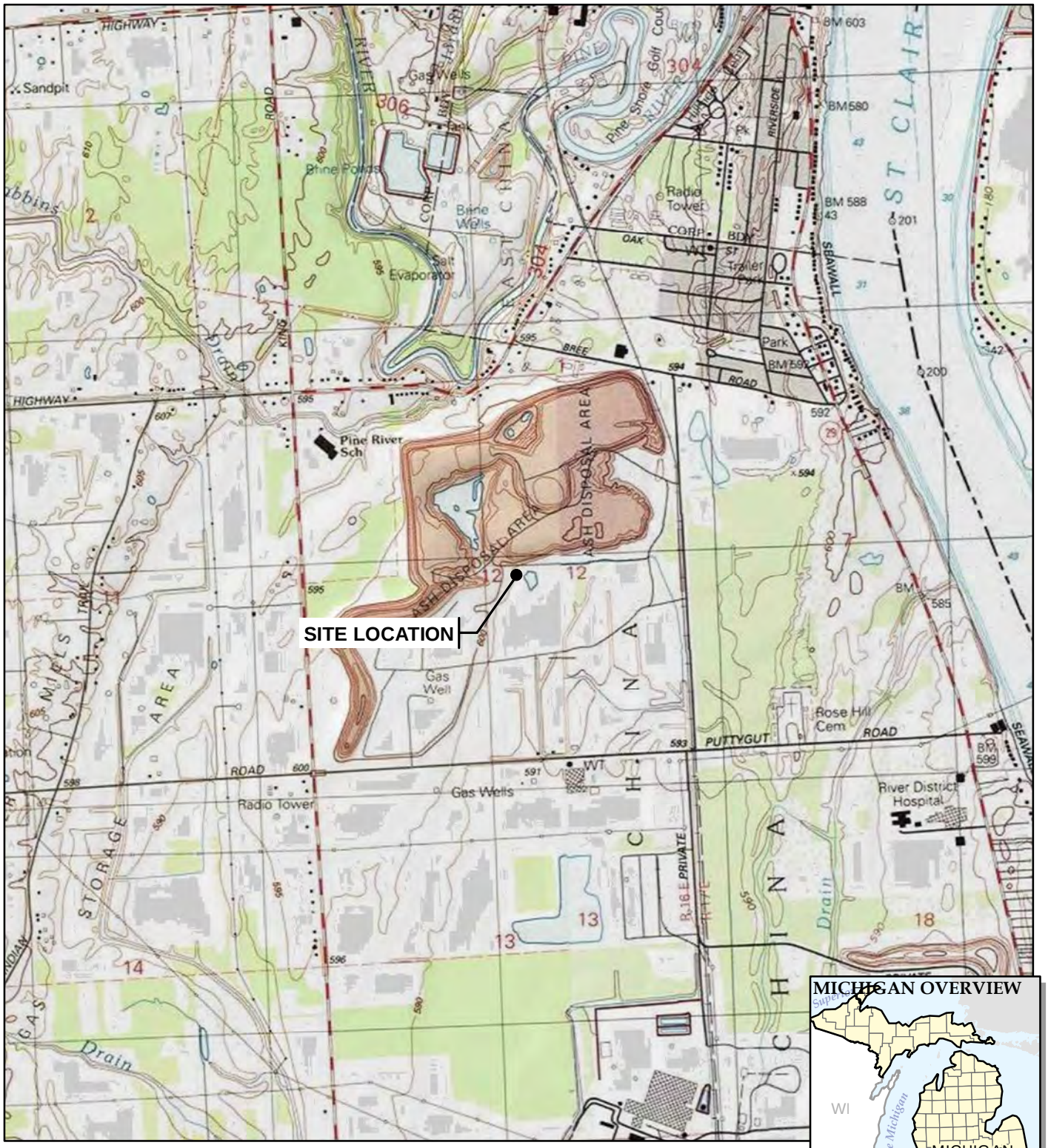
mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

RESULT Shading and bold font indicates an exceedance of the Prediction Limit (PL).

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

TRC
1540 Eisenhower Place
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TRC - GIS

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	J PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V BUENING
DATE:	DECEMBER 2017
PROJ. NO.:	254222.0000
FILE:	254222-001slmMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2016_231828\254222-001slmMB.mxd -- Saved By: SMAJOR on 12/8/2017, 09:25:05 AM

LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- OIL/GAS WELL LOCATION

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.
3. OIL AND GAS WELL LOCATIONS FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, GEOWEBFACE.

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

MONITORING NETWORK AND SITE PLAN

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0000
CHECKED BY:	S HOLMSTROM		**FIGURE 2**
APPROVED BY:	V. BUENING		
DATE:	OCTOBER 2017		

TRC
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Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trcsolutions.com

FILE NO.: 265996-0000-002.mxd

Plot Date: 10/12/2017, 09:21:55 AM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0000-002.mxd

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

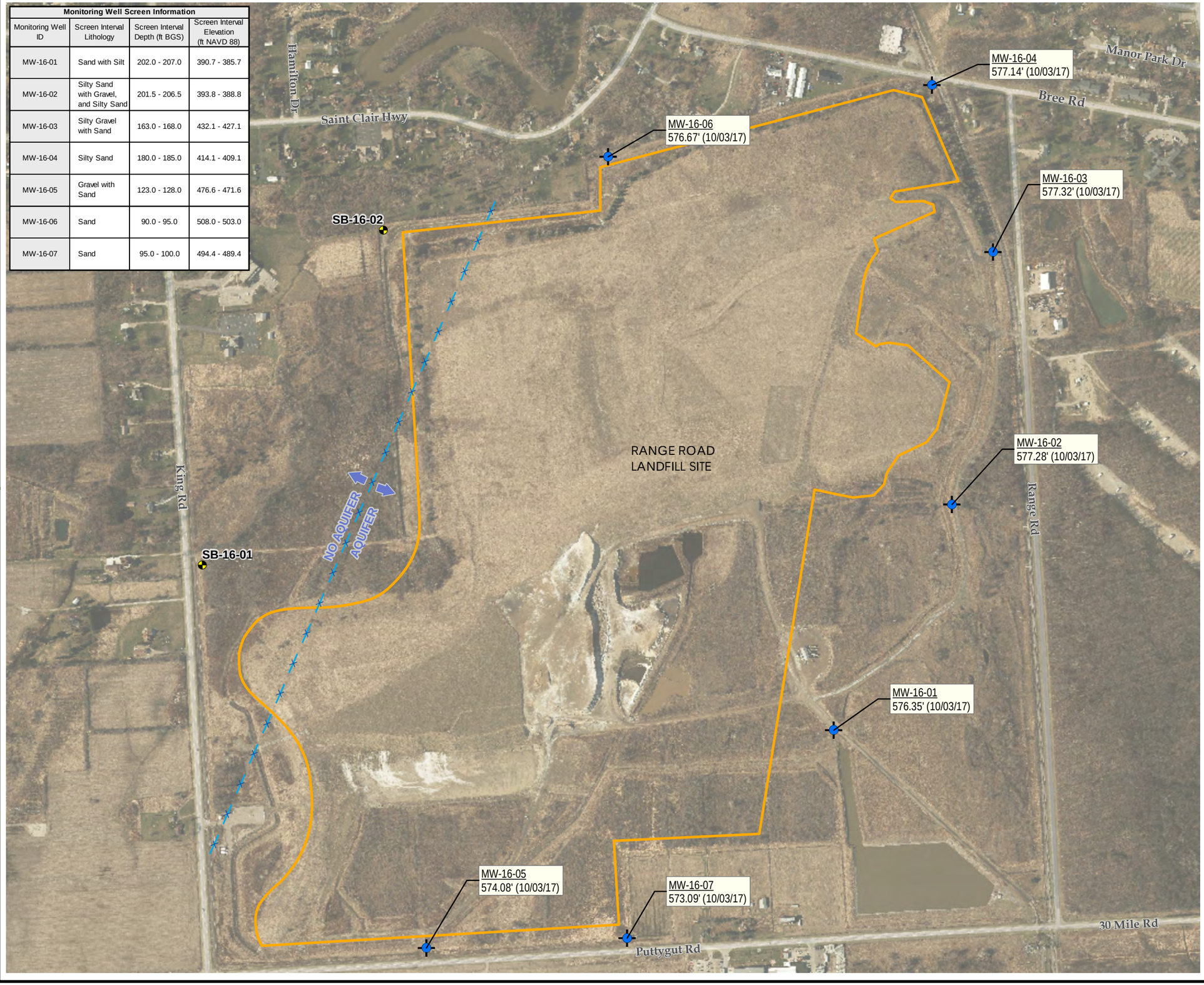
TRC - GIS

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Plot Date: 1/12/2018, 08:50:22 AM by SMAJOR -- LAYOUT: ANSI B(11"X17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0000-005.mxd

Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand with Silt	202.0 - 207.0	390.7 - 385.7
MW-16-02	Silty Sand with Gravel, and Silty Sand	201.5 - 206.5	393.8 - 388.8
MW-16-03	Silty Gravel with Sand	163.0 - 168.0	432.1 - 427.1
MW-16-04	Silty Sand	180.0 - 185.0	414.1 - 409.1
MW-16-05	Gravel with Sand	123.0 - 128.0	476.6 - 471.6
MW-16-06	Sand	90.0 - 95.0	508.0 - 503.0
MW-16-07	Sand	95.0 - 100.0	494.4 - 489.4



LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- APPROXIMATE AQUIFER BOUNDARY

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
GROUNDWATER PONTENTIOMETRIC ELEVATION SUMMARY OCTOBER 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	JANUARY 2018		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trcsolutions.com

FILE NO.: 265996-0000-005.mxd

Appendix A
Background Data

Table 1
Groundwater Elevation Summary
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Date Installed	1/13/2016		1/27/2016		2/1/2016		5/24/2016		5/13/2016		5/10/2016		5/13/2016	
TOC Elevation	595.35		598.44		597.69		596.87		601.97		600.68		589.34	
Geologic Unit of Screened interval	Sand with Silt		Silty Sand with Gravel		Silty Gravel with Sand		Silty Sand		Gravel with Sand		Sand		Sand	
Screened Interval Elevation	390.7 to 385.7		393.8 to 388.8		432.1 to 427.1		414.1 to 409.1		476.6 to 471.6		508.0 to 503.0		494.4 to 489.4	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
8/11/2016	22.77	572.58	21.10	577.34	20.24	577.45	19.54	577.33	27.73	574.24	23.89	576.79	16.13	573.21
9/22/2016	21.41	573.94	21.04	577.40	20.23	577.46	20.92	575.95	27.74	574.23	23.90	576.78	16.40	572.94
11/10/2016	21.07	574.28	20.96	577.48	20.17	577.52	19.55	577.32	27.72	574.25	23.80	576.88	16.20	573.14
1/11/2017	19.63	575.72	20.87	577.57	20.10	577.59	19.38	577.49	27.53	574.44	23.71	576.97	15.80	573.54
1/3/2017	19.05	576.30	20.30	578.14	19.49	578.20	18.85	578.02	26.91	575.06	23.08	577.60	15.74	573.60
4/19/2017	19.11	576.24	20.75	577.69	19.94	577.75	19.32	577.55	27.41	574.56	23.56	577.12	16.19	573.15
6/7/2017	19.00	576.35	20.79	577.65	20.03	577.66	19.32	577.55	27.50	574.47	23.65	577.03	15.82	573.52
7/26/2017	18.90	576.45	20.45	577.99	20.05	577.64	19.45	577.42	27.60	574.37	23.75	576.93	16.30	573.04

Notes:

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet below top of casing.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-01							
Sample Date:		8/11/2016	9/22/2016	11/9/2016	1/11/2017	3/1/2017	4/19/2017	6/7/2017	7/26/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	520	560	520	520	510	520	540	540
Calcium	ug/L	78,000	82,000	85,000	84,000	87,000	82,000	85,000	79,000
Chloride	mg/L	710	730	730	740	670	650	720	710
Fluoride	mg/L	0.81	0.81	0.85	0.69	0.89	0.83	0.86	0.88
pH	SU	7.7	7.8	7.8	7.9	7.8	7.7	7.8	8.1
Sulfate	mg/L	25	31	26	26	32	34	41	37
Total Dissolved Solids	mg/L	1,300	1,200	1,300	1,300	1,300	1,300	1,200	1,300
Appendix IV									
Antimony	ug/L	2.1	< 2.0	< 2.0	2.8	2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	430	430	410	430	430	420	420	440
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	2.5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	0.81	0.81	0.85	0.69	0.89	0.83	0.86	0.88
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	8.2	10	< 8.0	11	10	11	12	13
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	23	21	19	23	19	18	18	19
Radium-226	pCi/L	1.61	1.58	1.47	1.40	1.17	1.24	1.19	1.40
Radium-226/228	pCi/L	2.61	2.30	2.27	2.31	1.82	1.69	1.66	2.22
Radium-228	pCi/L	1.00	0.723	0.795	0.907	0.648	0.455	0.468	0.815
Selenium	ug/L	< 5.0	5.8	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-02							
Sample Date:		8/11/2016	9/22/2016	11/9/2016	1/11/2017	3/2/2017	4/19/2017	6/7/2017	7/26/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	1,000	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Calcium	ug/L	19,000	20,000	18,000	21,000	22,000	21,000	22,000	22,000
Chloride	mg/L	650	690	670	670	620	580	670	650
Fluoride	mg/L	2.0	1.8	1.9	1.8	1.9	1.8	2.0	2.0
pH	SU	8.3	8.3	8.2	8.3	8.3	8.3	8.1	8.4
Sulfate	mg/L	< 1.0	< 1.0	< 5.0	< 5.0	< 10	< 10	< 10	< 1.0
Total Dissolved Solids	mg/L	1,200	1,200	1,200	1,200	1,200	1,100	1,100	1,200
Appendix IV									
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	210	210	230	230	270	260	260	280
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	4.8	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	2.0	1.8	1.9	1.8	1.9	1.8	2.0	2.0
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	19	21	18	24	23	27	24	26
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	78	80	95	82	83	81	83	88
Radium-226	pCi/L	0.671	0.695	0.951	0.640	0.467	0.499	0.482	0.618
Radium-226/228	pCi/L	1.15	1.18	2.04	1.64	0.823	1.12	0.760	1.11
Radium-228	pCi/L	0.476	0.489	1.09	1.00	< 0.370	0.619	< 0.362	0.488
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-03								
Sample Date:		8/11/2016	9/22/2016	11/10/2016	1/11/2017	1/11/2017	3/2/2017	4/19/2017	6/7/2017	7/26/2017
Constituent	Unit					Field Dup				
Appendix III										
Boron	ug/L	1,100	1,100	1,200	1,100	1,100	1,100	1,100	1,200	1,200
Calcium	ug/L	19,000	19,000	18,000	20,000	19,000	19,000	20,000	20,000	21,000
Chloride	mg/L	540	540	540	540	550	500	490	550	530
Fluoride	mg/L	1.8	2.0	2.1	1.9	1.9	2.1	2.0	2.1	2.2
pH	SU	8.2	8.1	8.2	8.1	8.1	8.2	8.1	8.1	8.2
Sulfate	mg/L	< 10	< 1.0	< 5.0	< 5.0	< 5.0	< 5.0	< 10	< 10	< 1.0
Total Dissolved Solids	mg/L	1,100	1,000	1,100	1,100	1,100	1,100	1,000	1,000	1,100
Appendix IV										
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	600	600	730	620	610	670	650	640	690
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	2.2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.8	2.0	2.1	1.9	1.9	2.1	2.0	2.1	2.2
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	20	22	20	25	22	24	27	26	29
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	73	72	72	73	73	74	75	73	79
Radium-226	pCi/L	1.68	1.36	2.27	1.23	1.30	1.31	1.22	1.45	1.47
Radium-226/228	pCi/L	1.96	1.91	3.13	1.69	2.06	1.81	1.83	1.66	2.21
Radium-228	pCi/L	< 0.430	0.543	0.864	0.466	0.763	0.498	0.610	< 0.329	0.740
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-04								
Sample Date:		8/19/2016	9/23/2016	11/10/2016	1/12/2017	3/2/2017	4/19/2017	6/7/2017	7/26/2017	9/12/2017
Constituent	Unit									
Appendix III										
Boron	ug/L	920	1,000	1,100	1,000	1,000	1,000	1,000	1,100	1,100
Calcium	ug/L	57,000	67,000	62,000	62,000	62,000	61,000	62,000	61,000	65,000
Chloride	mg/L	3,200	3,400	3,200	3,500	2,900	2,800	3,200	3,200	3,200
Fluoride	mg/L	< 2.5	1.5	1.4	1.3	1.5	1.4	1.5	1.5	1.7
pH	SU	7.9	8.1	8.0	7.8	8.0	8.0	7.5	8.1	8.1
Sulfate	mg/L	< 50	24	< 20	< 20	< 20	< 20	17	< 10	< 5.0
Total Dissolved Solids	mg/L	4,500	4,300	5,000	5,000	4,900	4,600	4,800	5,100	5,100
Appendix IV										
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 25	< 5.0
Barium	ug/L	360	400	410	380	420	380	380	440	460
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
Chromium	ug/L	< 2.0	3.8	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
Fluoride	mg/L	< 2.5	1.5	1.4	1.3	1.5	1.4	1.5	1.5	1.7
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	37	47	40	39	40	45	39	56	46
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	73	120	99	100	100	89	78	120	110
Radium-226	pCi/L	1.39	1.48	1.78	1.11	1.01	0.944	0.851	0.983	1.12
Radium-226/228	pCi/L	2.80	2.24	2.84	2.21	1.76	2.25	1.35	2.29	2.23
Radium-228	pCi/L	1.41	0.767	1.06	1.10	0.750	1.30	0.496	1.31	1.11
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 25	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-05											
Sample Date:		8/19/2016	8/19/2016	9/22/2016	11/10/2016	1/12/2017	3/1/2017	4/19/2017	4/19/2017	6/8/2017	6/8/2017	7/26/2017	7/26/2017
Constituent	Unit		Field Dup						Field Dup		Field Dup		Field Dup
Appendix III													
Boron	ug/L	1,100	1,100	1,200	1,200	1,300	1,200	1,200	1,200	1,300	1,100	1,300	1,300
Calcium	ug/L	18,000	17,000	18,000	18,000	19,000	19,000	18,000	18,000	18,000	30,000	19,000	19,000
Chloride	mg/L	590	580	590	580	580	540	520	530	580	550	560	570
Fluoride	mg/L	1.7	1.8	1.7	1.7	1.6	1.8	1.7	1.8	1.8	1.5	1.9	1.9
pH	SU	8.1	8.1	8.2	8.3	8.2	8.2	8.2	8.2	7.8	7.9	8.2	8.2
Sulfate	mg/L	< 10	< 1.0	< 1.0	< 5.0	< 5.0	< 10	< 10	< 5.0	< 10	27	1.9	1.8
Total Dissolved Solids	mg/L	1,100	1,100	1,100	1,100	1,200	1,100	1,000	1,000	1,100	960	1,100	1,100
Appendix IV													
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	320	310	330	340	330	350	330	330	330	310	350	350
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.7	1.8	1.7	1.7	1.6	1.8	1.7	1.8	1.8	1.5	1.9	1.9
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	19	18	21	19	23	22	26	25	23	9.1	26	26
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	60	59	55	63	67	67	66	67	65	52	71	70
Radium-226	pCi/L	1.52	1.45	1.41	1.52	1.27	1.07	1.11	1.24	1.12	0.468	1.41	1.21
Radium-226/228	pCi/L	2.51	2.16	1.84	2.02	1.60	1.74	2.04	1.63	1.81	1.03	2.12	1.88
Radium-228	pCi/L	0.990	0.704	< 0.509	0.497	< 0.415	0.675	0.930	0.399	0.684	0.558	0.713	0.668
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-06										
Sample Date:		8/11/2016	9/23/2016	9/23/2016	11/10/2016	11/10/2016	1/12/2017	3/2/2017	3/2/2017	4/19/2017	6/7/2017	7/26/2017
Constituent	Unit			Field Dup		Field Dup			Field Dup			
Appendix III												
Boron	ug/L	1,000	1,000	1,000	1,100	1,100	1,100	1,000	1,000	1,100	1,100	1,100
Calcium	ug/L	28,000	27,000	27,000	28,000	27,000	29,000	30,000	30,000	29,000	30,000	28,000
Chloride	mg/L	560	560	580	560	550	550	510	520	490	540	540
Fluoride	mg/L	1.2	1.4	1.4	1.4	1.4	1.2	1.5	1.5	1.4	1.4	1.5
pH	SU	8.0	8.1	8.1	8.1	8.0	8.0	8.1	8.0	8.0	8.0	8.0
Sulfate	mg/L	< 10	2.6	2.5	7.9	7.4	11	16	17	22	27	19
Total Dissolved Solids	mg/L	1,000	970	980	1,000	1,100	1,100	1,000	1,000	970	1,100	1,000
Appendix IV												
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	320	310	310	330	320	310	340	330	310	320	310
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	2.4	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.2	1.4	1.4	1.4	1.4	1.2	1.5	1.5	1.4	1.4	1.5
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	< 8.0	8.0	8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	8.4	9.0	10
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	60	55	55	54	53	56	57	56	54	54	54
Radium-226	pCi/L	0.937	0.774	0.929	0.843	1.09	0.729	0.709	0.722	0.546	0.539	0.690
Radium-226/228	pCi/L	1.47	1.37	1.29	1.44	1.91	1.16	0.903	1.10	0.996	0.794	1.20
Radium-228	pCi/L	0.538	0.600	< 0.509	0.597	0.815	0.433	< 0.354	< 0.390	0.450	< 0.395	0.505
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-07															
Sample Date:		8/19/2016	9/23/2016	11/10/2016	1/12/2017	3/2/2017	4/19/2017	6/8/2017	7/10/2017	7/10/2017	7/25/2017	8/10/2017	8/10/2017	8/30/2017	8/30/2017	9/12/2017	9/12/2017
Constituent	Unit									Field Dup			Field Dup		Field Dup		Field Dup
Appendix III																	
Boron	ug/L	760	880	850	830	230	120	190	680	700	810	870	810	840	880	910	920
Calcium	ug/L	56,000	47,000	38,000	39,000	160,000	170,000	150,000	58,000	57,000	56,000	55,000	52,000	50,000	50,000	49,000	49,000
Chloride	mg/L	320	320	330	330	41	40	64	230	240	270	320	320	330	320	330	350
Fluoride	mg/L	1.3	1.2	1.1	0.98	0.33	0.31	< 0.50	0.91	0.92	1.0	1.1	1.1	1.1	1.1	1.2	1.2
pH	SU	8.0	7.9	8.0	7.9	7.6	7.5	7.5	7.7	7.7	7.9	7.9	7.9	7.6	7.8	7.9	7.9
Sulfate	mg/L	34	12	9.6	8.9	290	260	270	93	88	46	28	28	24	24	17	17
Total Dissolved Solids	mg/L	770	680	720	730	910	720	760	690	700	680	710	700	700	710	680	700
Appendix IV																	
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	6.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	390	350	330	320	150	100	99	85	83	140	180	170	180	180	230	230
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	24	12	3.0	2.2	2.5	2.1	< 2.0	4.4	4.1	18	11	9.9	7.9	7.7	8.9	9.6
Cobalt	ug/L	6.4	3.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	1.2	2.4	2.1	2.0	1.9	1.8	2.4	2.5
Fluoride	mg/L	1.3	1.2	1.1	0.98	0.33	0.31	< 0.50	0.91	0.92	1.0	1.1	1.1	1.1	1.1	1.2	1.2
Lead	ug/L	6.3	3.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	1.2	1.6	2.4	2.1	1.8	2.2	1.9	2.2	2.4
Lithium	ug/L	26	19	10	12	8.5	8.1	< 8.0	12	12	23	23	22	22	22	19	18
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	82	71	59	57	25	15	13	30	31	42	51	48	44	45	52	52
Radium-226	pCi/L	1.65	0.879	1.33	0.682	< 0.138	0.519	NA	0.479	0.492	0.503	0.645	0.988	0.687	0.582	0.625	0.688
Radium-226/228	pCi/L	4.20	1.41	1.98	1.09	< 0.464	0.744	NA	0.531	0.666	0.875	1.15	1.11	1.08	1.15	1.16	1.15
Radium-228	pCi/L	2.55	0.535	< 0.806	0.404	< 0.464	< 0.352	NA	< 0.322	< 0.341	< 0.456	0.508	< 0.400	< 0.527	0.566	0.531	< 0.487
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
NA - not analyzed
All metals were analyzed as total
unless otherwise specified.

Table 3
Summary of Field Parameters
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	8/11/2016	1.24	7.1	7.40	1,710	13.07	2.35
	9/22/2016	0.73	-34.6	8.25	2,118	15.77	1.35
	11/9/2016	0.40	-32.0	7.94	1,784	11.02	3.12
	1/11/2017	0.53	-60.7	7.70	1,694	9.41	1.42
	3/1/2017	0.65	-36.0	7.87	1,642	10.62	0.21
	4/19/2017	0.47	-107.7	7.69	2,317	12.53	0.27
	6/7/2017	1.08	-158.5	7.68	2,250	14.39	2.44
	7/26/2017	0.20	-181.5	7.55	2,342	11.2	2.65
MW-16-02	8/11/2016	0.64	-8.9	8.39	1,617	12.16	2.32
	9/22/2016	0.32	-56.3	9.04	1,900	13.04	1.65
	11/9/2016	0.31	-146.1	8.50	1,684	10.41	6.12
	1/11/2017	0.45	-105.4	8.21	1,594	8.55	1.16
	3/2/2017	0.12	-101.0	8.46	1,491	7.88	1.42
	4/19/2017	0.15	-214.7	8.41	2,214	11.42	0.24
	6/7/2017	0.19	-249.5	8.36	2,159	12.85	1.59
	7/26/2017	0.09	-267.5	8.23	2,214	11.3	3.00
MW-16-03	8/11/2016	0.48	-88.4	8.29	1,450	13.19	5.58
	9/22/2016	0.24	-28.4	8.82	1,666	13.07	1.72
	11/10/2016	0.48	-67.2	8.31	1,342	10.92	5.77
	1/11/2017	0.27	-112.0	8.05	1,434	9.66	0.56
	3/2/2017	0.21	-60.4	8.15	1,352	9.19	1.68
	4/19/2017	0.12	-149.2	8.12	1,897	11.74	0.75
	6/7/2017	0.18	-180.5	8.13	1,893	12.47	2.11
	7/26/2017	0.26	-199.0	8.01	1,949	12.4	1.50
MW-16-04	8/19/2016	0.73	-12.4	7.97	7,853	16.98	19.4
	9/23/2016	3.28	178.5	7.72	8,124	16.00	11.9
	11/10/2016	3.29	12.1	8.21	6,522	13.14	15.4
	1/12/2017	2.24	-45.0	7.69	7,174	12.34	2.62
	3/2/2017	1.62	-3.3	8.09	6,230	10.06	2.49
	4/19/2017	1.37	-214.3	8.02	8,721	12.30	4.50
	6/7/2017	0.15	-231.4	7.91	8,104	13.53	2.59
	7/26/2017	0.22	-227.0	8.25	9,154	13.0	4.80
	9/11/2017	0.75	-90.2	8.19	9,223	11.57	16.3

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric Turbidity Units.

Table 3
Summary of Field Parameters
Range Road Landfill – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-05	8/19/2016	0.73	-18.9	8.19	1,731	14.34	3.31
	9/22/2016	0.24	-2.3	8.93	1,703	12.81	2.53
	11/10/2016	0.36	-59.3	8.35	1,420	11.92	5.23
	1/12/2017	0.43	-3.9	8.00	1,449	8.98	1.35
	3/1/2017	0.39	27.6	8.29	1,420	10.50	1.75
	4/19/2017	0.31	-139.3	8.20	2,002	11.33	1.41
	6/8/2017	0.14	-178.2	8.16	1,961	11.88	1.65
	7/26/2017	0.25	-160.6	8.09	2,066	12.26	0.97
MW-16-06	8/11/2016	0.59	-147.1	8.00	1,492	14.43	26.4
	9/23/2016	0.30	-65.5	8.27	1,466	12.58	9.76
	11/10/2016	0.41	27.3	8.10	1,294	10.07	5.39
	1/12/2017	0.56	-24.5	7.76	1,334	8.75	0.37
	3/2/2017	0.30	-15.6	8.06	1,362	10.15	0.83
	4/19/2017	0.54	-135.4	8.01	1,868	13.51	1.08
	6/7/2017	0.73	-140.6	7.89	1,853	13.16	1.84
	7/26/2017	0.22	-206	7.90	1,875	11.9	1.95
MW-16-07	8/19/2016	0.68	-13.6	8.03	1,203	18.58	177
	9/23/2016	1.80	76.7	8.02	1,182	17.83	83.4
	11/10/2016	3.11	10.8	8.05	1,006	14.66	68.3
	1/12/2017	1.97	-53.6	7.69	1,120	12.71	27.2
	3/2/2017	1.34	156.7	7.37	823	8.10	52.6
	4/19/2017	0.55	-87.6	7.41	1,049	11.56	44.6
	6/8/2017	0.48	-118.0	7.48	1,035	13.03	16.3
	7/10/2017	0.48	-136.9	7.74	1,151	13.95	87.7
	7/25/2017	0.16	-176.7	7.50	1,154	12.0	79.0
	8/10/2017	0.23	-145.1	7.84	1,215	12.44	76.2
	8/30/2017	0.18	-155.5	7.56	1,235	15.16	60.0
	9/11/2017	0.28	-99.0	7.51	1,262	13.03	69.3

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

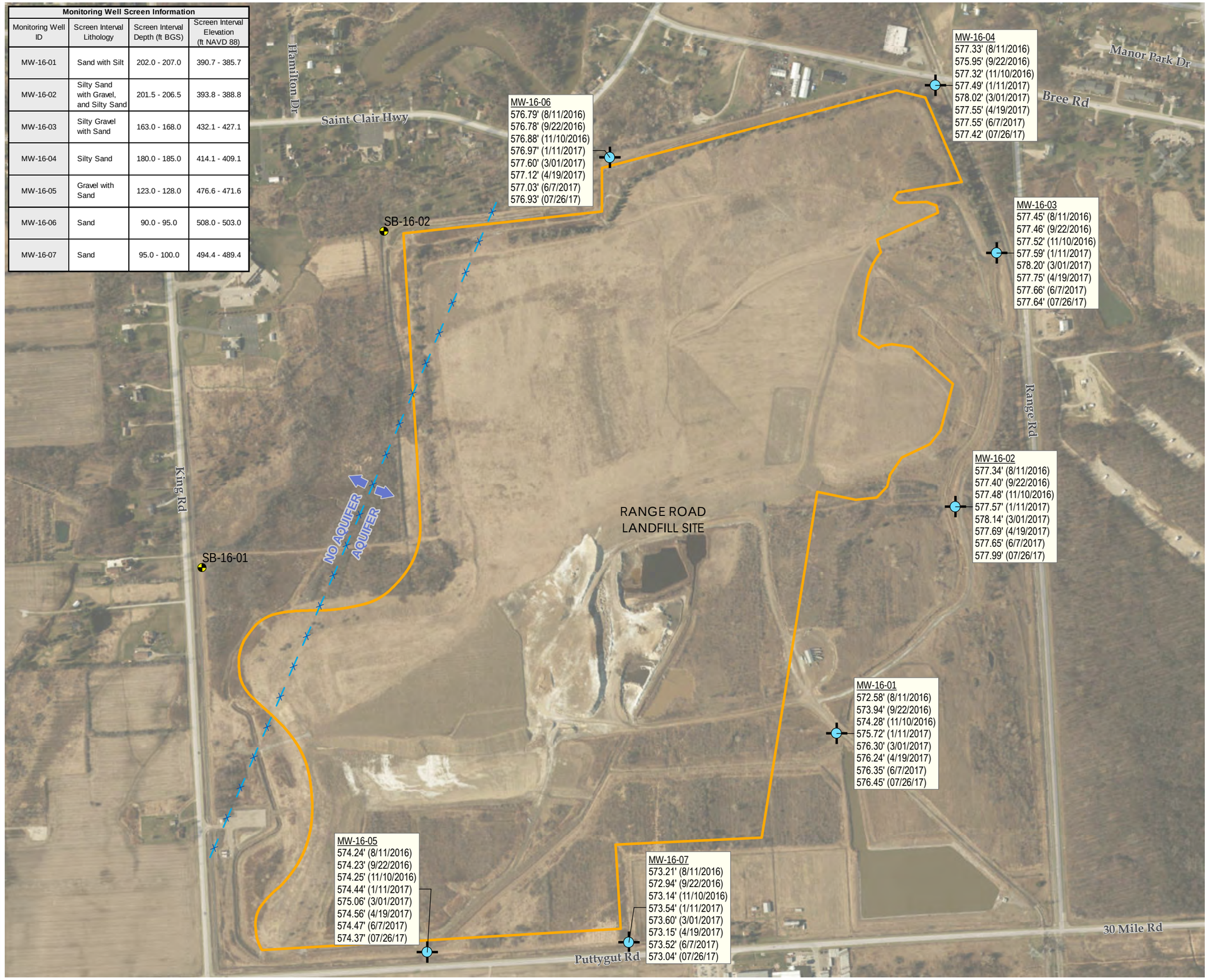
umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric Turbidity Units.

TRC - GIS

Monitoring Well Screen Information			
Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand with Silt	202.0 - 207.0	390.7 - 385.7
MW-16-02	Silty Sand with Gravel, and Silty Sand	201.5 - 206.5	393.8 - 388.8
MW-16-03	Silty Gravel with Sand	163.0 - 168.0	432.1 - 427.1
MW-16-04	Silty Sand	180.0 - 185.0	414.1 - 409.1
MW-16-05	Gravel with Sand	123.0 - 128.0	476.6 - 471.6
MW-16-06	Sand	90.0 - 95.0	508.0 - 503.0
MW-16-07	Sand	95.0 - 100.0	494.4 - 489.4



LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- APPROXIMATE AQUIFER BOUNDARY

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC ELEVATION SUMMARY

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 1**
DATE:	JANUARY 2018		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trcsolutions.com

FILE NO.: 265996-0000-001.mxd

Plot Date: 1/12/2018, 08:52:38 AM by:SMAJOR -- LAYOUT:ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0000-001.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Appendix B
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event October 2017
DTE Electric Company Range Road Landfill (DTE RRLF)

Groundwater samples were collected by TRC for the October 2017 sampling event. Samples were analyzed for anions, pH, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in Canton, Ohio. The laboratory analytical results are reported in laboratory report J86175-1.

During the October 2017 sampling event, a groundwater sample was collected from each of the following wells:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
pH	EPA 9040C
Total Metals	EPA 6020A, EPA 6010C
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD). Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;

- Reporting limits (RLs) compared to project-required RLs;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for laboratory duplicates. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method; and
- Overall usability of the data.

This data usability report addresses the following items:

  - Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
  - Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.
- When the data are evaluated through a detection monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary:

- One equipment blank (EB-01) was collected; no analytes were detected in the blank samples.
- Dup-01 corresponds with MW-16-06; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicates were performed on sample MW-16-01 for pH and total dissolved solids; RPDs between the parent and duplicate sample were within the QC limits.
- MS/MSD analyses were performed on sample MW-16-01 for anions (chloride, fluoride, and sulfate). Percent recoveries and RPDs were within the QC limits.

Appendix C
Statistical Background Limits

Technical Memorandum

Date: January 15, 2018

To: DTE Electric Company

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Jane Li, TRC

Project No.: 265996.0000.0000 Phase 001, Task 001

Subject: Background Statistical Evaluation – DTE Electric Company, Range Road Coal Combustion Residual Landfill

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Pursuant to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Federal Final Rule for Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (herein after "the CCR Rule") promulgated on April 17, 2015, the owner or operator of a CCR unit must collect a minimum of eight rounds of background groundwater data to initiate a detection monitoring program and evaluate statistically significant increases above background (40 CFR §257.94). This memorandum presents the background statistical limits derived for the DTE Electric Company (DTE Electric) Range Road Coal Combustion Residual Landfill (RRLF) CCR unit (the Site).

DTE Electric operates the RRLF in China Township, Michigan. The RRLF is a licensed Type III solid waste disposal facility in accordance with Michigan's regulations, and receives bottom and fly ash from the St. Clair and Belle River Power Plants. The landfill qualifies as a CCR storage unit. Therefore, it is required to be monitored under the CCR Rule.

A groundwater monitoring system has been established for RRLF CCR unit (TRC, October 2017), which established the following locations for detection monitoring.

MW-16-01	MW-16-02	MW-16-03
MW-16-04	MW-16-05	MW-16-06
MW-16-07		

Following the baseline data collection period (August 2016 through September 2017), the background data for the Site were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). Background data were evaluated in ChemStat™ statistical software.

ChemStat™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in U.S. EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance; UG). Within the ChemStat™ statistical program (and the UG), prediction limits (PLs) were selected to perform the statistical calculation for background limits. Use of PLs is recommended by the UG to provide high statistical power and is an acceptable approach for intrawell detection monitoring under the CCR rule. PLs were calculated for each of the CCR Appendix III parameters. The following narrative describes the methods employed and the results obtained and the ChemStat™ output files are included as an attachment.

The set of background wells utilized for Range Road Landfill CCR Unit includes MW-16-01 through MW-16-07. The background evaluation included the following steps:

- Review of data quality checklists for the baseline/background data sets for CCR Appendix III constituents;
- Graphical representation of the baseline data as time versus concentration (T v. C) by well/constituent pair;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of percentage of nondetects for each baseline/background well-constituent (w/c) pair;
- Distribution of the data; and
- Calculation of the upper PLs for each cumulative baseline/background data set (upper and lower PLs were calculated for field pH).

The results of these evaluations are presented and discussed below.

Data Quality

Data from each sampling round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The review was completed using the following quality control (QC) information which at a minimum included chain-of-custody forms, investigative sample results including blind field duplicates, and, as provided by the laboratory, method blanks, laboratory control spikes, laboratory duplicates. The data were found to be complete and usable for the purposes of the CCR monitoring program.

Time versus Concentration Graphs

The time versus concentration (T v. C) graphs (Attachment A) show potential or suspect outliers for the many of the Appendix III parameters at MW-16-07 on 3/2/2017, 4/19/2017, and 6/8/2017). Additional sampling events were completed for MW-16-07 to provide sufficient background data for prediction limit calculations.

While variations in results are present, the graphs show consistent baseline data and do not suggest that data sets, as a whole, likely have overall trending or seasonality. However, due to limitations on CCR Rule implementation timelines, the data sets are of relatively short duration for making such observations regarding overall trending or seasonality.

Outlier Testing

Outlier removal from the background data set is summarized in Table 1. Probability plots (Attachment B) were used to further evaluate the potential outliers in the Appendix III data for MW-16-07 that were identified in the T v. C graphs (Attachment A). In general, probability plots of the data residuals show that data collected on 3/2/2017, 4/19/2017, and 6/8/2017 were from a different distribution than the remaining data. This pattern was observed for most of the Appendix III parameters for MW-16-07. Prior to outlier removal, most of the parameters for MW-16-07 exhibited a non-normal distribution. The data sets for most of the parameters exhibited a normal distribution after the removal of these outliers. As such, data collected from monitoring well MW-16-07 on 3/2/2017, 4/19/2017, and 6/8/2017 were removed from the background data set used to calculate the statistical limit.

Distribution of the Data Sets

ChemStat™ was utilized to evaluate each data set for normality. If the skewness coefficient was calculated to be between negative one and one, then the data were assumed to be approximately normally distributed. If the skewness coefficient was calculated as greater than one (or less than negative one) then the calculation was performed on the natural log (Ln) of the data. If the Ln of the data still determined that the data appeared to be skewed, then the Shapiro-Wilk test of normality (Shapiro-Wilk) was performed. The Shapiro-Wilk statistic was calculated on both non-transformed data, and the Ln-transformed data. If the Shapiro-Wilk statistic indicated that normal distributional assumptions were not valid, then the parameter was considered a candidate for non-parametric statistical evaluation. The data distributions are summarized in Table 2.

Prediction Limits

Table 2 presents the calculated PLs for the background/baseline data sets. For normal and lognormal distributions, PLs are calculated for 95 percent confidence using parametric methods. For nonnormal background datasets, a nonparametric PL is utilized, resulting in the highest value from the background dataset as the PL. The achieved confidence levels for nonparametric prediction limits depend entirely on the number of background data points, which are shown in the ChemStat™ outputs. Verification resampling (1 of 2) is recommended per the Stats Plan and UG to achieve performance standards specified in the CCR rules.

Attachments

Table 1 – Summary of Outlier Evaluation
Table 2 – Summary of Descriptive Statistics and Prediction Limit Calculations
Attachment A – Background Concentration Time-Series Charts
Attachment B – Probability Plots for MW-17-06 Outlier Evaluation
Attachment C – ChemStat™ Prediction Limit Outputs

Tables

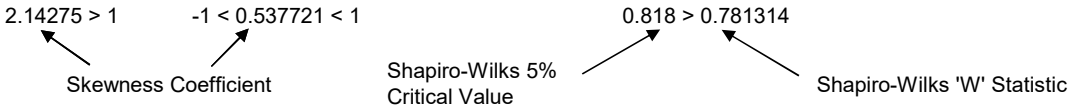
Table 1
Summary of Outlier Evaluation
Background Statistical Evaluation
DTE Electric Company – Range Road Landfill

Parameter	Units	Monitoring Well	Sample Date	Data Outlier	Basis for Removal of Outlier
Boron	ug/L	MW-16-07	03/02/17	230	Time vs. concentration graphs and probability plots indicate that data are anomalous for most of the parameters analyzed during these sampling events at MW-16-07.
		MW-16-07	04/19/17	120	
		MW-16-07	06/08/17	190	
Calcium	ug/L	MW-16-07	03/02/17	160,000	
		MW-16-07	04/19/17	170,000	
		MW-16-07	06/08/17	150,000	
Chloride	mg/L	MW-16-07	03/02/17	41	
		MW-16-07	04/19/17	40	
		MW-16-07	06/08/17	64	
Fluoride	mg/L	MW-16-07	03/02/17	0.33	
		MW-16-07	04/19/17	0.31	
		MW-16-07	06/08/17	< 0.50	
pH, Field	SU	MW-16-07	03/02/17	7.37	
		MW-16-07	04/19/17	7.41	
		MW-16-07	06/08/17	7.48	
Sulfate	mg/L	MW-16-07	03/02/17	290	
		MW-16-07	04/19/17	260	
		MW-16-07	06/08/17	270	
Total Dissolved Solids	mg/L	MW-16-07	03/02/17	910	
		MW-16-07	04/19/17	720	
		MW-16-07	06/08/17	760	

Table 2
Summary of Descriptive Statistics and Prediction Limit Calculations
Background Statistical Evaluation
DTE Electric Company – Range Road Landfill

Monitoring Well	Skewness Test		Shapiro-Wilks Test (5% Critical Value)		Outliers Removed	Prediction Limit Test	Prediction Limit
	Un-Transformed Data	Natural Log Transformed Data	Un-Transformed Data	Natural Log Transformed Data			
Appendix III							
Boron (ug/L)							
MW-16-01	-1 < 0.831034 < 1	--	--	--	N	Parametric	560
MW-16-02	-2.26779 < -1	-2.26779 < -1	0.818 > 0.418591	0.818 > 0.418591	N	Non-Parametric	1,100
MW-16-03	-1 < 0.516398 < 1	--	--	--	N	Parametric	1,200
MW-16-04	-1 < 0.0447916 < 1	--	--	--	N	Parametric	1,100
MW-16-05	-1 < -0.32397 < 1	--	--	--	N	Parametric	1,400
MW-16-06	-1 < -0.516398 < 1	--	--	--	N	Parametric	1,200
MW-16-07	-1 < -0.988208 < 1	--	--	--	Y	Parametric	950
Calcium (ug/L)							
MW-16-01	-1 < -0.302188 < 1	--	--	--	N	Parametric	89,000
MW-16-02	-1 < -0.658181 < 1	--	--	--	N	Parametric	24,000
MW-16-03	-1 < 0 < 1	--	--	--	N	Parametric	21,000
MW-16-04	-1 < 0.0296219 < 1	--	--	--	N	Parametric	67,000
MW-16-05	-1 < 0.516398 < 1	--	--	--	N	Parametric	19,000
MW-16-06	-1 < 0.0359966 < 1	--	--	--	N	Parametric	31,000
MW-16-07	-1 < -0.57014 < 1	--	--	--	Y	Parametric	66,000
Chloride (mg/L)							
MW-16-01	-1 < -0.897006 < 1	--	--	--	N	Parametric	770
MW-16-02	-1.00011 < -1	-1.07765 < -1	0.818 < 0.880116	--	N	Parametric	720
MW-16-03	-1.0002 < -1	-1.02154 < -1	0.818 > 0.782237	0.818 > 0.776606	N	Non-Parametric	550
MW-16-04	-1 < -0.402314 < 1	--	--	--	N	Parametric	3,600
MW-16-05	-1 < -0.919265 < 1	--	--	--	N	Parametric	620
MW-16-06	-1 < -0.964218 < 1	--	--	--	N	Parametric	590
MW-16-07	-1.54983 < -1	-1.63265 < -1	0.818 > 0.667853	0.818 > 0.652594	Y	Non-Parametric	330
Fluoride (mg/L)							
MW-16-01	-1.33125 < -1	-1.45989 < -1	0.818 < 0.843843	--	N	Parametric	0.95
MW-16-02	-1 < 3.83925e-015 < 1	--	--	--	N	Parametric	2.1
MW-16-03	-1 < -0.489556 < 1	--	--	--	N	Parametric	2.3
MW-16-04	-1 < 0.257716 < 1	--	--	--	N	Parametric	1.6
MW-16-05	-1 < 0.391042 < 1	--	--	--	N	Parametric	1.9
MW-16-06	-1 < -0.652024 < 1	--	--	--	N	Parametric	1.6
MW-16-07	-1 < 0.0584343 < 1	--	--	--	Y	Parametric	1.3

Notes:

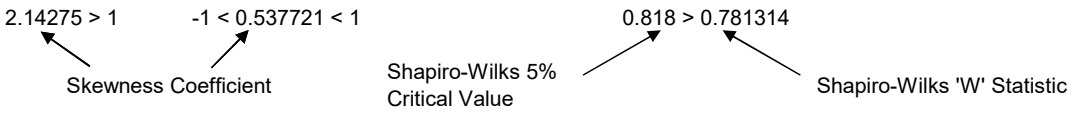


PQL = Practical Quantitation Limit
ug/L = micrograms per liter
mg/L = milligrams per liter
SU = standard units

Table 2
Summary of Descriptive Statistics and Prediction Limit Calculations
Background Statistical Evaluation
DTE Electric Company – Range Road Landfill

Monitoring Well	Skewness Test		Shapiro-Wilks Test (5% Critical Value)		Outliers Removed	Prediction Limit Test	Prediction Limit
	Un-Transformed Data	Natural Log Transformed Data	Un-Transformed Data	Natural Log Transformed Data			
pH, Field (SU)							
MW-16-01	-1 < 0.589334 < 1	--	--	--	N	Parametric	7.1 - 8.4
MW-16-02	1.58026 > 1	1.53264 > 1	0.818 > 0.782117	0.818 > 0.792962	N	Non-Parametric	8.2 - 9.0
MW-16-03	1.59228 > 1	1.55237 > 1	0.818 > 0.778864	0.818 > 0.789122	N	Non-Parametric	8.0 - 8.8
MW-16-04	-1 < -0.396997 < 1	--	--	--	N	Parametric	7.5 - 8.5
MW-16-05	1.63718 > 1	1.58913 > 1	0.818 > 0.782518	0.818 > 0.795224	N	Non-Parametric	8.0 - 8.9
MW-16-06	-1 < 0.223932 < 1	--	--	--	N	Parametric	7.6 - 8.4
MW-16-07	-1 < 0.0823904 < 1	--	--	--	Y	Parametric	7.2 - 8.3
Sulfate (mg/L)							
MW-16-01	-1 < 0.350297 < 1	--	--	--	N	Parametric	43
MW-16-02	100% Non-Detect	--	--	--	N	PQL	10
MW-16-03	100% Non-Detect	--	--	--	N	PQL	10
MW-16-04	>50% Non-Detect	--	--	--	N	Non-Parametric	50
MW-16-05	>50% Non-Detect	--	--	--	N	Non-Parametric	10
MW-16-06	-1 < 0.160185 < 1	--	--	--	N	Parametric	31
MW-16-07	1.58435 > 1	-1 < 0.396139 < 1	--	--	Y	Parametric	120
Total Dissolved Solids (mg/L)							
MW-16-01	-1.1547 < -1	-1.1547 < -1	0.818 > 0.566231	0.818 > 0.566231	N	Non-Parametric	1,300
MW-16-02	-1.1547 < -1	-1.1547 < -1	0.818 > 0.566231	0.818 > 0.566231	N	Non-Parametric	1,200
MW-16-03	-1 < -0.516398 < 1	--	--	--	N	Parametric	1,200
MW-16-04	-1 < -0.635017 < 1	--	--	--	N	Parametric	5,300
MW-16-05	-1 < 0 < 1	--	--	--	N	Parametric	1,200
MW-16-06	-1 < 0.93233 < 1	--	--	--	N	Parametric	1,100
MW-16-07	1.0181 > 1	-1 < 0.954355 < 1	--	--	Y	Parametric	770

Notes:

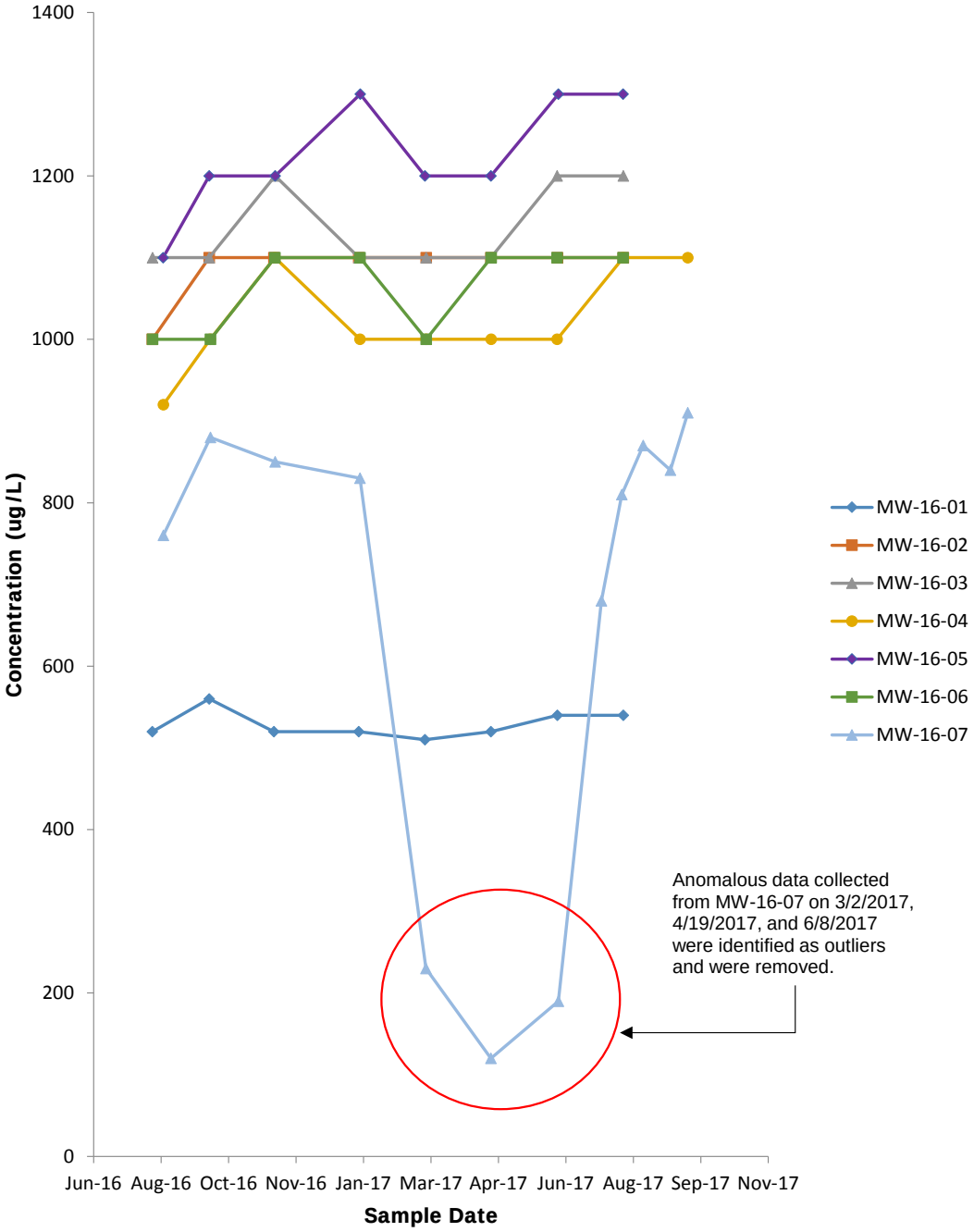


PQL = Practical Quantitation Limit
ug/L = micrograms per liter
mg/L = milligrams per liter
SU = standard units

Attachment A

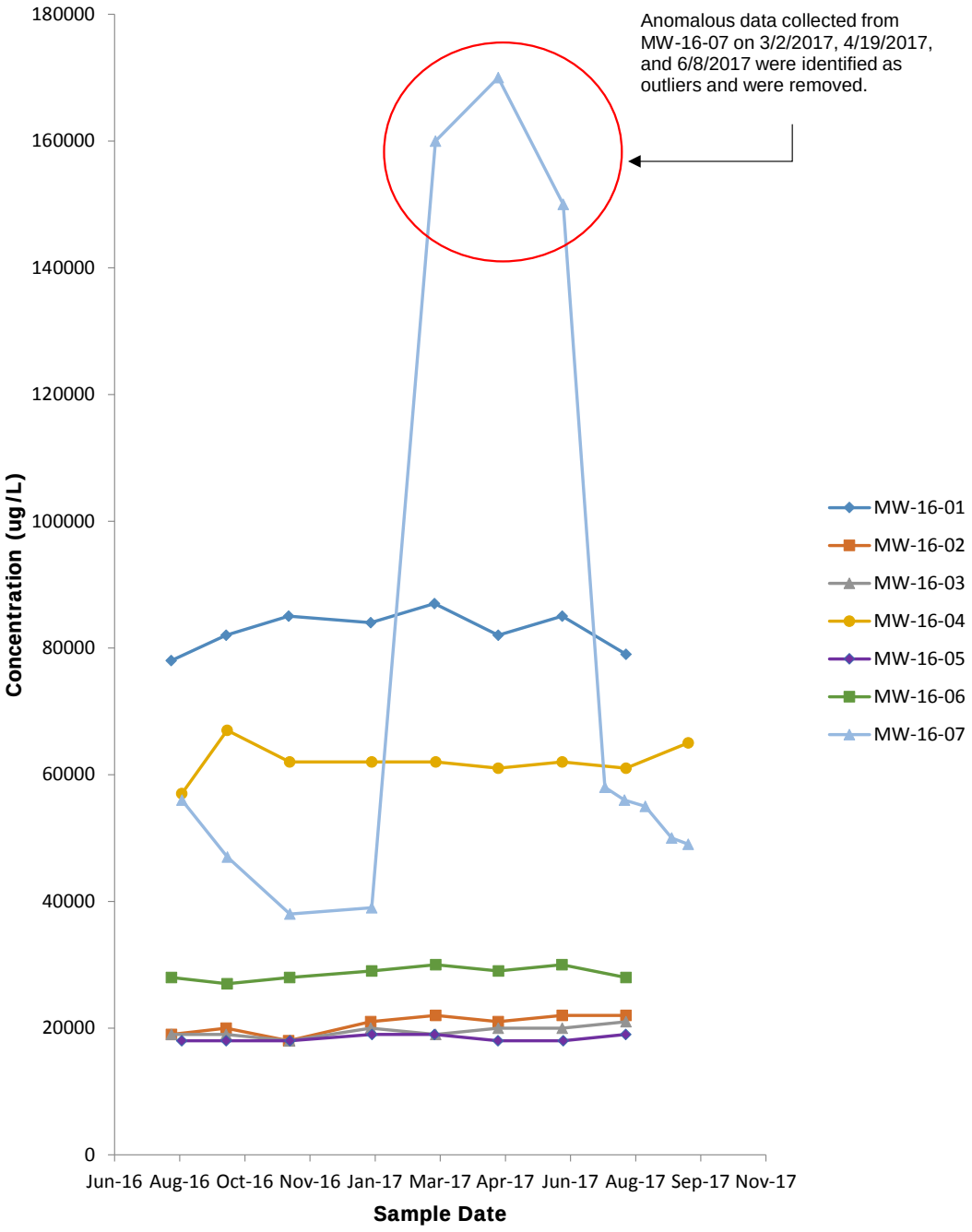
Background Concentration Time-Series Charts

Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Boron



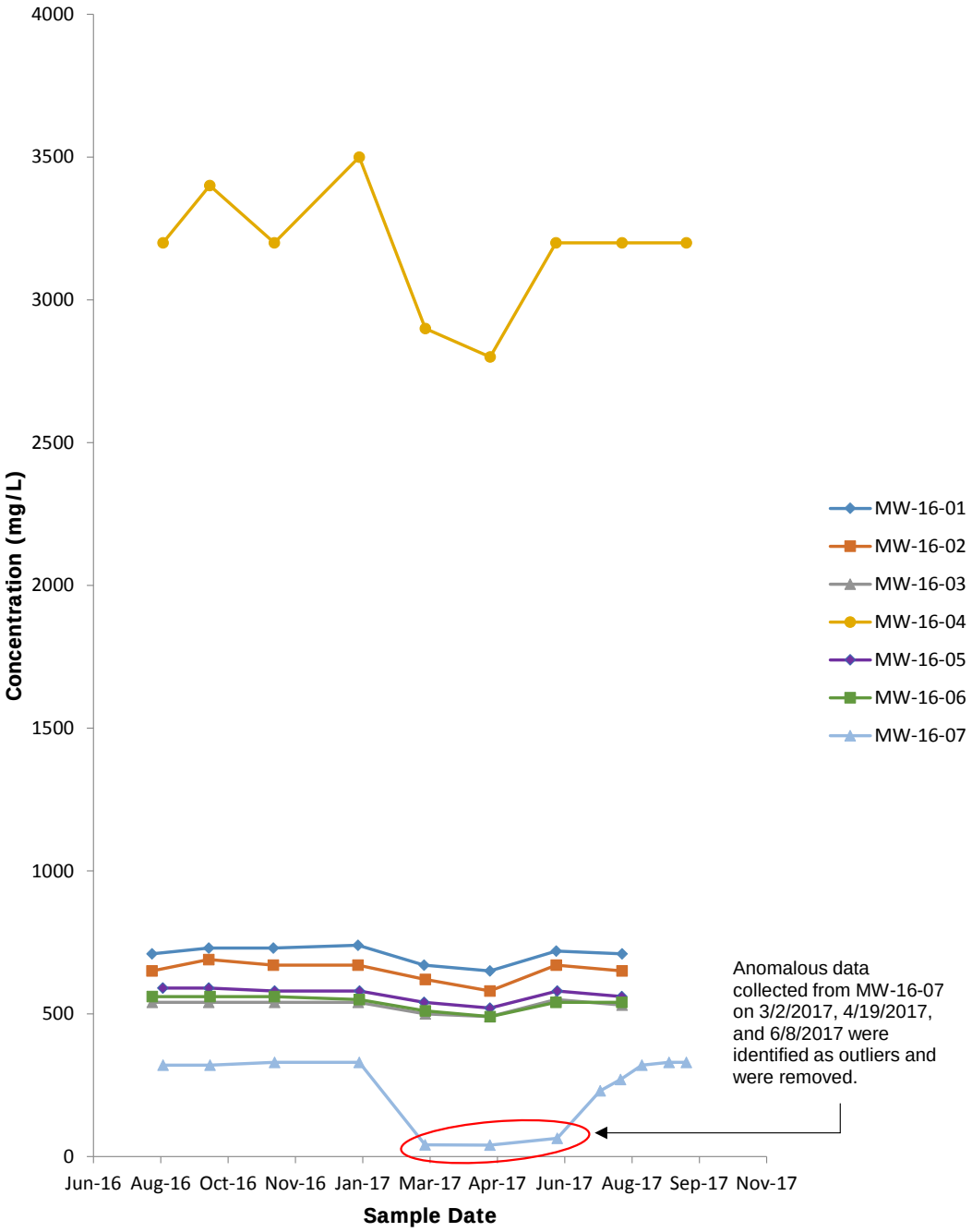
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Calcium



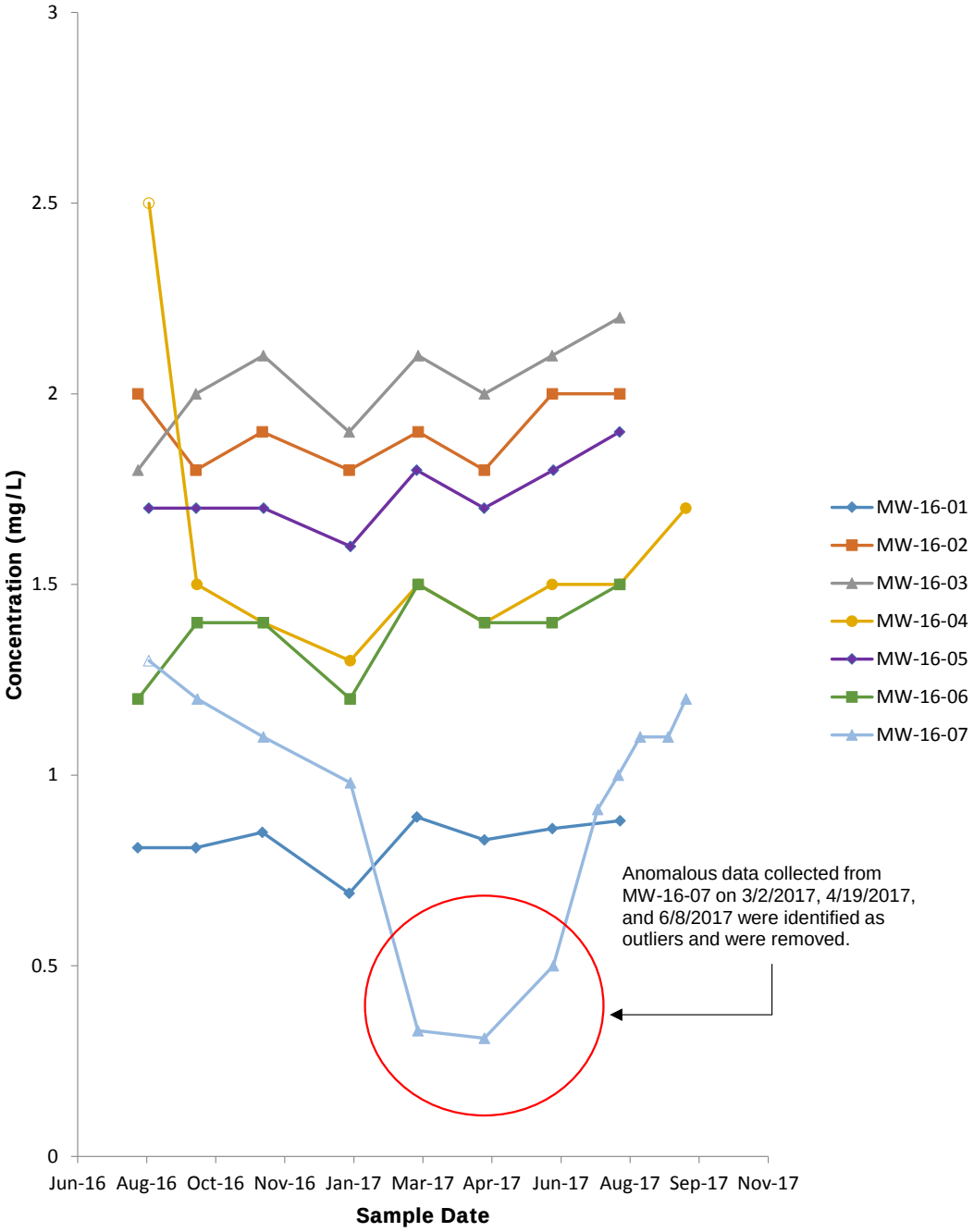
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Chloride



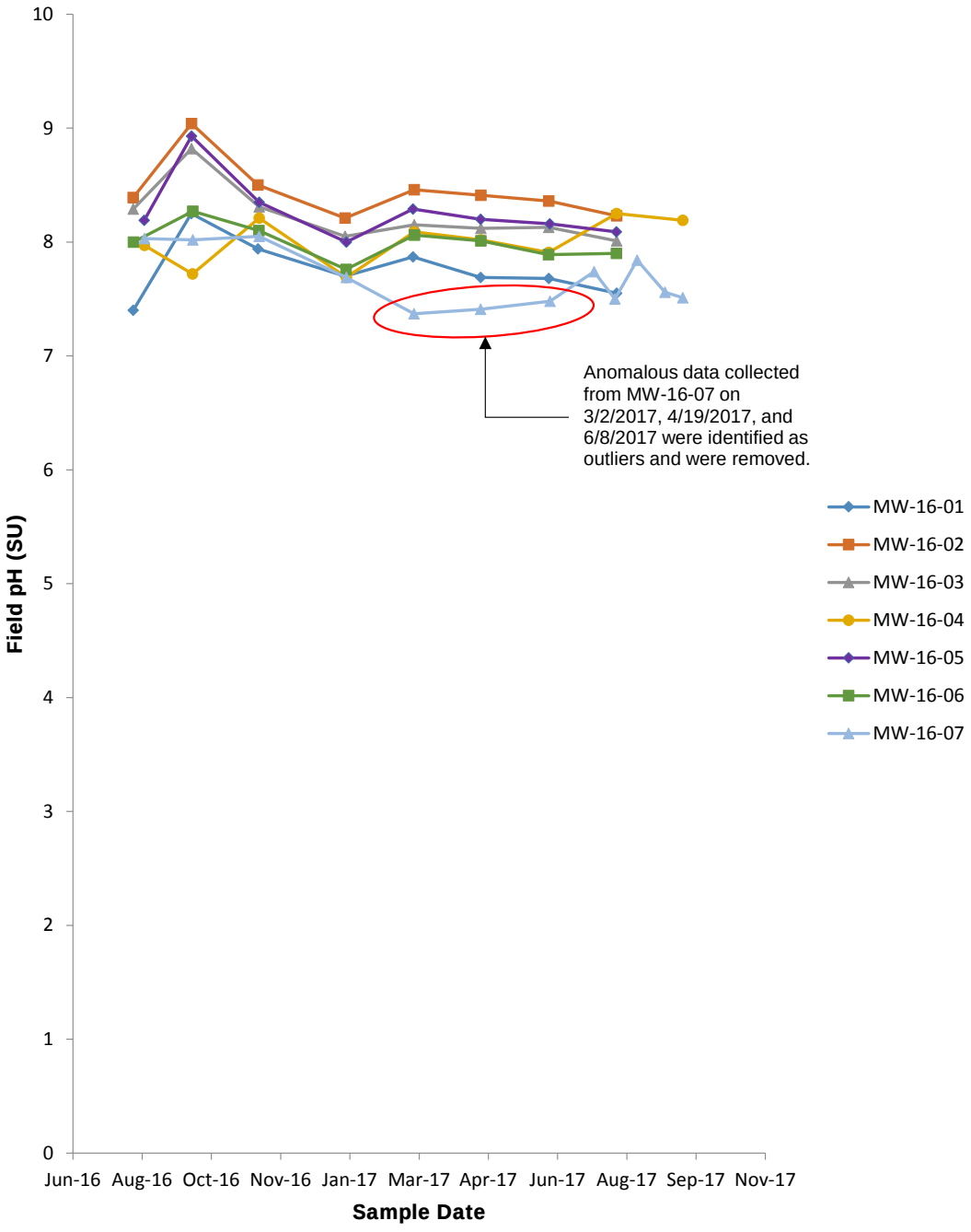
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Fluoride

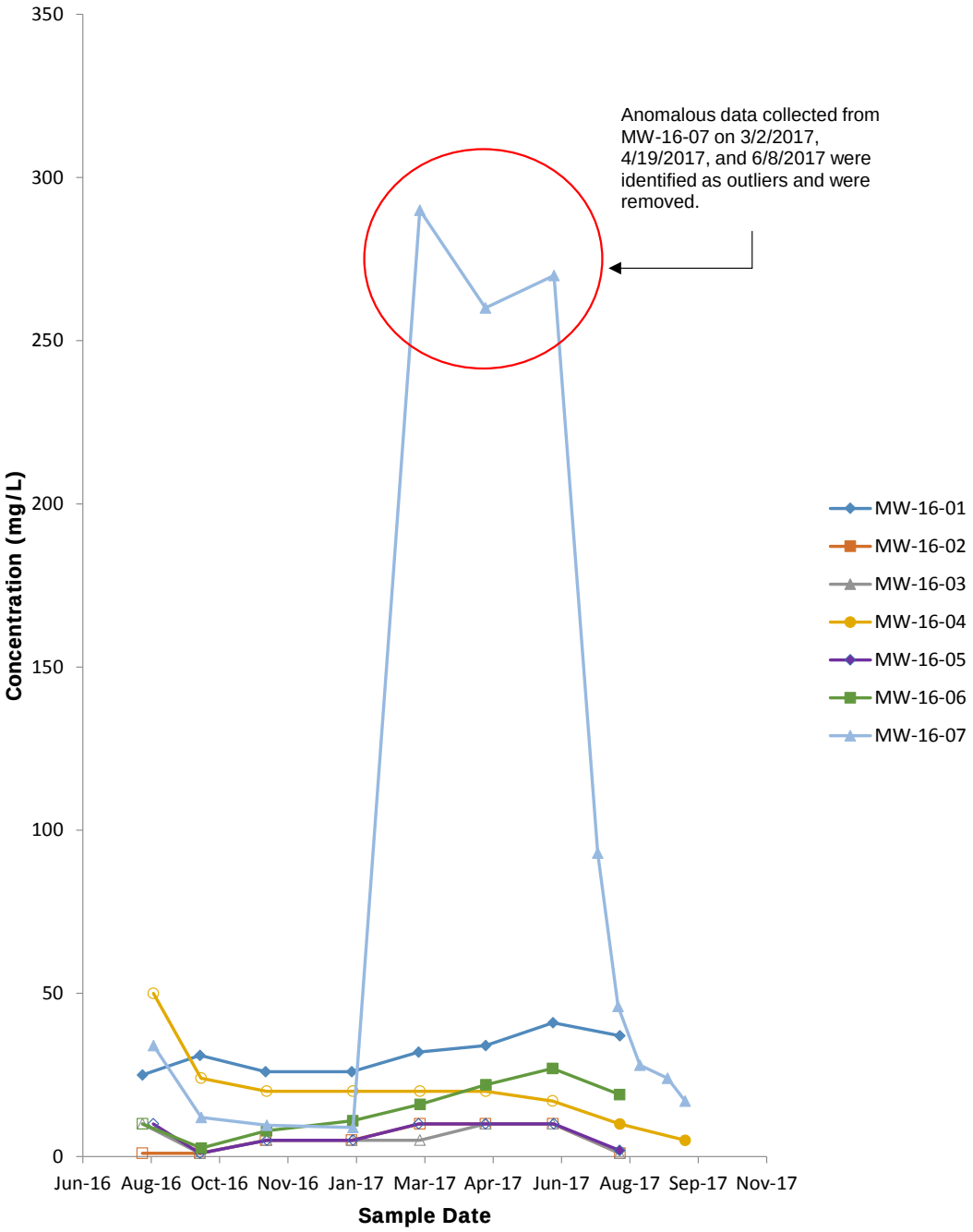


Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
pH, Field

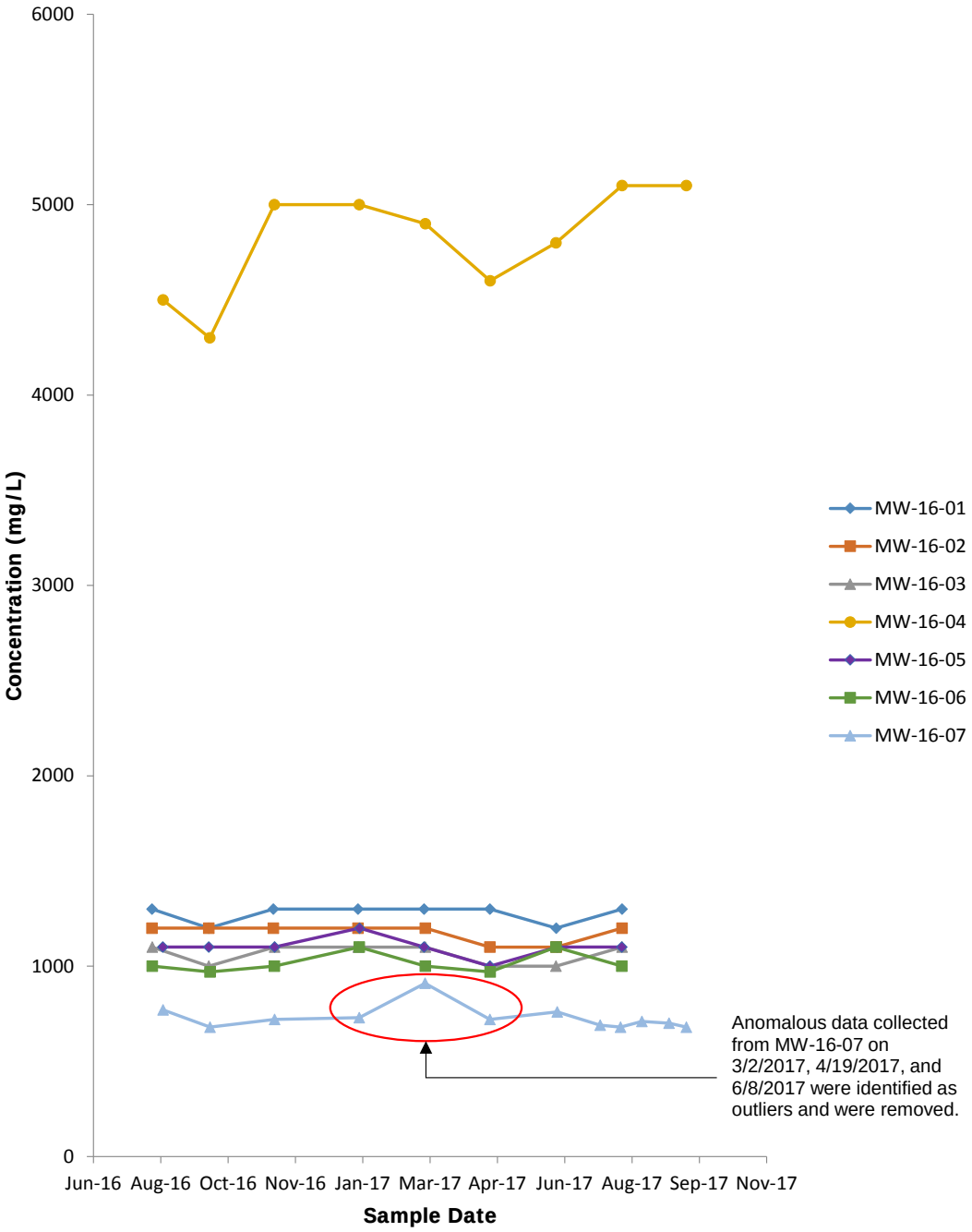


Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Sulfate



Open symbols denote non-detect concentrations.

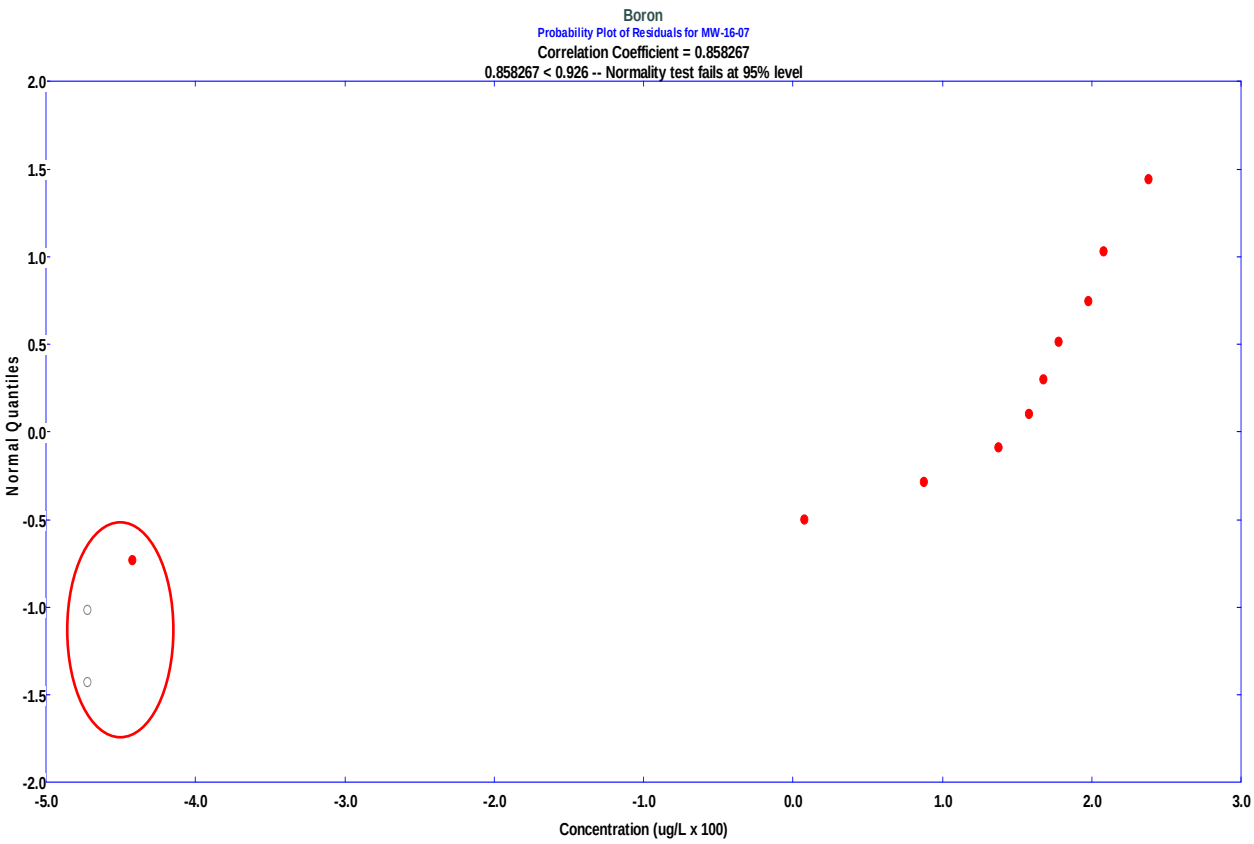
Time-Series Plots
DTE Electric Company - Range Road Landfill
China Township, Michigan
Total Dissolved Solids



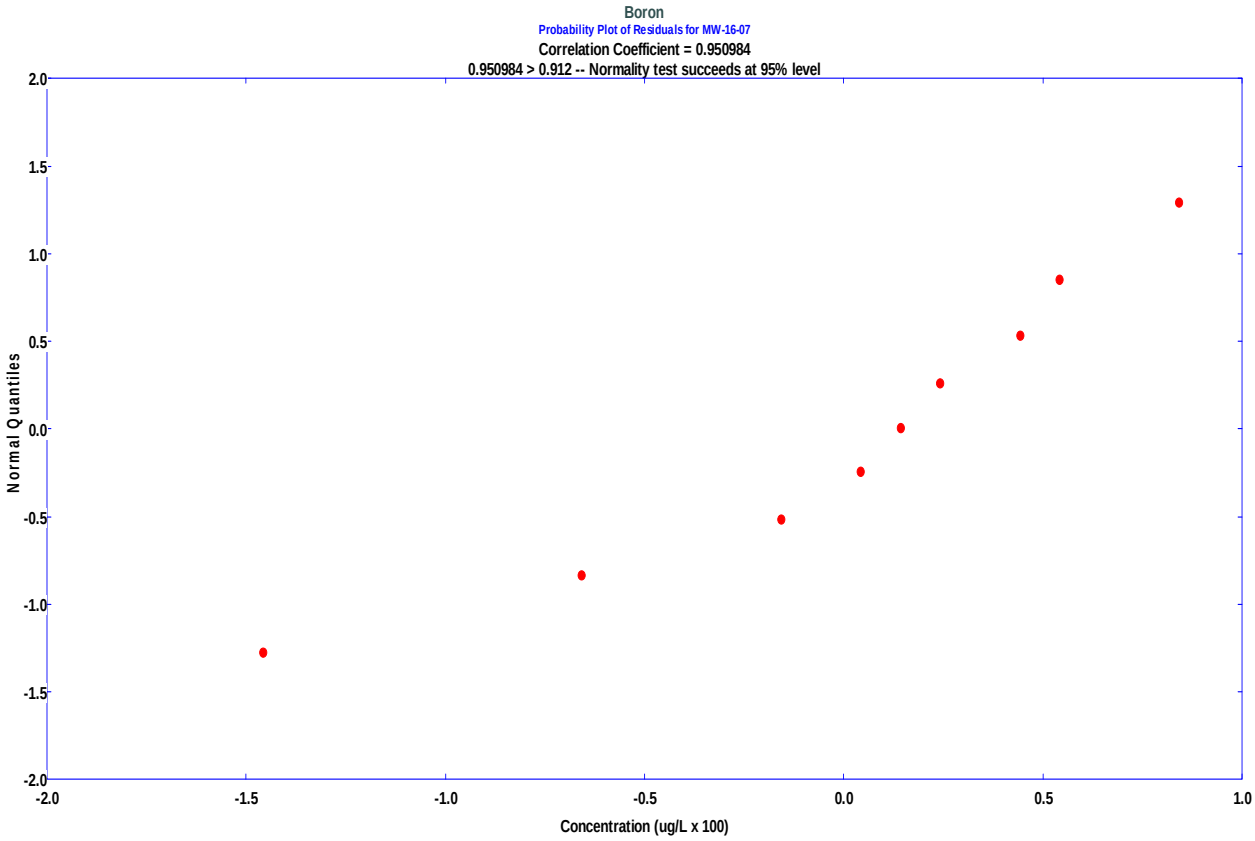
Open symbols denote non-detect concentrations.

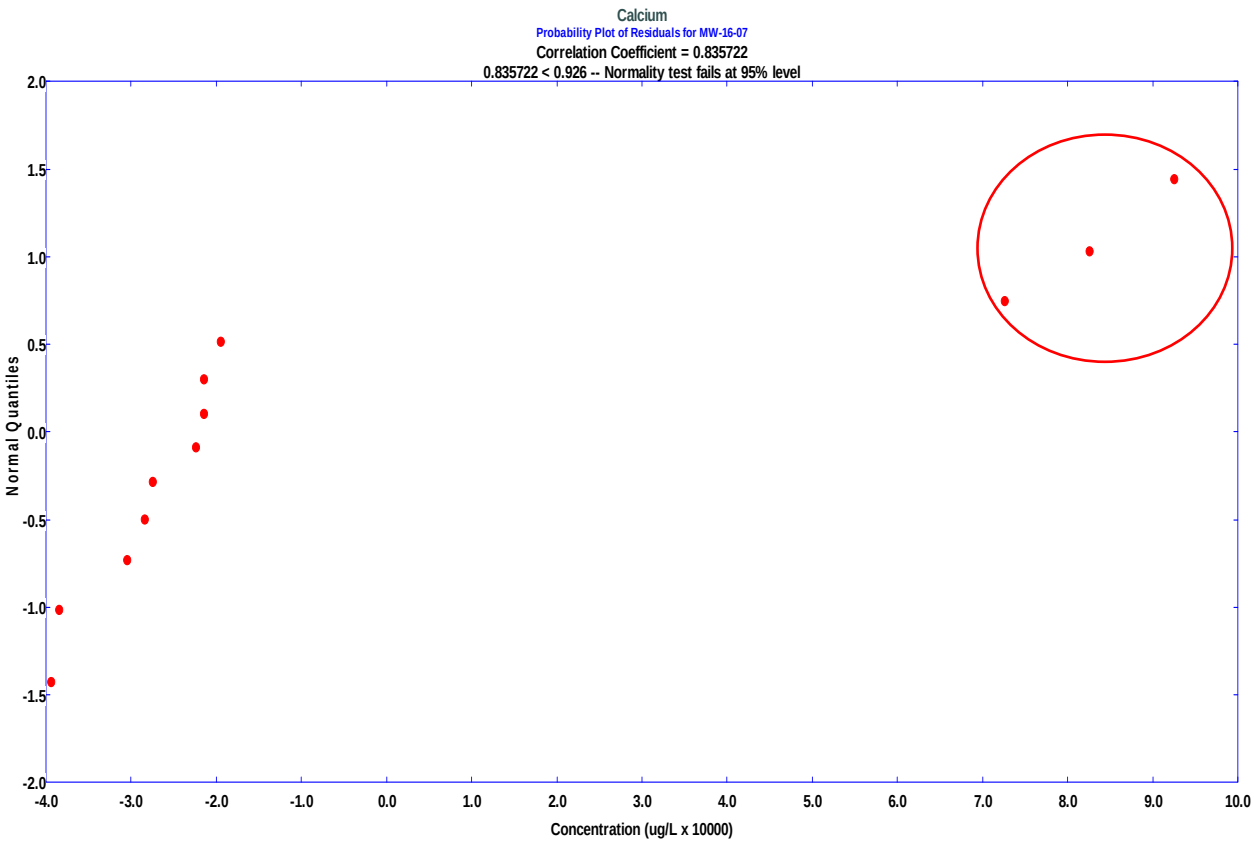
Attachment B

Probability Plots for MW-17-06 Outlier Evaluation

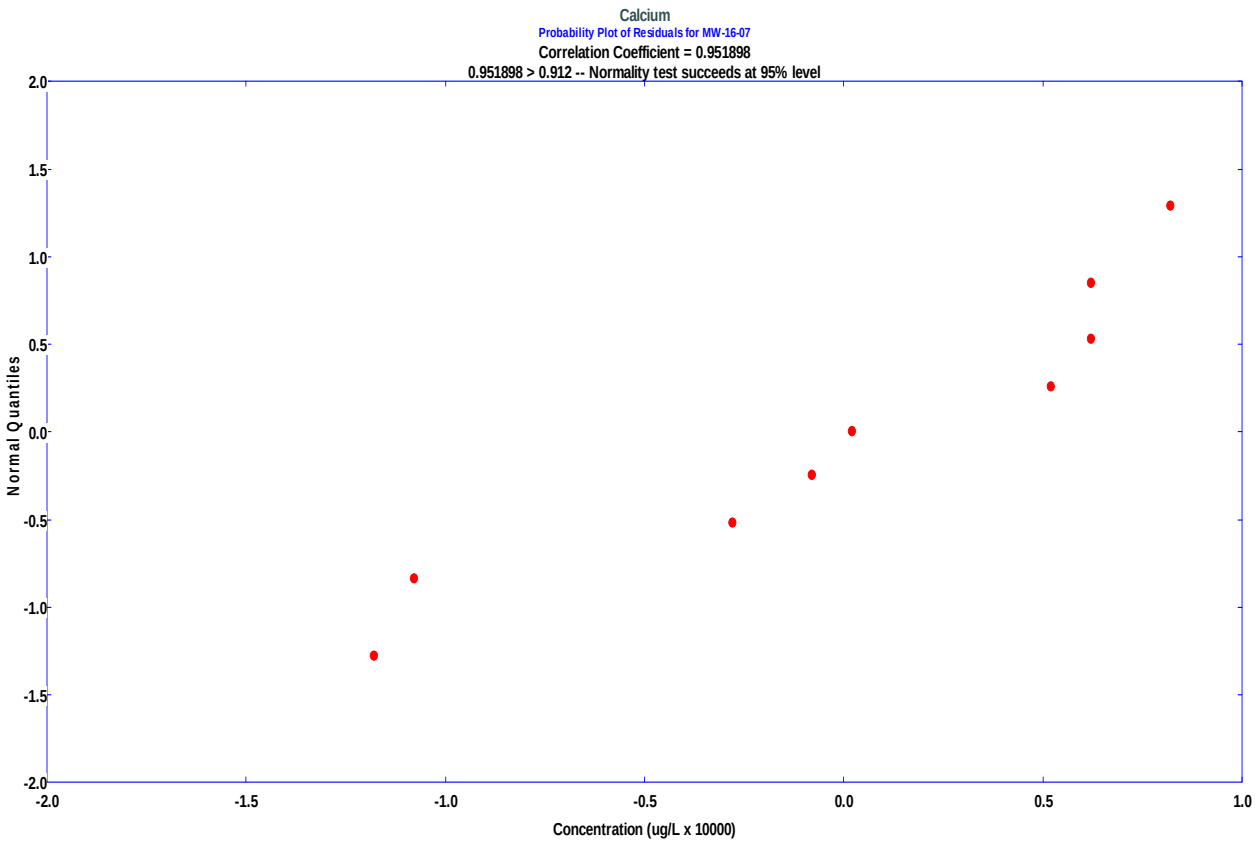

Boron
Probability Plot of Residuals for MW-16-07
Correlation Coefficient = 0.858267
0.858267 < 0.926 -- Normality test fails at 95% level
Normal Quantiles
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
Concentration (ug/L x 100)

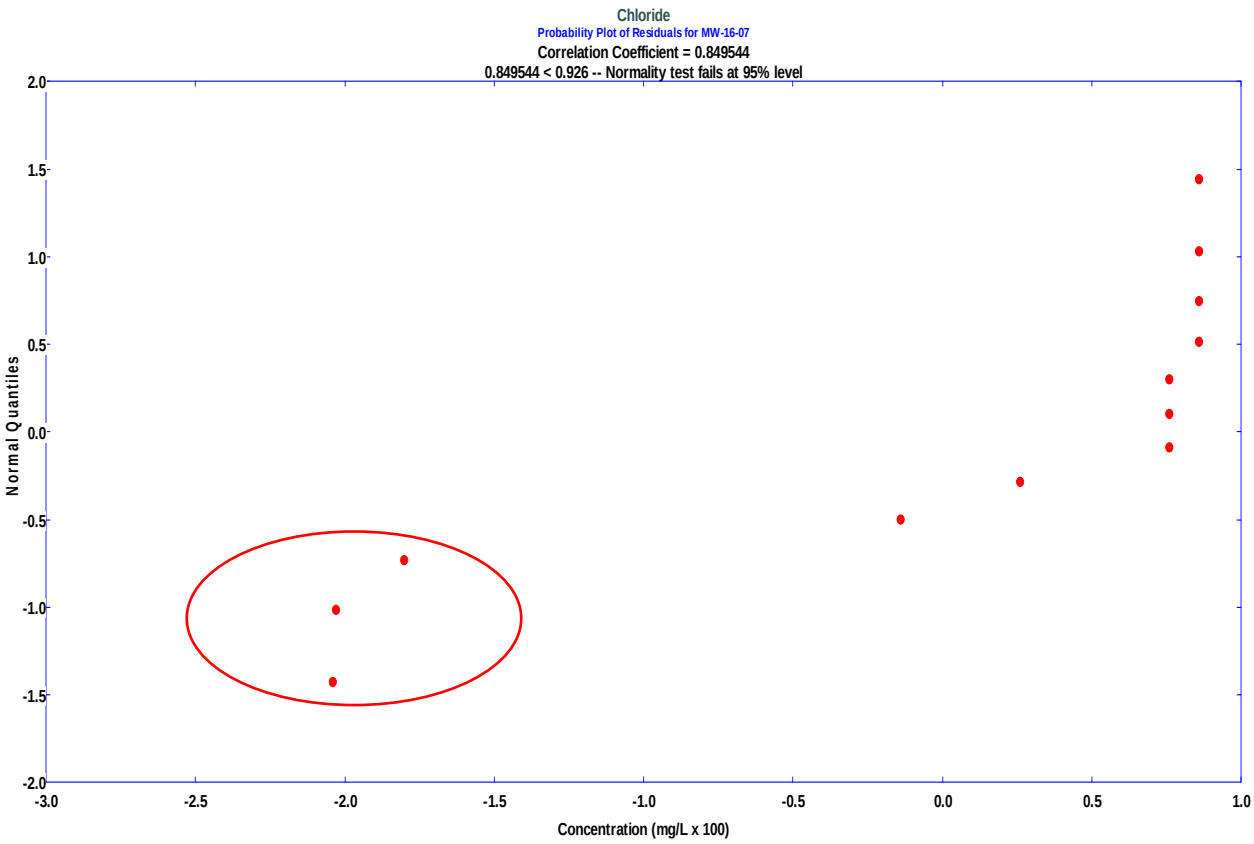
After outlier removal



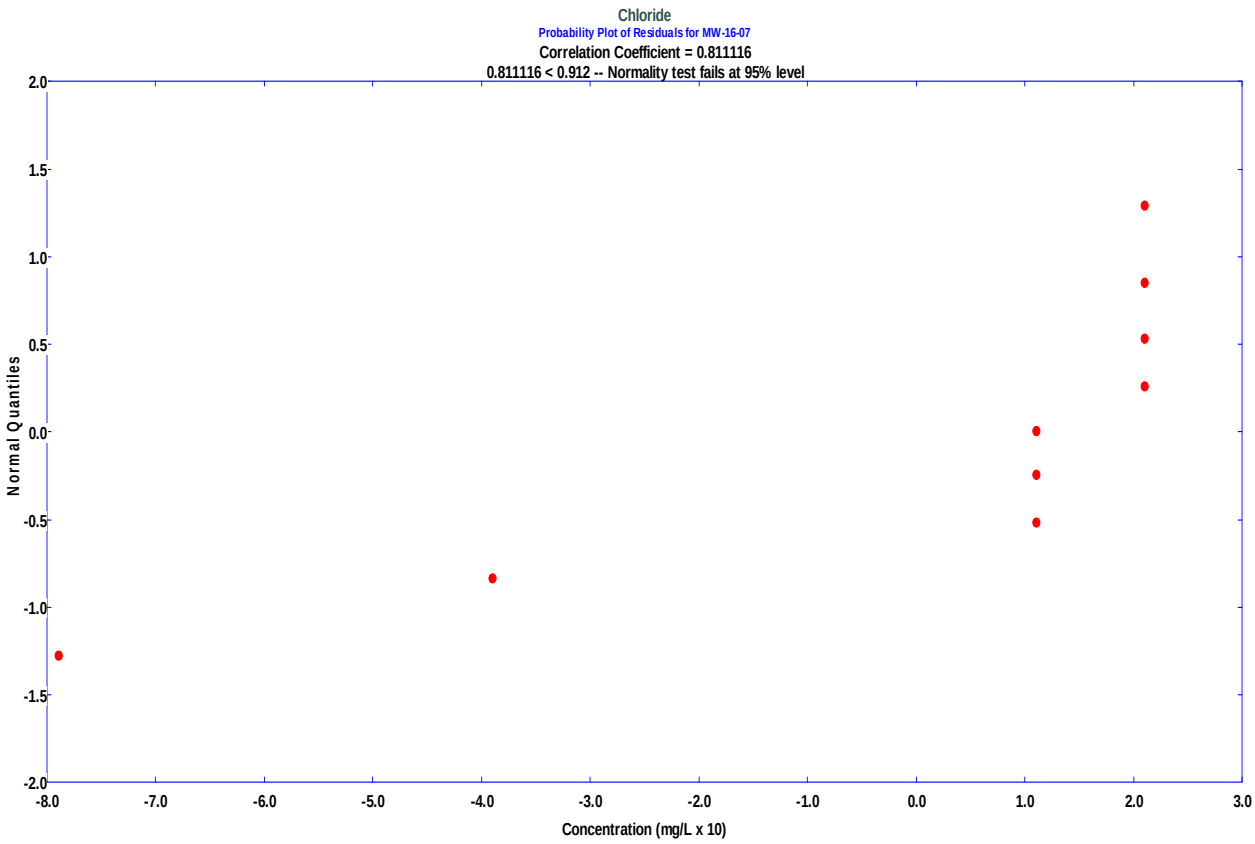

Calcium
Probability Plot of Residuals for MW-16-07
Correlation Coefficient = 0.835722
0.835722 < 0.926 -- Normality test fails at 95% level
Normal Quantiles
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Concentration (ug/L x 10000)

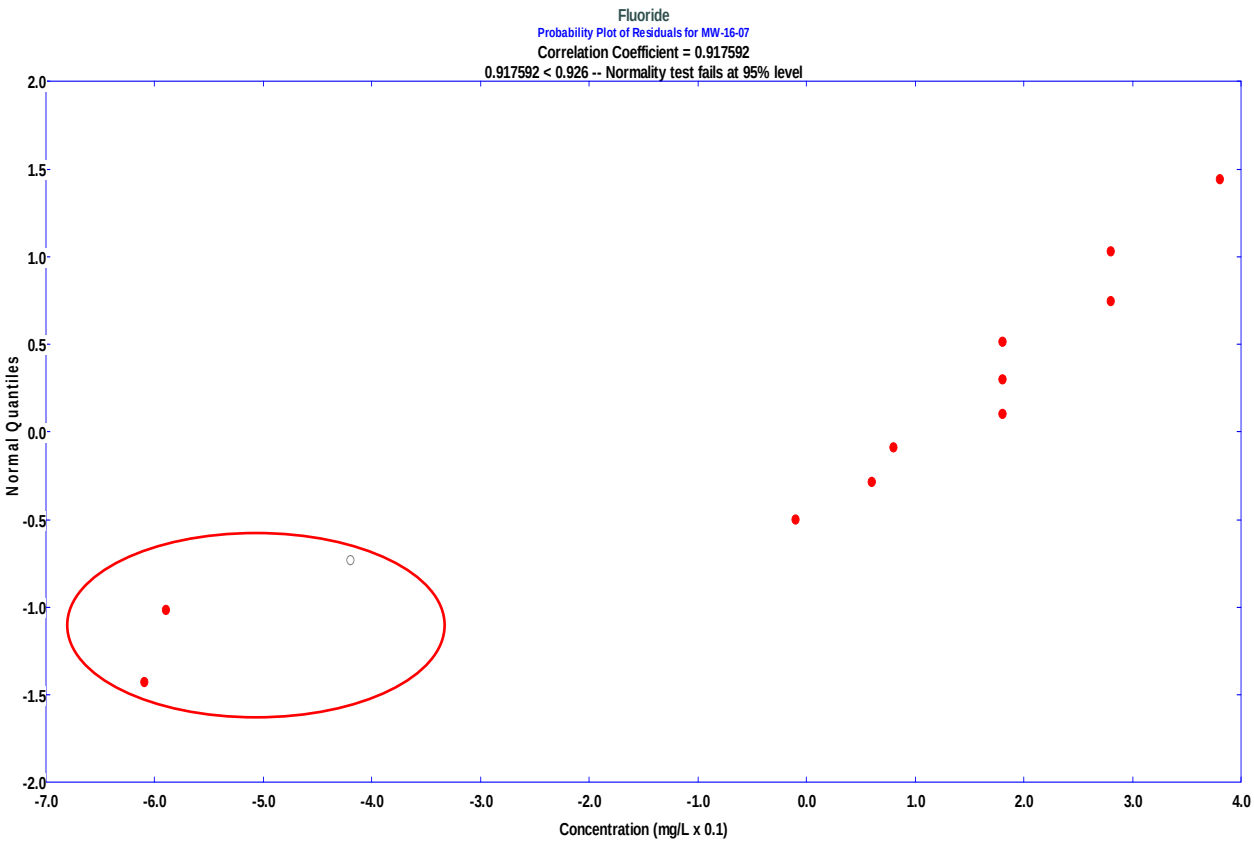
After outlier removal



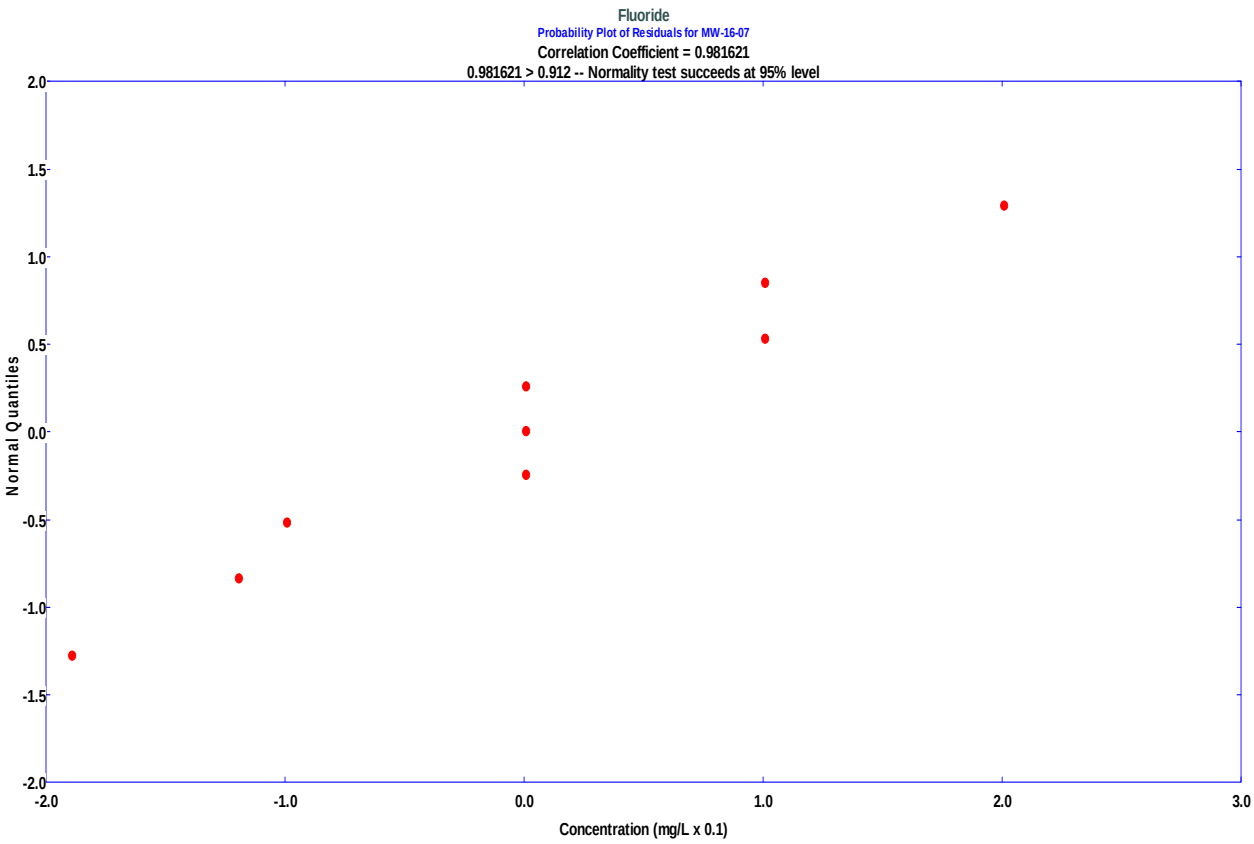

Chloride
Probability Plot of Residuals for MW-16-07
Correlation Coefficient = 0.849544
0.849544 < 0.926 -- Normality test fails at 95% level
Normal Quantiles
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
Concentration (mg/L x 100)

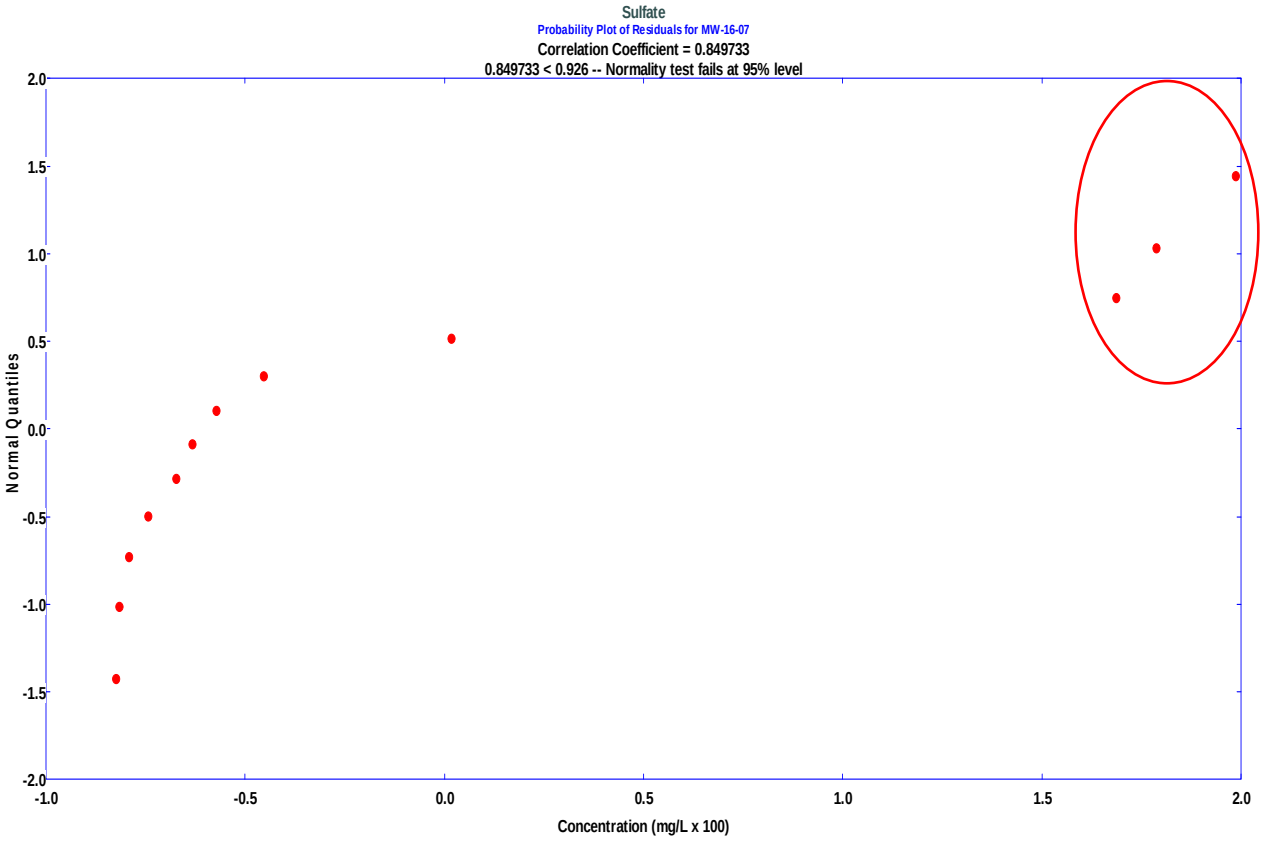
After outlier removal



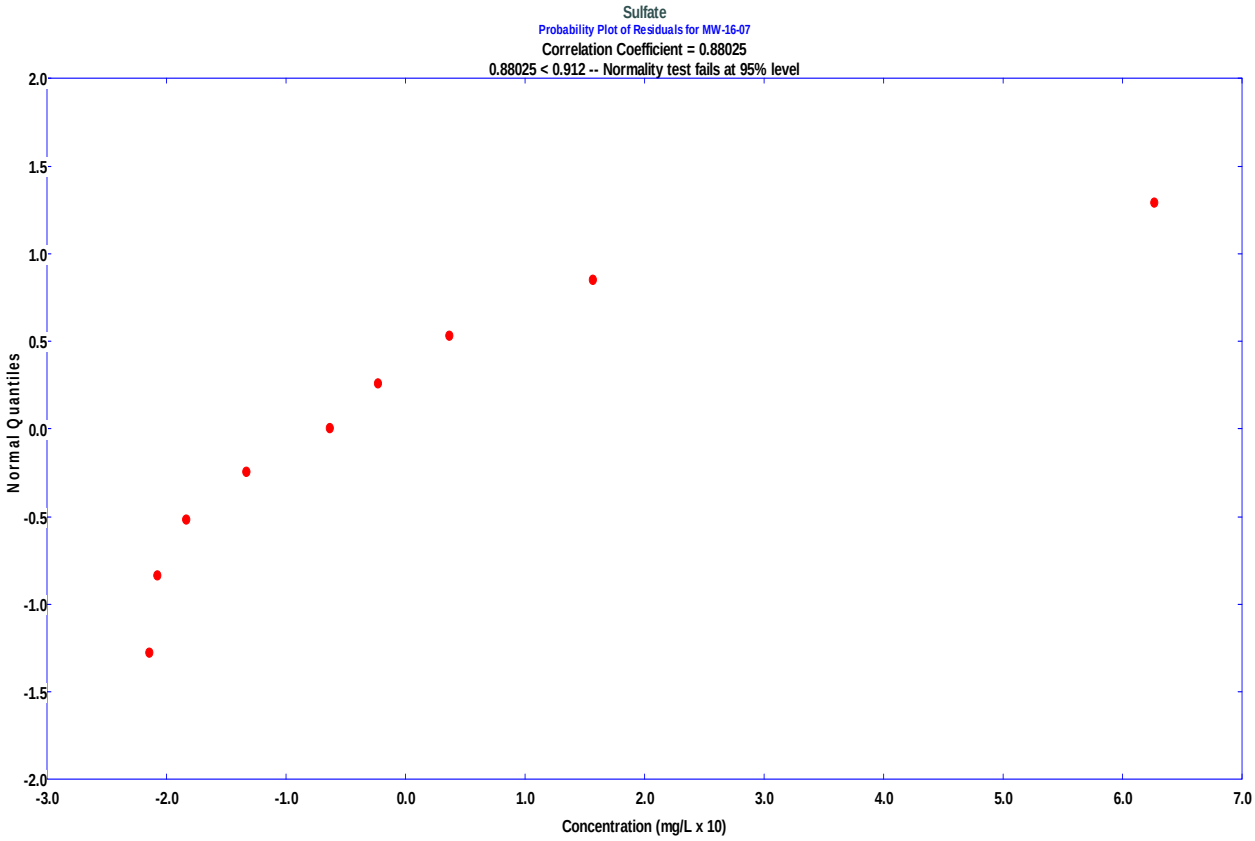

Fluoride
Probability Plot of Residuals for MW-16-07
Correlation Coefficient = 0.917592
0.917592 < 0.926 -- Normality test fails at 95% level
Normal Quantiles
Concentration (mg/L x 0.1)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-7.0
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0

After outlier removal




Sulfate
Probability Plot of Residuals for MW-16-07
Correlation Coefficient = 0.849733
0.849733 < 0.926 -- Normality test fails at 95% level
Normal Quantiles
Concentration (mg/L x 100)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0

After outlier removal



Attachment C

ChemStat™ Prediction Limit Outputs

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	520
	9/22/2016	560
	11/9/2016	520 B
	1/11/2017	520
	3/1/2017	510
	4/19/2017	520
	6/7/2017	540
	7/26/2017	540

From 8 baseline samples
Baseline mean = 528.75
Baseline std Dev = 16.4208

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	470	[0, 561.748]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-02
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 1100
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	1000
	9/22/2016	1100
	11/9/2016	1100 B
	1/11/2017	1100
	3/2/2017	1100
	4/19/2017	1100
	6/7/2017	1100
	7/26/2017	1100

Date	Count	Mean	Significant
10/3/2017	1	980	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1100
	9/22/2016	1100
	11/10/2016	1200 B
	1/11/2017	1100
	3/2/2017	1100
	4/19/2017	1100
	6/7/2017	1200
	7/26/2017	1200

From 8 baseline samples
Baseline mean = 1137.5
Baseline std Dev = 51.7549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	950	[0, 1241.5]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	920
	9/23/2016	1000
	11/10/2016	1100 B
	1/12/2017	1000
	3/2/2017	1000
	4/19/2017	1000
	6/7/2017	1000
	7/26/2017	1100

From 8 baseline samples
Baseline mean = 1015
Baseline std Dev = 59.2814

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	980	[0, 1134.13]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	1100
	9/22/2016	1200
	11/10/2016	1200 B
	1/12/2017	1300
	3/1/2017	1200
	4/19/2017	1200
	6/8/2017	1300
	7/26/2017	1300

From 8 baseline samples
Baseline mean = 1225
Baseline std Dev = 70.7107

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	1100	[0, 1367.09]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1000
	9/23/2016	1000
	11/10/2016	1100 B
	1/12/2017	1100
	3/2/2017	1000
	4/19/2017	1100
	6/7/2017	1100
	7/26/2017	1100

From 8 baseline samples
Baseline mean = 1062.5
Baseline std Dev = 51.7549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	910	[0, 1166.5]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	760
	9/23/2016	880
	11/10/2016	850 B
	1/12/2017	830
	7/10/2017	680 B
	7/25/2017	810
	8/10/2017	870
	8/30/2017	840

From 8 baseline samples
Baseline mean = 815
Baseline std Dev = 66.1168

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	790	[0, 947.862]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	78000
	9/22/2016	82000
	11/9/2016	85000
	1/11/2017	84000
	3/1/2017	87000
	4/19/2017	82000
	6/7/2017	85000
	7/26/2017	79000

From 8 baseline samples
Baseline mean = 82750
Baseline std Dev = 3105.3

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	79000	[0, 88990.1]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	19000
	9/22/2016	20000
	11/9/2016	18000
	1/11/2017	21000
	3/2/2017	22000
	4/19/2017	21000
	6/7/2017	22000
	7/26/2017	22000

From 8 baseline samples
Baseline mean = 20625
Baseline std Dev = 1505.94

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	21000	[0, 23651.2]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	19000
	9/22/2016	19000
	11/10/2016	18000
	1/11/2017	20000
	3/2/2017	19000
	4/19/2017	20000
	6/7/2017	20000
	7/26/2017	21000

From 8 baseline samples
Baseline mean = 19500
Baseline std Dev = 925.82

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	18000	[0, 21360.4]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	57000
	9/23/2016	67000
	11/10/2016	62000
	1/12/2017	62000
	3/2/2017	62000
	4/19/2017	61000
	6/7/2017	62000
	7/26/2017	61000

From 8 baseline samples
Baseline mean = 61750
Baseline std Dev = 2712.41

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	64000	[0, 67200.6]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	18000
	9/22/2016	18000
	11/10/2016	18000
	1/12/2017	19000
	3/1/2017	19000
	4/19/2017	18000
	6/8/2017	18000
	7/26/2017	19000

From 8 baseline samples
Baseline mean = 18375
Baseline std Dev = 517.549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	18000	[0, 19415]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	28000
	9/23/2016	27000
	11/10/2016	28000
	1/12/2017	29000
	3/2/2017	30000
	4/19/2017	29000
	6/7/2017	30000
	7/26/2017	28000

From 8 baseline samples
Baseline mean = 28625
Baseline std Dev = 1060.66

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	28000	[0, 30756.4]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	56000
	9/23/2016	47000
	11/10/2016	38000
	1/12/2017	39000
	7/10/2017	58000
	7/25/2017	56000
	8/10/2017	55000
	8/30/2017	50000

From 8 baseline samples
Baseline mean = 49875
Baseline std Dev = 7881.94

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	46000	[0, 65713.8]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	710
	9/22/2016	730
	11/9/2016	730
	1/11/2017	740
	3/1/2017	670
	4/19/2017	650
	6/7/2017	720 F2
	7/26/2017	710

From 8 baseline samples
Baseline mean = 707.5
Baseline std Dev = 31.5096

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	760	[0, 770.819]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	650
	9/22/2016	690
	11/9/2016	670
	1/11/2017	670
	3/2/2017	620
	4/19/2017	580
	6/7/2017	670
	7/26/2017	650

From 8 baseline samples
Baseline mean = 650
Baseline std Dev = 35.051

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	720	[0, 720.435]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-03
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 550
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	540
	9/22/2016	540
	11/10/2016	540
	1/11/2017	540
	3/2/2017	500
	4/19/2017	490
	6/7/2017	550
	7/26/2017	530

Date	Count	Mean	Significant
10/3/2017	1	570	TRUE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	3200
	9/23/2016	3400
	11/10/2016	3200
	1/12/2017	3500
	3/2/2017	2900
	4/19/2017	2800
	6/7/2017	3200
	7/26/2017	3200

From 8 baseline samples
Baseline mean = 3175
Baseline std Dev = 231.455

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	3200	[0, 3640.11]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	590
	9/22/2016	590
	11/10/2016	580
	1/12/2017	580
	3/1/2017	540
	4/19/2017	520
	6/8/2017	580 F2
	7/26/2017	560

From 8 baseline samples
Baseline mean = 567.5
Baseline std Dev = 25.4951

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	620	[0, 618.732]	TRUE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	560
	9/23/2016	560
	11/10/2016	560
	1/12/2017	550
	3/2/2017	510
	4/19/2017	490
	6/7/2017	540
	7/26/2017	540

From 8 baseline samples
Baseline mean = 538.75
Baseline std Dev = 25.8775

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	610	[0, 590.751]	TRUE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-07
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 330
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/19/2016	320
	9/23/2016	320
	11/10/2016	330
	1/12/2017	330
	7/10/2017	230
	7/25/2017	270
	8/10/2017	320
	8/30/2017	330

Date	Count	Mean	Significant
10/5/2017	1	350	TRUE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	0.81
	9/22/2016	0.81
	11/9/2016	0.85
	1/11/2017	0.69
	3/1/2017	0.89
	4/19/2017	0.83
	6/7/2017	0.86 F1
	7/26/2017	0.88

From 8 baseline samples
Baseline mean = 0.8275
Baseline std Dev = 0.0629626

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	0.9	[0, 0.954023]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	2
	9/22/2016	1.8
	11/9/2016	1.9
	1/11/2017	1.8
	3/2/2017	1.9
	4/19/2017	1.8
	6/7/2017	2
	7/26/2017	2

From 8 baseline samples
Baseline mean = 1.9
Baseline std Dev = 0.092582

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	2	[0, 2.08604]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	2
	9/22/2016	1.8
	11/9/2016	1.9
	1/11/2017	1.8
	3/2/2017	1.9
	4/19/2017	1.8
	6/7/2017	2
	7/26/2017	2

From 8 baseline samples
Baseline mean = 1.9
Baseline std Dev = 0.092582

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	2	[0, 2.08604]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1.8
	9/22/2016	2
	11/10/2016	2.1
	1/11/2017	1.9
	3/2/2017	2.1
	4/19/2017	2
	6/7/2017	2.1
	7/26/2017	2.2

From 8 baseline samples
Baseline mean = 2.025
Baseline std Dev = 0.128174

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	2.2	[0, 2.28257]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	ND<1.25 U
	9/23/2016	1.5
	11/10/2016	1.4
	1/12/2017	1.3
	3/2/2017	1.5
	4/19/2017	1.4
	6/7/2017	1.5
	7/26/2017	1.5

From 8 baseline samples
Baseline mean = 1.41875
Baseline std Dev = 0.0997765

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	1.5	[0, 1.61925]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	1.7
	9/22/2016	1.7
	11/10/2016	1.7
	1/12/2017	1.6
	3/1/2017	1.8
	4/19/2017	1.7
	6/8/2017	1.8 F1F2
	7/26/2017	1.9

From 8 baseline samples
Baseline mean = 1.7375
Baseline std Dev = 0.0916125

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	1.9	[0, 1.9216]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1.2
	9/23/2016	1.4
	11/10/2016	1.4
	1/12/2017	1.2
	3/2/2017	1.5
	4/19/2017	1.4
	6/7/2017	1.4
	7/26/2017	1.5

From 8 baseline samples
Baseline mean = 1.375
Baseline std Dev = 0.116496

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	1.5	[0, 1.6091]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	1.3
	9/23/2016	1.2
	11/10/2016	1.1
	1/12/2017	0.98
	7/10/2017	0.91
	7/25/2017	1
	8/10/2017	1.1
	8/30/2017	1.1

From 8 baseline samples
Baseline mean = 1.08625
Baseline std Dev = 0.124778

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	1.2	[0, 1.33699]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	7.4
	9/22/2016	8.25
	11/9/2016	7.94
	1/11/2017	7.7
	3/1/2017	7.87
	4/19/2017	7.69
	6/7/2017	7.68
	7/26/2017	7.55

From 8 baseline samples
Baseline mean = 7.76
Baseline std Dev = 0.26

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
10/3/2017	1	7.62	[7.11, 8.41]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-02
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 9.04
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	8.39
	9/22/2016	9.04
	11/9/2016	8.5
	1/11/2017	8.21
	3/2/2017	8.46
	4/19/2017	8.41
	6/7/2017	8.36
	7/26/2017	8.23

Date	Count	Mean	Significant
10/3/2017	1	8.21	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-03
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 8.82
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	8.29
	9/22/2016	8.82
	11/10/2016	8.31
	1/11/2017	8.05
	3/2/2017	8.15
	4/19/2017	8.12
	6/7/2017	8.13
	7/26/2017	8.01

Date	Count	Mean	Significant
10/3/2017	1	7.95	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	7.97
	9/23/2016	7.72
	11/10/2016	8.21
	1/12/2017	7.69
	3/2/2017	8.09
	4/19/2017	8.02
	6/7/2017	7.91
	7/26/2017	8.25
	9/11/2017	8.19

From 9 baseline samples
Baseline mean = 8.00556
Baseline std Dev = 0.204457

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 9 (background observations) - 1
t(0.975, 9) = 2.30601

Date	Samples	Mean	Interval	Significant
10/5/2017	1	8.19	[7.51, 8.5]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-05
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 8.93
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/19/2016	8.19
	9/22/2016	8.93
	11/10/2016	8.35
	1/12/2017	8
	3/1/2017	8.29
	4/19/2017	8.2
	6/8/2017	8.16
	7/26/2017	8.09

Date	Count	Mean	Significant
10/3/2017	1	8.12	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	8
	9/23/2016	8.27
	11/10/2016	8.1
	1/12/2017	7.76
	3/2/2017	8.06
	4/19/2017	8.01
	6/7/2017	7.89
	7/26/2017	7.9

From 8 baseline samples
Baseline mean = 7.99875
Baseline std Dev = 0.154128

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
10/3/2017	1	7.83	[7.61, 8.39]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	8.03
	9/23/2016	8.02
	11/10/2016	8.05
	1/12/2017	7.69
	7/10/2017	7.74
	7/25/2017	7.5
	8/10/2017	7.84
	8/30/2017	7.56
	9/11/2017	7.51

From 9 baseline samples
Baseline mean = 7.77111
Baseline std Dev = 0.22508

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 9 (background observations) - 1
t(0.975, 9) = 2.30601

Date	Samples	Mean	Interval	Significant
10/5/2017	1	7.71	[7.22, 8.32]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	25
	9/22/2016	31
	11/9/2016	26
	1/11/2017	26
	3/1/2017	32
	4/19/2017	34
	6/7/2017	41 F1
	7/26/2017	37

From 8 baseline samples
Baseline mean = 31.5
Baseline std Dev = 5.73212

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	34	[0, 43.0187]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-04
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 50
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/19/2016	ND<50 U
	9/23/2016	24
	11/10/2016	ND<20 U
	1/12/2017	ND<20 U
	3/2/2017	ND<20 U
	4/19/2017	ND<20 U
	6/7/2017	17
	7/26/2017	ND<10 U

Date	Count	Mean	Significant
10/5/2017	1	5	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-05
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 10
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/19/2016	ND<10 U
	9/22/2016	ND<1 U
	11/10/2016	ND<5 U
	1/12/2017	ND<5 U
	3/1/2017	ND<10 U
	4/19/2017	ND<10 U
	6/8/2017	ND<10 UF1F2
	7/26/2017	1.9

Date	Count	Mean	Significant
10/3/2017	1	1	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	ND<5 U
	9/23/2016	2.6
	11/10/2016	7.9
	1/12/2017	11
	3/2/2017	16
	4/19/2017	22
	6/7/2017	27
	7/26/2017	19

From 8 baseline samples
Baseline mean = 13.8125
Baseline std Dev = 8.6097

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	23	[0, 31.1137]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Sulfate
Natural Logarithm Transformation
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	3.52636
	9/23/2016	2.48491
	11/10/2016	2.26176
	1/12/2017	2.18605
	7/10/2017	4.5326
	7/25/2017	3.82864
	8/10/2017	3.3322
	8/30/2017	3.17805

From 8 baseline samples
Baseline mean = 3.16632
Baseline std Dev = 0.819943

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	2.70805	[0, 4.814]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-01
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 1300
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	1300
	9/22/2016	1200
	11/9/2016	1300
	1/11/2017	1300
	3/1/2017	1300
	4/19/2017	1300
	6/7/2017	1200
	7/26/2017	1300

Date	Count	Mean	Significant
10/3/2017	1	1300	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-02
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 1200
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/11/2016	1200
	9/22/2016	1200
	11/9/2016	1200
	1/11/2017	1200
	3/2/2017	1200
	4/19/2017	1100
	6/7/2017	1100
	7/26/2017	1200

Date	Count	Mean	Significant
10/3/2017	1	1200	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1100
	9/22/2016	1000
	11/10/2016	1100
	1/11/2017	1100
	3/2/2017	1100
	4/19/2017	1000
	6/7/2017	1000
	7/26/2017	1100

From 8 baseline samples
Baseline mean = 1062.5
Baseline std Dev = 51.7549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	990	[0, 1166.5]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	4500
	9/23/2016	4300
	11/10/2016	5000
	1/12/2017	5000
	3/2/2017	4900
	4/19/2017	4600
	6/7/2017	4800
	7/26/2017	5100

From 8 baseline samples
Baseline mean = 4775
Baseline std Dev = 281.577

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	4900	[0, 5340.83]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	1100
	9/22/2016	1100
	11/10/2016	1100
	1/12/2017	1200
	3/1/2017	1100
	4/19/2017	1000
	6/8/2017	1100
	7/26/2017	1100

From 8 baseline samples
Baseline mean = 1100
Baseline std Dev = 53.4522

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	1000	[0, 1207.41]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/11/2016	1000
	9/23/2016	970
	11/10/2016	1000
	1/12/2017	1100
	3/2/2017	1000
	4/19/2017	970
	6/7/2017	1100
	7/26/2017	1000

From 8 baseline samples
Baseline mean = 1017.5
Baseline std Dev = 52.5765

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/3/2017	1	990	[0, 1123.15]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Total Dissolved Solids
Natural Logarithm Transformation
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/19/2016	6.64639
	9/23/2016	6.52209
	11/10/2016	6.57925
	1/12/2017	6.59304
	7/10/2017	6.53669
	7/25/2017	6.52209
	8/10/2017	6.56526
	8/30/2017	6.55108

From 8 baseline samples
Baseline mean = 6.56449
Baseline std Dev = 0.0418998

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
10/5/2017	1	6.55108	[0, 6.64869]	FALSE