Annual Groundwater Monitoring Report

DTE Electric Company
River Rouge Power Plant Bottom Ash Basin
Coal Combustion Residual Unit

1 Belanger Park Drive
River Rouge, 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) River Rouge Power Plant (RRPP) Bottom Ash Basin (BAB) 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 RRPP BAB 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 September 2017 semiannual groundwater monitoring event for the RRPP BAB 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 boron, fluoride and pH in one or more downgradient wells during September 2017. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels.

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. In response to the potential SSIs over background limits noted during the September 2017 monitoring event, DTE Electric plans to initiate assessment monitoring. In addition, given the uncertainty around the potential hydraulic connection between the RRPP BAB CCR unit and the uppermost aquifer, the detected arsenic concentrations above the generic Michigan Part 201 drinking water and groundwater surface water interface criteria within the uppermost aquifer around the RRPP BAB CCR unit during background sampling, and the proximity of the BAB to the Rouge River, DTE Electric is proactively managing this potential migration pathway. DTE Electric's selected management strategy is to construct and operate a groundwater extraction system to control the uncertainty around the potential migration of CCR constituents from the BAB to groundwater. This system is currently being constructed and is anticipated to be operational by Spring 2018.

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) River Rouge Power Plant (RRPP) Bottom Ash Basin (BAB). 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 RRPP BAB 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 September 2017 semiannual groundwater monitoring event for the RRPP BAB 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 River Rouge Power Plant Bottom Ash Basin* (QAPP) (TRC, August 2016; revised August 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan – River Rouge Power Plant Coal Combustion Residual Bottom Ash Basin* (Stats Plan) (TRC, October 2017; revised December 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 RRPP BAB is located at 1 Belanger Park Drive, within the City of River Rouge in Wayne County, Michigan. The RRPP, including the BAB CCR unit, was originally constructed in the early 1950s, just northeast of the DTE Electric RRPP. The power plant property is located at the confluence of the Rouge River and the Detroit River.

The RRPP BAB is a sedimentation basin that is an incised CCR surface impoundment. The impoundment is sheet-piled around the perimeters to approximately 30 feet below ground

surface (ft bgs) into the native soil. The BAB is used for receiving sluiced bottom ash and other process flow effluent pumped from the power plant to the eastern end of the BAB. There is a sheet pile weir near the middle of the BAB that maintains the water elevation in the eastern portion to approximately 577.5 feet through gravity flow. The water in the western portion of the BAB is maintained at an elevation of no higher than 577 feet before being recirculated back to the RRPP and/or is discharged into the Rouge River in accordance with a National Pollution Discharge Elimination System (NPDES) permit.

1.3 Geology/Hydrogeology

The RRPP BAB CCR unit is located immediately adjacent to the Rouge River to the northeast near the intersection of the Rouge River and Detroit River (Figure 1). The RRPP CCR unit is underlain initially by approximately 10 feet of surficial fill of various composition (gravel, sand, silt and clay, brick and/or concrete fragments). The fill is partially saturated in some areas, but is not continuously saturated across the RRPP, does not represent a significant, usable source of water, and is, therefore, not an aquifer. An organic layer is often encountered beneath the surficial fill that is then underlain by a silt/clay-rich unit that ranges from 3 to about 8 feet thick in the area of the BAB. Beneath the silt/clay-rich unit, there is a saturated sand and gravel unit that often coarsens from sand to gravel with depth. This coarse-grained sand and gravel unit is present from as shallow as 15 ft bgs to as deep as 25.5 ft bgs. This same coarse-grained unit is observed in most of the historical boring logs across the RRPP and appears to be a relatively continuous unit across the RRPP. Based on this information, this coarse-grained sand and gravel unit represents the uppermost aquifer present at the RRPP BAB CCR unit.

The coarse-grained sand and gravel uppermost aquifer is underlain by a more than 60-foot-thick contiguous silty clay-rich deposit that serves as a natural lower confining hydraulic barrier that isolates the uppermost aquifer from the underlying Dundee limestone that represents the next aquifer. There is no apparent hydraulic connection between the uppermost aquifer and the Dundee limestone aquifer, and the limestone aquifer is artesian.

A definitive groundwater flow direction to the northeast with an average gradient of 0.00067 foot/foot (using data from June 2016 through September 2017) within the uppermost aquifer is evident around the RRPP BAB CCR unit, with potential groundwater flow rates within the uppermost aquifer ranging from approximately 5.8 to 73 feet/year. Due to the relatively small footprint of the BAB, based on the consistent flow regime, in addition to the relatively shallow position of the uppermost aquifer relative to the BAB CCR unit, interwell statistical approaches appear to be appropriate and, as such, will be used during detection monitoring as discussed in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the RRPP BAB CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the BAB CCR unit currently consists of five monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Monitoring wells MW-17-06 and MW-17-07 are located south-southwest of the RRPP BAB and provide data on background groundwater quality that has not been affected by the CCR unit (total of two background wells). Monitoring wells MW-16-01 through MW-16-03 are located north-northeast, downgradient of the RRPP BAB CCR unit (total of three downgradient monitoring wells).

As shown on Figure 2, monitoring well MW-16-04S is used for water level measurements only. MW-16-04S had originally been installed as a potential background monitoring well; however, based on concentrations of several Appendix III parameters, the proximity of the well to the BAB and the hydrogeology of the area, monitoring well MW-16-04S does not appear to be representative of background groundwater conditions; therefore, this well was excluded from the background monitoring network. As such, in June 2017, two additional monitoring wells (MW-17-06 and MW-17-07) were installed in the uppermost aquifer further upgradient on the southwest side of the RRPP main building for use as background wells (Figure 2).

2.2 Background Sampling

Background groundwater monitoring was conducted at the RRPP BAB CCR unit from August 2016 through September 2017 in accordance with the QAPP. Data collection included eight background data collection events (August 2016 through July 2017) 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 five monitoring wells installed for the BAB CCR unit, in addition to MW-16-04S. Since the background wells MW-17-06 and MW-17-07 were established in June 2017, background data collection was conducted July 2017 through September 2017 from these background wells. 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; 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 Figures 1 through 8.

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 September 22, 2017, by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all monitoring well locations in addition to surface water measuring points MP-01 through MP-04 established along the Rouge River and Detroit River (Figure 2). Groundwater samples were collected from the two background monitoring wells and three downgradient monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the September 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

Groundwater elevation data collected during the most recent background sampling events showed that groundwater within the uppermost aquifer in the vicinity of the RRPP BAB generally flows to the north-northeast across the site toward the Rouge River, with an eastern groundwater flow component on the east edge of the site toward the

Detroit River. Groundwater elevations measured across the Site during the September 2017 sampling event are provided on Table 1 and were used to construct a groundwater contour map (Figure 3).

The map indicates that current groundwater flow is consistent with previous monitoring events. The average hydraulic gradient throughout the RRPP BAB CCR Unit during this event is estimated at 0.0006 ft/ft. Using the low hydraulic conductivity of 9.5 feet/day and high hydraulic conductivity of 120 feet/day presented in the GWMS Report, and an assumed effective porosity of 0.4, the estimated seepage velocity ranges from approximately 0.014 feet/day (5.2 feet/year) to 0.18 feet/day (66 feet/year) for this event.

The general flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the RRPP BAB 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 two established background monitoring wells (MW-17-06 and MW-17-07). 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 RRPP BAB 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 the downgradient wells were compared to the statistical background limits calculated from the background data collected from MW-16-01 through MW-16-03. The comparisons are presented on Table 4.

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

- Boron at MW-16-01, MW-16-02, and MW-16-03;
- Fluoride at MW-16-01; and
- pH at MW-16-01, MW-16-02, and MW-16-03.

There were no SSIs compared to background for calcium, chloride, sulfate or TDS.

Section 4
Conclusions and Recommendations

Potential SSIs over background limits were noted for boron, fluoride and pH in one or more downgradient wells during September 2017. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels.

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.

In response to the potential SSIs over background limits noted during the September 2017 monitoring event, DTE Electric plans to initiate assessment monitoring. During the 90-day period after triggering assessment monitoring, groundwater samples will be collected from the groundwater monitoring system wells and analyzed for Appendix IV constituents pursuant to §257.95(b). Within 90 days of obtaining the results from the first assessment monitoring event, groundwater samples will be collected from the groundwater monitoring system wells and analyzed for Appendix III parameters and the detected Appendix IV parameters from the initial assessment monitoring event.

In addition, given the uncertainty around the potential hydraulic connection between the RRPP BAB CCR unit and the uppermost aquifer, the detected arsenic concentrations above the generic Michigan Part 201 drinking water and groundwater surface water interface criteria within the uppermost aquifer around the RRPP BAB CCR unit during background sampling, and the proximity of the BAB to the Rouge River, DTE Electric is proactively managing this potential migration pathway. DTE Electric's selected management strategy is to construct and operate a groundwater extraction system to control the uncertainty around the potential migration of CCR constituents from the BAB to groundwater. This system is currently being constructed and is anticipated to be operational by Spring 2018.

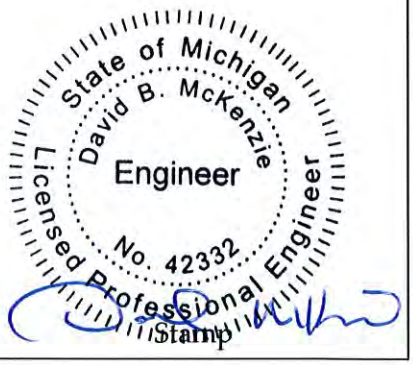
Section 5
Groundwater Monitoring Report Certification

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
River Rouge Power Plant Bottom Ash Basin
River Rouge, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the RRPP BAB 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	
Company: TRC Engineers Michigan, Inc.	Date: 1/30/18	

Section 6
References

TRC Environmental Corporation. August 2016; Revised March and August 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company River Rouge Power Plant Bottom Ash Basin, 1 Belanger Park Drive, River Rouge, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report – DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit, 1 Belanger Park Drive, River Rouge, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017; Revised December 2017. Groundwater Statistical Evaluation Plan – River Rouge Power Plant Coal Combustion Residual Bottom Ash Basin, 1 Belanger Park Drive, River Rouge, Michigan. Prepared for DTE Electric Company.

Tables

Table 1
Summary of Groundwater Elevation Data – September 2017
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04S		MW-17-06		MW-17-07	
Date Installed	6/13/2016		6/13/2016		6/10/2016		3/17/2016		6/7/2017		6/14/2017	
TOC Elevation	583.02		582.79		582.75		582.41		583.01		583.05	
Geologic Unit of Screened Interval	Sand/Silty Clay/Gravel		Silty Sand/Sand/ Clay/Gravel		Sand with Gravel		Sand and Gravel		Silty Sand/ Gravel with Sand		Silt with Sand/Clay	
Screened Interval Elevation	562.0 to 557.0		561.4 to 556.4		561.4 to 556.4		561.2 to 556.2		559.9 to 554.9		564.0 to 559.0	
Unit	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
9/22/2017	7.90	575.12	7.57	575.22	7.79	574.96	7.09	575.32	7.28	575.73	7.10	575.95

Notes:

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

ft BTOC - feet below top of casing

NA - not applicable

1) Elevation represents the point of reference used to collect surface water level measurements.

Table 1
Summary of Groundwater Elevation Data – September 2017
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

Well ID	MP-01		MP-02		MP-03		MP-04	
Date Installed	6/23/2016		6/23/2016		6/20/2017		6/20/2017	
TOC Elevation	579.25[(1)]		579.15[(1)]		578.42[(1)]		579.17[(1)]	
Geologic Unit of Screened Interval	NA		NA		NA		NA	
Screened Interval Elevation	NA		NA		NA		NA	
Unit	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
9/22/2017	2.30	576.95	4.16	574.99	3.28	575.14	4.08	575.09

Notes:

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

ft BTOC - feet below top of casing

NA - not applicable

1) Elevation represents the point of reference used to collect surface water level measurements.

Table 2
Summary of Groundwater Analytical Data – September 2017
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-17-06	MW-17-07	MW-16-01	MW-16-02	MW-16-03
Sample Date:		9/22/2017	9/22/2017	9/22/2017	9/22/2017	9/22/2017
Constituent	Unit	Background		Downgradient		
Appendix III						
Boron	ug/L	320	620	2,800	2,900	1,600
Calcium	ug/L	270,000	370,000	210,000	230,000	110,000
Chloride	mg/L	680	2,200	230	160	130
Fluoride	mg/L	0.39	0.46	1.8	1.3	1.0
pH	SU	6.7	6.7	7.1	7.0	7.1
Sulfate	mg/L	320	1,100	860	980	160
Total Dissolved Solids	mg/L	2,100	5,500	1,700	1,800	910

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 – September 2017
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, 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	9/22/2017	0.14	-81.8	7.1	2,268	14.63	2.60
MW-16-02	9/22/2017	0.13	-75.3	7.0	2,245	14.12	1.05
MW-16-03	9/22/2017	0.13	-90.8	7.1	1,442	13.89	0.34
MW-17-06	9/22/2017	0.18	-64.6	6.7	3,264	18.61	2.13
MW-17-07	9/22/2017	0.38	-57.1	6.7	8,567	21.31	3.40

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 – September 2017
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

		Sample Location:	MW-16-01	MW-16-02	MW-16-03
		Sample Date:	9/22/2017	9/22/2017	9/22/2017
Constituent	Unit	TL			
Appendix III					
Boron	ug/L	**840**	**2,800**	**2,900**	**1,600**
Calcium	ug/L	430,000	210,000	230,000	110,000
Chloride	mg/L	3,400	230	160	130
Fluoride	mg/L	**1.3**	**1.8**	1.3	1.0
pH, Field	SU	**6.5 - 6.7**	**7.1**	**7.0**	**7.1**
Sulfate	mg/L	1,700	860	980	160
Total Dissolved Solids	mg/L	8,300	1,700	1,800	910

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 Tolerance Limits (TL).

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
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
TRC - GIS

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0005
FILE:	265996-SLMMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\265996-SLMMB.mxd -- Saved By: BDEEGAN on 10/9/2017, 14:51:49 PM

LEGEND

- DOWNGRADIENT MONITORING WELLS
- MONITORING WELLS (STATIC WATER LEVEL ONLY)
- BACKGROUND MONITORING WELL
- MONITORING POINT

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

MONITORING NETWORK AND SITE PLAN

DRAWN BY:	B. DEEGAN	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 2**
DATE:	DECEMBER 2017		

TRC
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Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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FILE NO.: 265996-0005-005B_Stat.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 12/19/2017, 15:18:01 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\City\ORichmond\NM\GP_GW_Eval\2017_288529\265996-0005-005B_Stat.mxd

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.25' INTERVAL, DASHED WHERE INFERRED)
- (575.25) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP SEPTEMBER 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-025.mxd

Plot Date: 1/12/2018, 10:57:31 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-025.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

Appendix A
Background Data

Table 1
Groundwater Elevation Summary
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Well ID	MP-01		MP-02		MP-03		MP-04		MW-16-01		MW-16-02		MW-16-03		MW-16-04S		MW-17-06		MW-17-07	
Date Installed	6/23/2016		6/23/2016		6/20/2017		6/20/2017		6/13/2016		6/13/2016		6/10/2016		3/17/2016		6/7/2017		6/14/2017	
TOC Elevation	579.25[1]		579.15[1]		578.42[1]		579.17[1]		583.02		582.79		582.75		582.41		583.01		583.05	
Geologic Unit of Screened Interval	NA		NA		NA		NA		Sand/Silty Clay/Gravel		Silty Sand/Sand/ Clay/Gravel		Sand with Gravel		Sand and Gravel		Silty Sand/ Gravel with Sand		Silt with Sand/Clay	
Screened Interval Elevation	NA		NA		NA		NA		562.0 to 557.0		561.4 to 556.4		561.4 to 556.4		561.2 to 556.2		559.9 to 554.9		564.0 to 559.0	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	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	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
8/5/2016	NM	NM	NM	NM	NI	NI	NI	NI	8.20	574.82	8.00	574.79	8.18	574.57	7.13	575.28	NI		NI	
9/30/2016	NM	NM	NM	NM	NI	NI	NI	NI	7.85	575.17	7.61	575.18	7.82	574.93	6.84	575.57				
11/18/2016	2.30	576.95	4.41	574.74	NI	NI	NI	NI	8.83	574.19	8.73	574.06	8.92	573.83	7.74	574.67				
1/20/2017	2.41	576.84	5.09	574.06	NI	NI	NI	NI	8.44	574.58	8.33	574.46	8.50	574.25	7.05	575.36				
3/10/2017	2.35	576.90	5.05	574.10	NI	NI	NI	NI	8.46	574.56	8.34	574.45	8.52	574.23	7.23	575.18				
4/28/2017	2.30	576.95	4.32	574.83	NI	NI	NI	NI	7.94	575.08	7.75	575.04	7.93	574.82	6.97	575.44				
6/16/2017	2.35	576.90	3.93	575.22	NI	NI	NI	NI	7.56	575.46	7.26	575.53	7.52	575.23	6.69	575.72	NM	NM	NM	NM
7/14/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	6.53	576.48	6.43	576.62
7/21/2017	2.10	577.15	3.65	575.50	2.75	575.67	3.40	575.77	7.43	575.59	7.15	575.64	7.36	575.39	6.66	575.75	6.80	576.21	6.75	576.30
8/1/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.17	575.84	7.15	575.90
8/8/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.28	575.73	7.22	575.83
8/15/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.27	575.74	7.34	575.71
8/22/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.01	576.00	6.84	576.21
8/29/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.16	575.85	7.16	575.89
9/5/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	6.95	576.06	6.76	576.29
9/15/2017	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	7.33	575.68	NM	NM

Notes:

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

ft BTOC - feet below top of casing

NA - not applicable

NM - not measured

NI - not installed

1) Elevation represents the point of reference used to collect surface water level measurements.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-16-01									
Sample Date:		8/5/2016	8/5/2016	9/30/2016	11/18/2016	1/20/2017	3/10/2017	3/10/2017	4/28/2017	6/16/2017	7/21/2017
Constituent	Unit		Field Dup					Field Dup			
Appendix III											
Boron	ug/L	2,400	2,200	2,300	2,700	2,700	2,800	2,900	2,700	2,800	2,800
Calcium	ug/L	210,000	220,000	220,000	230,000	220,000	220,000	220,000	210,000	230,000	230,000
Chloride	mg/L	220	220	220	230	240	230	230	230	250	230
Fluoride	mg/L	1.6	1.6	1.5	1.5	1.4	<2.5	1.9	1.9	1.8	1.8
pH	SU	7.1	7.1	7.7	7.1	7.2	7.4	7.3	7.2	6.9	7.0
Sulfate	mg/L	940	930	860	840	850	780	790	810	880	840
Total Dissolved Solids	mg/L	1,700	1,700	1,700	1,700	1,700	1,700	1,800	1,700	1,700	1,900
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
Arsenic	ug/L	37	37	37	39	40	38	38	37	35	36
Barium	ug/L	51	52	53	56	55	53	55	52	54	55
Beryllium	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.8	<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
Chromium	ug/L	<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
Fluoride	mg/L	1.6	1.6	1.5	1.5	1.4	<2.5	1.9	1.9	1.8	1.8
Lead	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lithium	ug/L	44	44	53	50	48	49	48	53	51	44
Mercury	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Molybdenum	ug/L	78	80	84	88	90	91	92	84	87	86
Radium-226	pCi/L	0.638	0.551	0.639	0.683	0.452	0.481	0.384	0.470	0.537	0.499
Radium-226/228	pCi/L	1.90	1.71	1.58	1.38	1.48	1.25	1.30	1.48	2.10	2.06
Radium-228	pCi/L	1.26	1.16	0.940	0.701	1.02	0.767	0.917	1.01	1.56	1.56
Selenium	ug/L	<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

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-16-02							
Sample Date:		8/5/2016	9/30/2016	11/18/2016	1/20/2017	3/10/2017	4/28/2017	6/16/2017	7/21/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	2,300	2,400	2,900	2,900	2,900	2,900	2,900	2,900
Calcium	ug/L	230,000	240,000	240,000	240,000	230,000	240,000	250,000	250,000
Chloride	mg/L	140	150	160	160	170	160	160	160
Fluoride	mg/L	1.2	1.1	1.1	0.99	1.0	1.3	1.3	1.4
pH	SU	7.1	7.1	7.1	7.1	7.0	7.0	6.9	6.9
Sulfate	mg/L	1,000	990	990	960	970	910	960	950
Total Dissolved Solids	mg/L	1,800	1,700	1,800	1,800	1,900	1,700	1,800	1,600
Appendix IV									
Antimony	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	ug/L	24	27	30	31	29	30	30	27
Barium	ug/L	56	47	42	39	34	36	37	36
Beryllium	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.5	<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	<2.0	<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	1.1	<1.0
Fluoride	mg/L	1.2	1.1	1.1	0.99	1.0	1.3	1.3	1.4
Lead	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lithium	ug/L	57	64	62	64	58	71	64	52
Mercury	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Molybdenum	ug/L	66	68	70	73	71	69	72	71
Radium-226	pCi/L	0.565	0.634	<0.362	0.698	0.428	0.401	0.416	0.413
Radium-226/228	pCi/L	1.36	1.84	1.72	2.05	1.66	1.14	1.14	1.72
Radium-228	pCi/L	0.800	1.21	1.44	1.35	1.23	0.735	0.720	1.30
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.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-16-03									
Sample Date:		8/5/2016	9/30/2016	11/18/2016	11/18/2016	1/20/2017	3/10/2017	4/28/2017	6/16/2017	7/21/2017	7/21/2017
Constituent	Unit				Field Dup						Field Dup
Appendix III											
Boron	ug/L	480	1,300	1,600	1,600	1,600	1,600	1,500	1,600	1,600	1,600
Calcium	ug/L	110,000	110,000	110,000	110,000	120,000	120,000	110,000	130,000	130,000	120,000
Chloride	mg/L	130	120	130	130	130	120	120	130	130	130
Fluoride	mg/L	1.0	0.84	0.88	0.88	0.96	1.0	1.1	1.1	1.1	1.1
pH	SU	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.1	7.2	7.3
Sulfate	mg/L	180	150	150	150	150	150	160	150	150	150
Total Dissolved Solids	mg/L	890	860	910	900	910	1,000	930	910	930	930
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
Arsenic	ug/L	91	40	21	22	13	12	12	12	12	12
Barium	ug/L	60	62	66	64	63	58	56	60	61	60
Beryllium	ug/L	<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
Chromium	ug/L	<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
Fluoride	mg/L	1.0	0.84	0.88	0.88	0.96	1.0	1.1	1.1	1.1	1.1
Lead	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lithium	ug/L	29	44	44	47	49	45	51	49	41	41
Mercury	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Molybdenum	ug/L	15	<10	<10	<10	<10	<10	<10	<10	<10	<10
Radium-226	pCi/L	0.369	0.465	0.779	1.43	<0.323	0.331	0.289	0.345	0.358	0.346
Radium-226/228	pCi/L	0.646	0.884	1.24	3.07	0.744	1.43	0.681	0.679	0.835	1.55
Radium-228	pCi/L	<0.493	0.419	0.465	1.64	<0.461	1.09	<0.399	<0.362	0.477	1.21
Selenium	ug/L	<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

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-16-04S											
Sample Date:		8/5/2016	9/30/2016	9/30/2016	11/18/2016	1/20/2017	1/20/2017	3/10/2017	4/28/2017	4/28/2017	6/16/2017	6/16/2017	7/21/2017
Constituent	Unit			Field Dup			Field Dup			Field Dup		Field Dup	
Appendix III													
Boron	ug/L	2,400	2,500	2,600	2,700	2,200	2,200	2,300	2,100	2,200	1,700	1,800	2,600
Calcium	ug/L	280,000	320,000	330,000	330,000	300,000	300,000	280,000	260,000	270,000	300,000	300,000	260,000
Chloride	mg/L	290	290	290	350	370	370	310	310	310	340	340	340
Fluoride	mg/L	2.0	1.8	2.2	2.0	1.6	1.6	<2.5	2.1	2.1	1.9	1.9	2.3
pH	SU	7.1	7.0	7.0	7.1	7.1	7.1	7.3	7.0	7.0	6.9	6.8	7.0
Sulfate	mg/L	1,000	960	990	900	730	740	610	600	600	600	610	660
Total Dissolved Solids	mg/L	1,900	2,000	2,000	1,900	1,700	1,700	1,700	1,600	1,600	1,600	1,600	1,600
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	160	190	200	190	160	150	150	140	140	130	130	150
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	2.0	1.8	2.2	2.0	1.6	1.6	<2.5	2.1	2.1	1.9	1.9	2.3
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	18	21	22	18	25	26	24	26	27	26	26	17
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	33	37	37	42	30	30	30	23	23	16	16	35
Radium-226	pCi/L	1.30	1.77	1.31	0.441	1.22	1.33	0.958	0.853	0.652	0.832	0.688	0.863
Radium-226/228	pCi/L	1.82	3.04	2.31	0.941	1.97	3.11	1.86	1.59	1.09	1.64	1.77	2.60
Radium-228	pCi/L	0.515	1.28	1.00	0.500	0.753	1.78	0.898	0.733	0.436	0.812	1.08	1.74
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.
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-17-06										
Sample Date:		7/14/2017	8/1/2017	8/8/2017	8/8/2017	8/15/2017	8/15/2017	8/22/2017	8/29/2017	9/5/2017	9/15/2017	9/15/2017
Constituent	Unit				Field Dup		Field Dup					Field Dup
Appendix III												
Boron	ug/L	340	300	350	350	300	290	310	310	340	320	330
Calcium	ug/L	250,000	250,000	280,000	270,000	270,000	270,000	270,000	280,000	270,000	270,000	270,000
Chloride	mg/L	450	550	560	570	610	610	560	580	650	640	630
Fluoride	mg/L	0.41	0.38	<0.50	<0.50	0.37	0.37	0.51	0.45	0.40	0.42	0.42
pH	SU	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.7	6.8	8.0	6.9
Sulfate	mg/L	330	300	320	320	300	300	310	310	330	330	330
Total Dissolved Solids	mg/L	1,800	1,900	1,800	1,900	2,100	2,000	2,100	1,900	1,900	1,900	2,000
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	5.1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.2	<5.0	5.1
Barium	ug/L	80	92	96	92	100	100	96	110	100	110	110
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	<2.0	<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
Fluoride	mg/L	0.41	0.38	<0.50	<0.50	0.37	0.37	0.51	0.45	0.40	0.42	0.42
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	22	20	22	21	20	19	22	19	22	20	21
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	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Radium-226	pCi/L	0.605	0.619	0.534	0.584	0.630	0.631	0.681	0.800	0.672	0.707	0.886
Radium-226/228	pCi/L	1.90	1.55	1.06	1.86	1.97	1.58	1.98	1.73	2.05	2.10	2.31
Radium-228	pCi/L	1.29	0.932	0.523	1.28	1.34	0.946	1.30	0.930	1.37	1.39	1.43
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.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location:		MW-17-07												
Sample Date:		7/14/2017	7/14/2017	7/21/2017	8/1/2017	8/1/2017	8/8/2017	8/15/2017	8/22/2017	8/22/2017	8/29/2017	8/29/2017	9/5/2017	9/5/2017
Constituent	Unit		Field Dup			Field Dup				Field Dup		Field Dup		Field Dup
Appendix III														
Boron	ug/L	570	570	610	570	580	650	600	580	580	620	620	640	640
Calcium	ug/L	350,000	330,000	370,000	320,000	320,000	370,000	360,000	360,000	360,000	360,000	340,000	370,000	350,000
Chloride	mg/L	2,200	2,200	2,200	2,100	2,100	2,200	2,200	2,100	2,100	2,100	2,100	2,200	2,100
Fluoride	mg/L	<1.3	<1.3	<0.50	0.42	0.42	<1.3	0.39	0.44	0.44	0.44	0.44	0.46	0.42
pH	SU	6.9	6.9	6.8	6.8	6.8	6.7	6.9	6.8	6.8	6.8	6.8	6.9	6.9
Sulfate	mg/L	1,000	1,100	1,100	1,000	1,000	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Total Dissolved Solids	mg/L	4,900	5,300	5,500	5,400	5,800	5,500	5,800	5,600	5,700	5,200	5,100	5,600	5,700
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
Arsenic	ug/L	16	16	16	15	15	20	17	20	20	18	16	20	19
Barium	ug/L	40	38	40	32	32	22	36	30	30	32	28	33	31
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
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
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	<2.0
Cobalt	ug/L	10	9.7	9.5	9.3	9.0	9.4	9.0	9.3	9.2	9.5	8.7	11	10
Fluoride	mg/L	<1.3	<1.3	<0.50	0.42	0.42	<1.3	0.39	0.44	0.44	0.44	0.44	0.46	0.42
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	<1.0
Lithium	ug/L	28	28	25	28	26	28	28	28	29	26	26	30	29
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
Molybdenum	ug/L	14	14	16	13	13	16	15	13	13	15	14	16	14
Radium-226	pCi/L	0.317	0.494	0.414	0.359	0.301	0.291	0.370	0.292	0.480	0.322	0.325	0.456	0.277
Radium-226/228	pCi/L	1.07	1.36	1.98	1.51	1.16	1.44	1.13	2.56	2.11	0.834	1.21	1.79	1.69
Radium-228	pCi/L	0.755	0.866	1.57	1.15	0.857	1.15	0.759	2.27	1.63	0.512	0.883	1.34	1.42
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
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

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 3
Summary of Field Parameters
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, 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	8/5/2016	0.35	-95.1	7.28	1,946	14.41	2.15
	9/30/2016	0.95	-193.0	7.42	2,380	14.21	0.59
	11/18/2016	0.88	-63.3	7.21	1,955	14.29	5.50
	1/20/2017	0.42	-56.4	7.11	1,834	12.78	2.89
	3/10/2017	0.16	-68.2	7.19	2,342	12.03	1.04
	4/28/2017	0.21	-72.7	7.23	2,098.8	12.71	1.82
	6/16/2017	0.17	-69.2	7.21	2,269.1	13.43	1.41
	7/21/2017	0.16	-63.3	7.19	2,355.7	14.23	2.27
MW-16-02	8/5/2016	0.47	-82.6	7.20	1,911	14.00	1.47
	9/30/2016	1.03	-186.0	7.32	2,380	13.63	0.51
	11/18/2016	0.61	-60.9	7.11	1,936	13.92	5.30
	1/20/2017	0.29	-45.0	7.01	1,775	11.85	2.75
	3/10/2017	0.16	-55.5	7.09	2,280	11.51	1.69
	4/28/2017	0.15	-65.6	7.12	2,036.1	12.60	0.96
	6/16/2017	0.18	-58.3	7.10	2,222.8	13.53	1.75
	7/21/2017	0.14	-51.7	7.08	2,312.0	13.89	1.08
MW-16-03	8/5/2016	0.52	-78.4	7.31	1,195	13.95	2.12
	9/30/2016	0.57	-200.0	7.47	1,500	13.54	0.00
	11/18/2016	1.36	-40.4	7.21	1,192	13.34	5.00
	1/20/2017	0.65	-21.4	7.08	1,122	11.58	3.66
	3/10/2017	0.16	-67.4	7.18	1,460.1	11.05	0.16
	4/28/2017	0.14	-78.9	7.22	1,321.5	12.04	0.43
	6/16/2017	0.16	-70.1	7.20	1,435.8	13.34	0.51
	7/21/2017	0.14	-71.9	7.18	1,497.4	13.58	0.49

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
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, 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-16-04S	8/5/2016	0.34	-106.4	7.34	2,143	13.84	2.16
	9/30/2016	1.00	-227.0	7.45	2,720	13.83	2.19
	11/18/2016	1.19	-69.9	7.23	2,147	13.30	4.51
	1/20/2017	0.25	-59.8	7.08	1,889	11.51	2.27
	3/10/2017	0.19	-64.1	7.14	2,301.5	10.81	0.37
	4/28/2017	0.22	-70.2	7.16	2,035.2	11.74	0.92
	6/16/2017	0.17	-65.2	7.09	2,172.1	13.21	1.01
	7/21/2017	0.14	-62.2	7.19	2,341.5	13.99	0.98
MW-17-06	7/14/2017	0.14	-49.0	6.62	2,703.0	16.01	1.61
	8/1/2017	0.17	-51.4	6.61	3,189.4	17.62	4.72
	8/8/2017	0.13	-28.1	6.58	3,138.0	15.89	5.35
	8/15/2017	0.21	-37.9	6.57	3,344.9	17.51	2.12
	8/22/2017	0.15	-54.1	6.62	3,250.5	16.86	3.75
	8/29/2017	0.20	-70.8	6.62	3,301.0	16.90	4.08
	9/5/2017	0.18	-51.3	6.62	3,225.7	16.69	3.00
	9/15/2017	0.14	-90.8	6.60	3,272.6	18.07	2.43
MW-17-07	7/14/2017	0.24	-18.5	6.66	8,604.7	16.06	7.69
	7/21/2017	0.32	-26.0	6.65	8,842.8	18.86	3.48
	8/1/2017	0.34	-26.6	6.62	8,808.8	19.31	3.50
	8/8/2017	0.29	-13.8	6.64	8,686.9	17.98	3.01
	8/15/2017	0.25	-27.4	6.64	9,058.8	17.98	3.60
	8/22/2017	0.31	-40.4	6.60	9,057.3	17.92	3.59
	8/29/2017	0.28	-48.6	6.60	9,118.2	16.60	3.13
	9/5/2017	0.27	-35.8	6.60	8,864.5	16.20	3.29

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.

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.50' INTERVAL, DASHED WHERE INFERRED)
- (575.0) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. NM = NOT MEASURED.

N

0 300 600
Feet

1 " = 300 '
1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
AUGUST 2016

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		**FIGURE 1**
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2018		

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1540 Eisenhower Place
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FILE NO.: 265996-0005-016.mxd

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Map Rotation: 0
Plot Date: 1/12/2018, 10:59:27 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-016.mxd

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.5' INTERVAL, DASHED WHERE INFERRED)
- (575.0) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. NM = NOT MEASURED.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
SEPTEMBER 2016

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 2**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-017.mxd

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LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.5' INTERVAL, DASHED WHERE INFERRED)
- (575.0) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP NOVEMBER 2016

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-018.mxd

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

TRC - GIS

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.5' INTERVAL, DASHED WHERE INFERRED)
- *(575.0)* ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP JANUARY 2017

DRAWN BY:	S MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 4**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-019A.mxd

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LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.5' INTERVAL, DASHED WHERE INFERRED)
- (575.0) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
MARCH 2017

DRAWN BY:	S MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 5**
DATE:	JANUARY 2018		

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Map Rotation: 0
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Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-020.mxd

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.5' INTERVAL, DASHED WHERE INFERRED)
- (575.0) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
APRIL 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 6**
DATE:	JANUARY 2018		

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

TRC - GIS

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.25' INTERVAL, DASHED WHERE INFERRED)
- (575.25) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
JUNE 2017

DRAWN BY:	S MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 7**
DATE:	JANUARY 2018		

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LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.25' INTERVAL, DASHED WHERE INFERRED)
- (575.25) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION, NOT GROUNDWATER ELEVATION.
5. NU = NOT USED, DATA COLLECTED IS NOT REPRESENTATIVE OF SURFACE WATER ELEVATION DUE TO WAVE ACTION.

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
JULY 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		**FIGURE 8**
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-024.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 1/12/2018, 11:17:33 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-024.mxd

Appendix B
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event September 2017
DTE Electric Company River Rouge Power Plant (DTE RRPP)

Groundwater samples were collected by TRC for the September 2017 sampling event for the Bottom Ash Basin at the DTE RRPP. Samples were analyzed for anions, pH, total metals, total dissolved solids, hardness, and alkalinity by Test America Laboratories, Inc. (Test America), located in Canton, Ohio. The laboratory analytical results are reported in laboratory report J85455-1.

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

- MW-16-01
- MW-16-02
- MW-16-03
- MW-17-06
- MW-17-07

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 9056A
pH	EPA 9040C
Total Metals	EPA 6010B
Total Dissolved Solids	SM 2540C
Alkalinity	SM 2320B
Hardness	SM 2340C

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. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical 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:

- Potassium and sodium were detected in the method blank at concentrations above the method detection limit, but below the reporting limit. Potassium and sodium results for all samples were >10X the method blank potassium and sodium results. Therefore, it is unlikely that the potassium and sodium results are false positives. Data usability is not affected as these constituents are not being evaluated for detection monitoring.
- Dup-01 corresponds with MW-17-07; relative percent differences (RPDs) between the parent and duplicate sample for chloride, fluoride, and sulfate were above QC limits. Potential uncertainty exists for chloride, fluoride, and sulfate results for Dup-01 and MW-17-07 due to field duplicate variability. The chloride, fluoride, and sulfate results

for MW-17-07 are consistent with historical results, so data are considered usable for the purposes of the detection monitoring program.

- Laboratory duplicates were performed on sample MW-16-01 for pH; RPDs between the parent and duplicate sample were within the QC limits.
- MS/MSD analyses were performed on sample MW-16-03 for chloride and fluoride. Recoveries and RPDs were within 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.: 265996.0005.0000 Phase 001, Task 001

Subject: Background Statistical Evaluation – DTE Electric Company, River Rouge Power Plant Coal Combustion Residual Bottom Ash Basin

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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) River Rouge Power Plant (RRPP) Coal Combustion Residual Bottom Ash Basin (BAB) CCR unit.

The RRPP, including the BAB CCR unit, was originally constructed in the early 1950s, just east of the DTE Electric RRPP. The power plant is located at the confluence of the Rouge River and the Detroit River. The property has been used continuously as a coal fired power plant since Detroit Edison Company (now DTE Electric) began power plant operations at RRPP in 1957. The RRPP BAB is a sedimentation basin that is an incised CCR surface impoundment. The BAB is used for receiving sluiced bottom ash and other process flow effluent pumped from the power plant to the eastern end of the BAB. The BAB has been in operation with the RRPP since it began operation and the collected CCR bottom ash is cleaned out as needed and disposed of at the Sibley Quarry Landfill.

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

MW-16-01	MW-16-02	MW-16-03
MW-17-06	MW-17-07	

CCR monitoring wells MW-17-06 and MW-17-07 are up gradient to the southwest relative to the BAB CCR unit (i.e., background wells), whereas the CCR monitoring wells MW-16-01, MW-16-02, and MW-16-03 are down gradient to the northeast of the BAB CCR unit (*i.e.* downgradient compliance wells).

Following the baseline data collection period (August 2016 through July 2017), the background data for the RRPP BAB were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017; Revised December 2017). Background data were evaluated utilizing 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), tolerance limits (TLs) were selected to perform the statistical calculation for background limits. Use of TLs is a streamlined approach that offers adequate statistical power and is an acceptable approach for interwell detection monitoring under the CCR rule. TLs 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 two background wells utilized for the BABs CCR Unit includes MW-17-06 and MW-17-07. For interwell comparisons, background data should be "pooled" creating a single, combined background dataset from the background monitoring wells. Data from each individual downgradient well during a detection monitoring event is compared to the statistical limit developed using the background/baseline dataset to identify potential statistically significant increases above background limits. The background data 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 TLs for each cumulative baseline/background data set (upper and lower TLs 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) do not show potential or suspect outliers for any of the Appendix III parameters.

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

No outliers were identified in the T v. C graphs. Therefore, outlier testing was not applicable.

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 1.

Tolerance Limits

Table 1 presents the calculated TLs for the background/baseline data sets. For normal and lognormal distributions, TLs are calculated for 95 percent confidence using parametric methods. For nonnormal background datasets, a nonparametric TL is utilized, resulting in the highest value from the background dataset as the TL. The achieved confidence levels for nonparametric tolerance 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

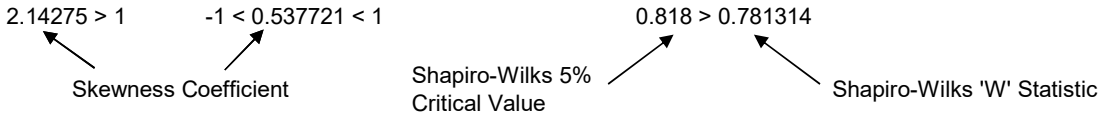
Table 1 – Summary of Descriptive Statistics and Tolerance Limit Calculations
Attachment A – Background Concentration Time-Series Charts
Attachment B – ChemStat™ Tolerance Limit Outputs

Tables

Table 1
Summary of Descriptive Statistics and Tolerance Limit Calculations
Background Statistical Evaluation
DTE Electric Company – River Rouge Power Plant

Monitoring Well	Skewness Test		Shapiro-Wilks Test (5% Critical Value)		Outliers Removed	Tolerance Limit Test	Tolerance Limit
	Un-Transformed Data	Natural Log Transformed Data	Un-Transformed Data	Natural Log Transformed Data			
Appendix III							
Boron (ug/L)	-1 < 0.0359916 < 1	--	--	--	N	Parametric	840
Calcium (ug/L)	-1 < 0.0488521 < 1	--	--	--	N	Parametric	430,000
Chloride (mg/L)	-1 < -0.00288632 < 1	--	--	--	N	Parametric	3,400
Fluoride (mg/L)	2.42254 > 1	1.7578 > 1	0.887 > 0.529868	0.887 > 0.631243	N	Non-Parametric	1.3
pH, Field (SU)	-1 < 0.00852651 < 1	--	--	--	N	Parametric	6.5 - 6.7
Sulfate (mg/L)	-1 < 0.0169554 < 1	--	--	--	N	Parametric	1,700
Total Dissolved Solids (mg/L)	-1 < 0.0252723 < 1	--	--	--	N	Parametric	8,300

Notes:

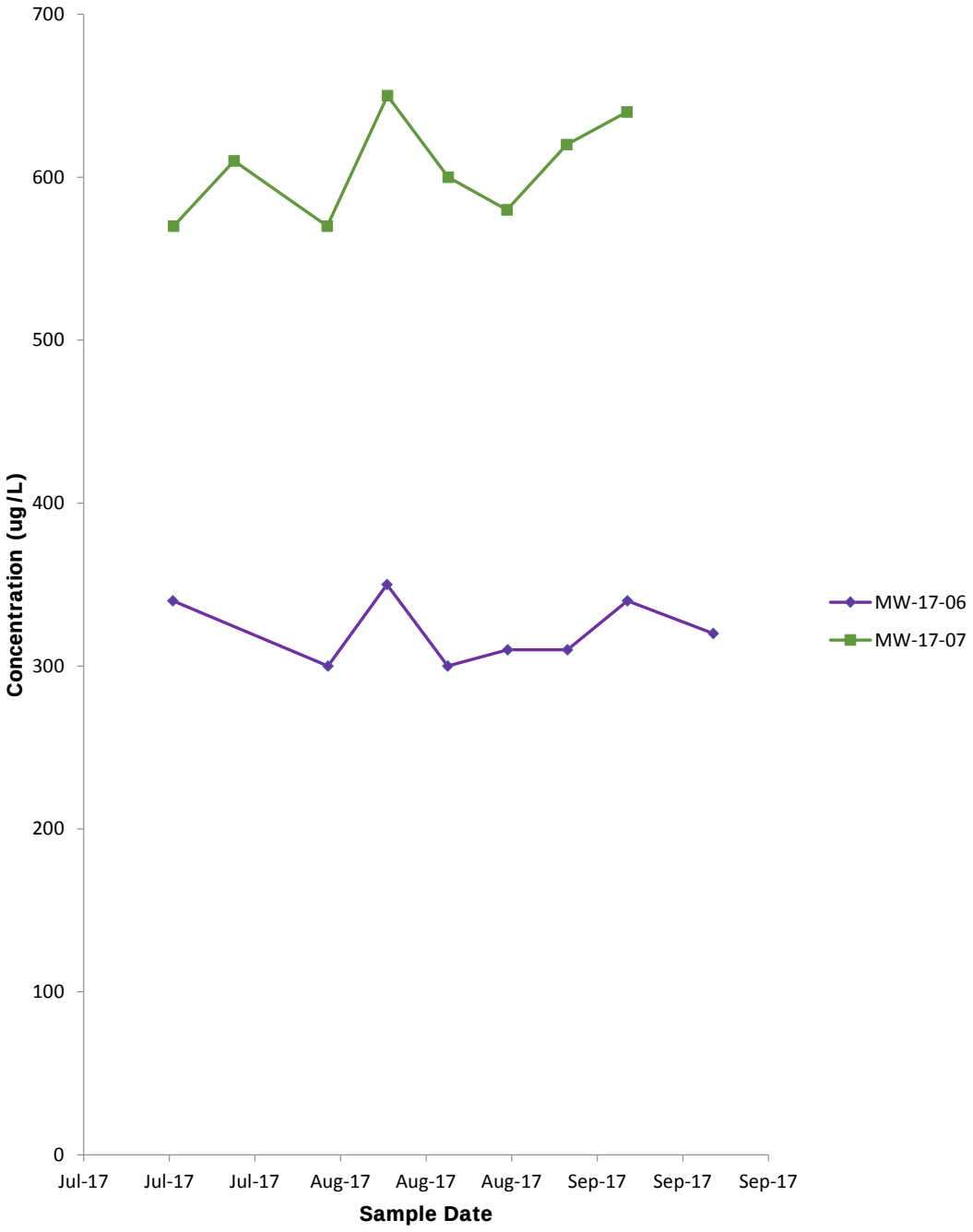


ug/L = micrograms per liter
mg/L = milligrams per liter
SU = standard units

Attachment A

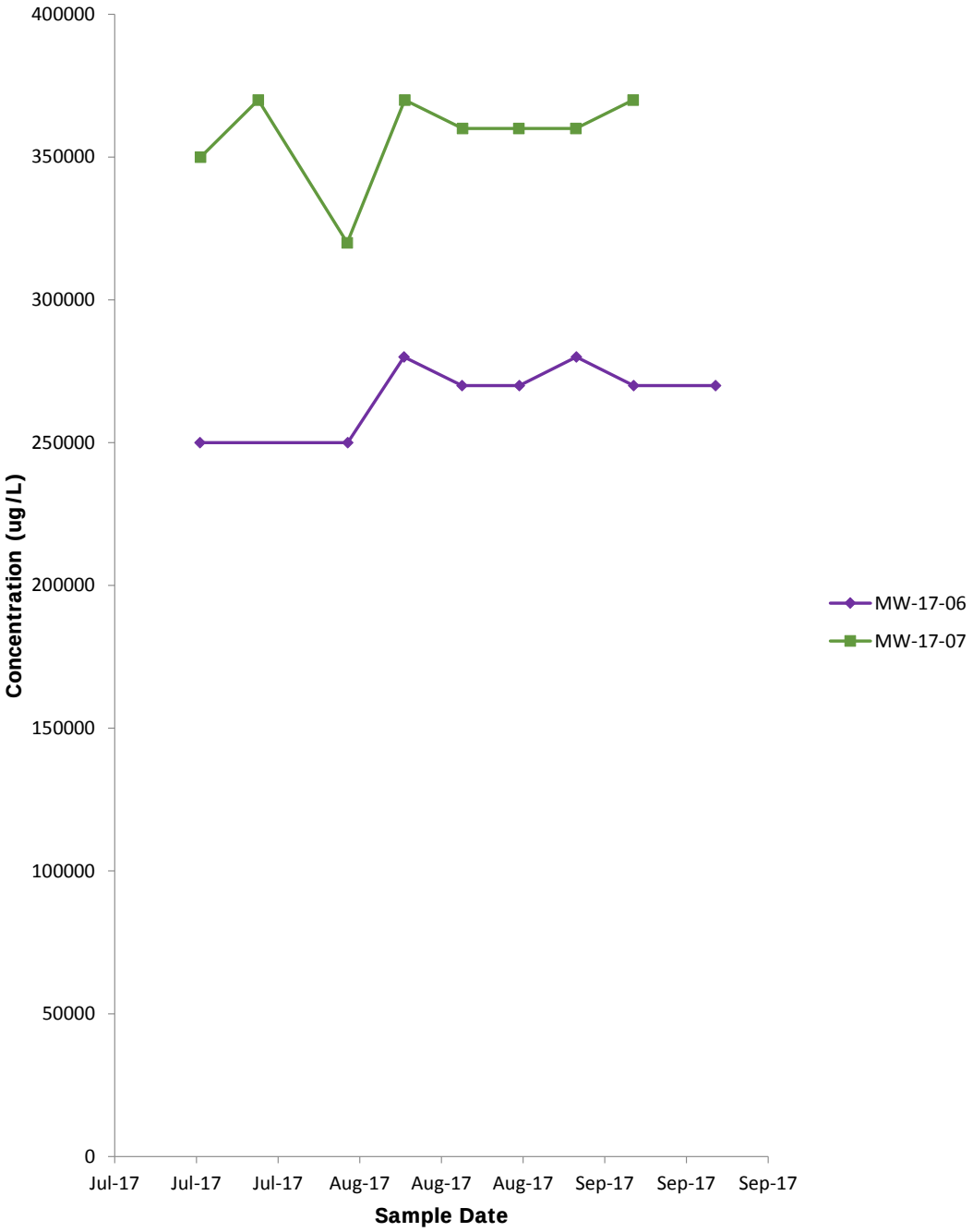
Background Concentration Time-Series Charts

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Boron



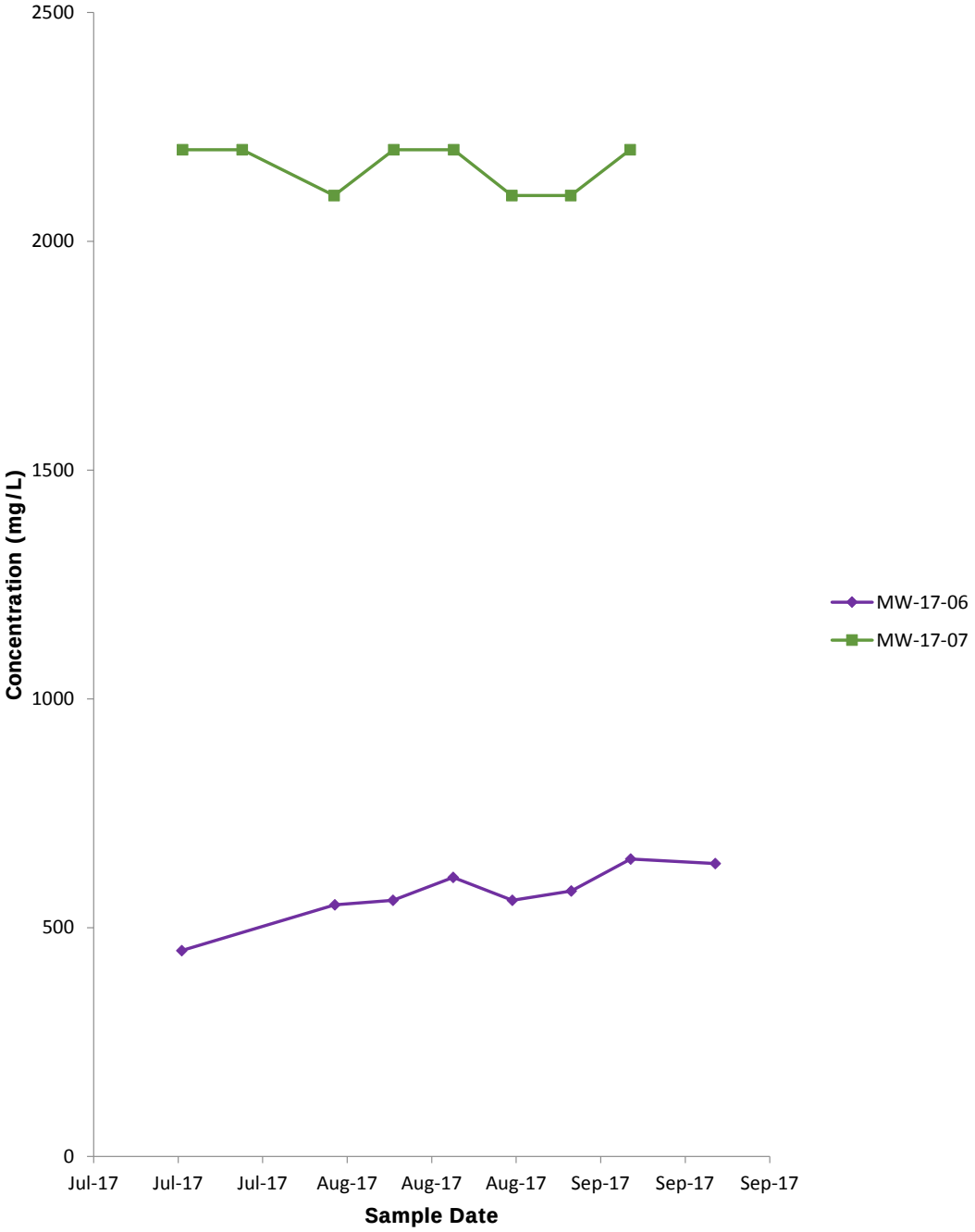
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Calcium



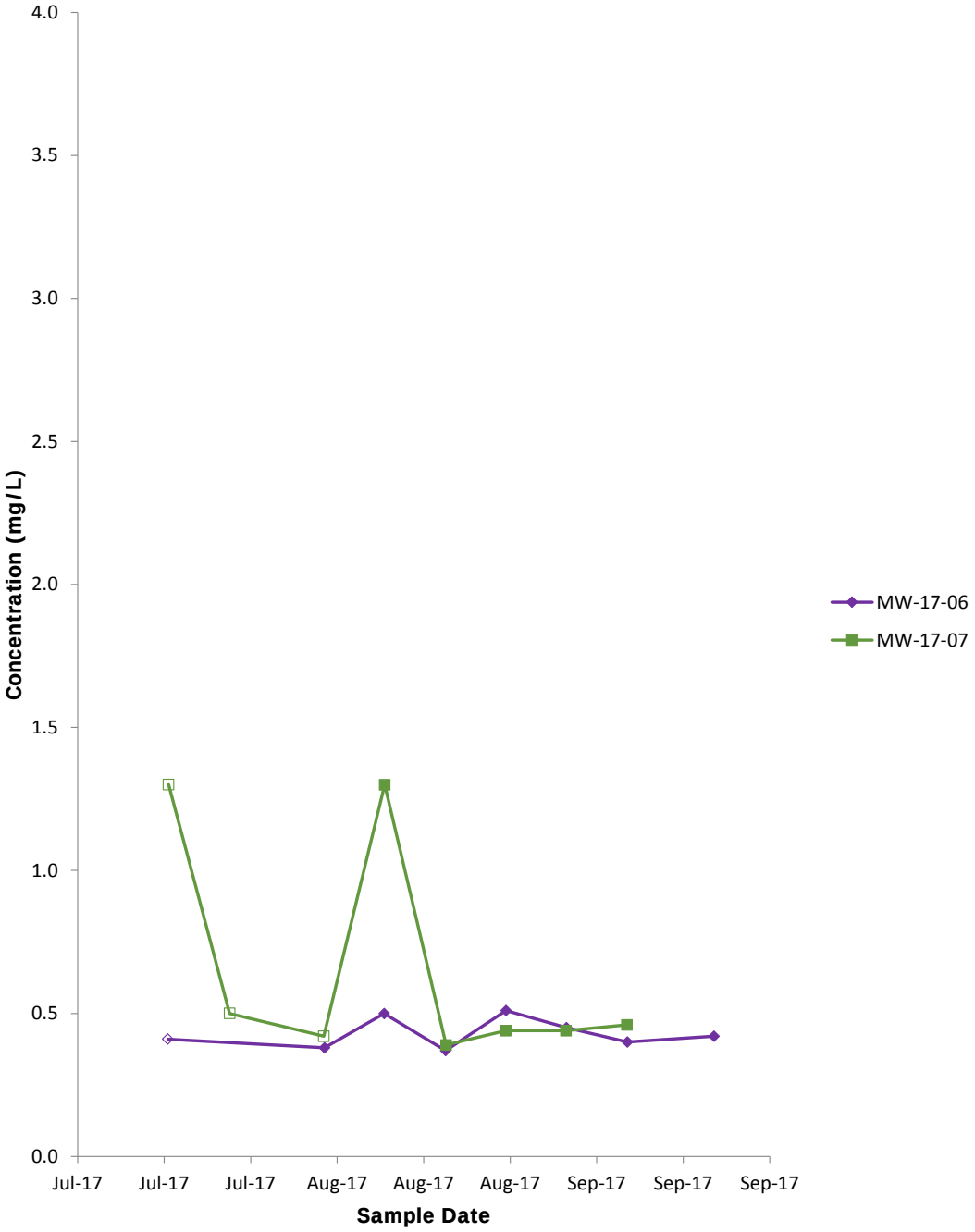
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Chloride



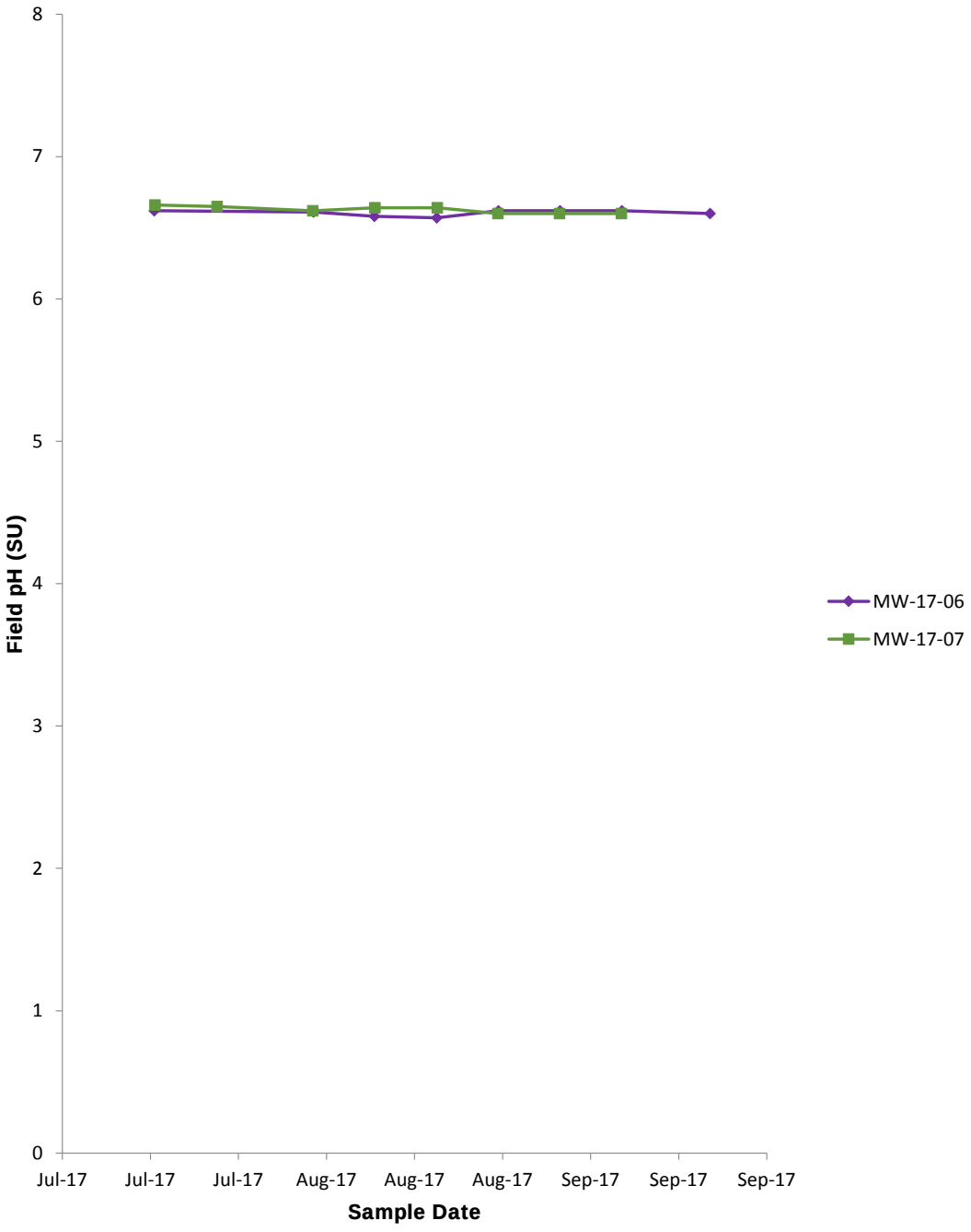
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Fluoride

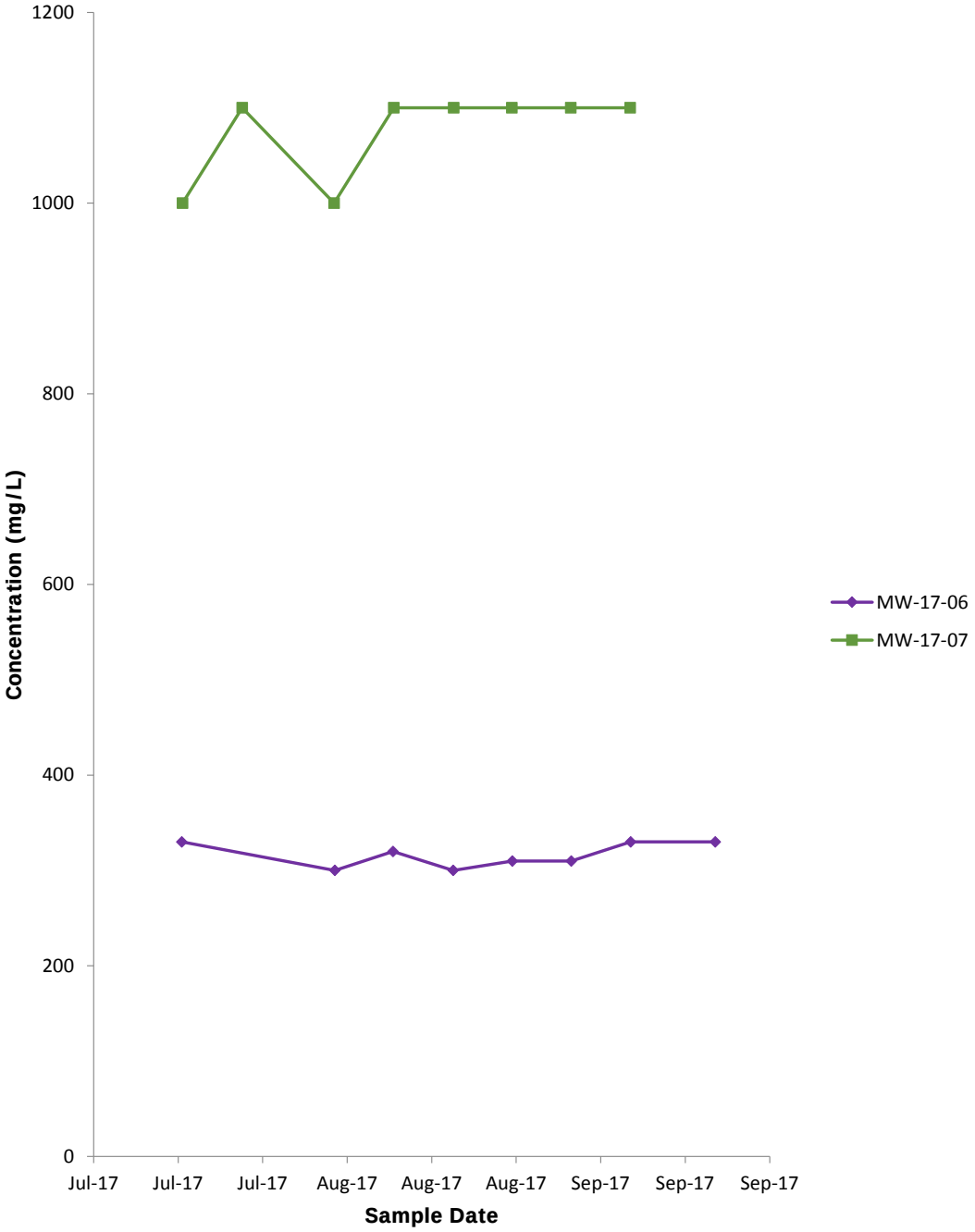


Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
pH, Field

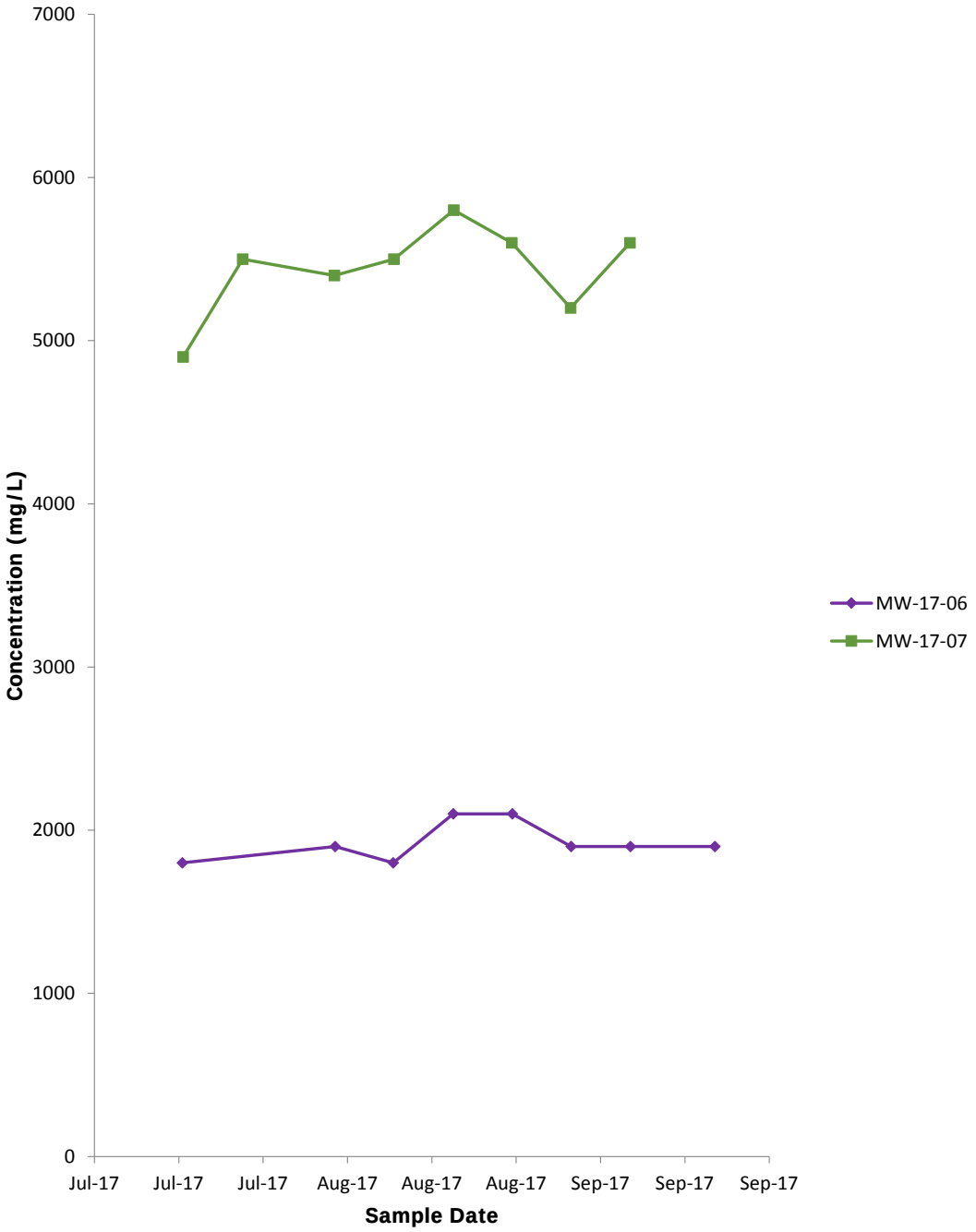


Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Sulfate



Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - River Rouge Power Plant
River Rouge, Michigan
Total Dissolved Solids



Open symbols denote non-detect concentrations.

Attachment B

ChemStat™ Tolerance Limit Outputs

Parametric Tolerance Interval Analysis

Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 16
Background mean = 463.125
Background standard deviation = 148.626
One-sided normal tolerance factor (K) at 95% confidence = 2.523
Upper tolerance limit = 838.108

Location	Date	Value	Significant
MW-16-01	9/22/2017	2800	TRUE
MW-16-02	9/22/2017	2900	TRUE
MW-16-03	9/22/2017	1600	TRUE

Parametric Tolerance Interval Analysis

Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 16
Background mean = 312500
Background standard deviation = 48511.2
One-sided normal tolerance factor (K) at 95% confidence = 2.523
Upper tolerance limit = 434894

Location	Date	Value	Significant
MW-16-01	9/22/2017	210000	FALSE
MW-16-02	9/22/2017	230000	FALSE
MW-16-03	9/22/2017	110000	FALSE

Parametric Tolerance Interval Analysis

Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 16
Background mean = 1368.75
Background standard deviation = 821.672
One-sided normal tolerance factor (K) at 95% confidence = 2.523
Upper tolerance limit = 3441.83

Location	Date	Value	Significant
MW-16-01	9/22/2017	230	FALSE
MW-16-02	9/22/2017	160	FALSE
MW-16-03	9/22/2017	130	FALSE

Non-Parametric Tolerance Interval

Parameter: Fluoride
Original Data (Not Transformed)
Cohen's Adjustment

Total Percent Non-Detects = 21.0526%
Background measurements (n) = 16
Maximum Background Concentration = 1.3
Minimum Coverage = 82.9%
Average Coverage = 94.1176%

Location	Date	Value	Significant
MW-16-01	**9/22/2017**	**1.8**	**TRUE**
MW-16-02	9/22/2017	1.3	FALSE
MW-16-03	9/22/2017	1	FALSE

Parametric Tolerance Interval Analysis

Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (Two-Tailed)

Background observations = 16
Background mean = 6.61562
Background standard deviation = 0.0242126
Two-sided normal tolerance factor (K) at 95% confidence = 2.752
Upper tolerance limit = 6.68226
Lower tolerance limit = 6.54899

Location	Date	Value	Significant
MW-16-01	9/22/2017	7.13	TRUE
MW-16-02	9/22/2017	7.01	TRUE
MW-16-03	9/22/2017	7.14	TRUE

Parametric Tolerance Interval Analysis

Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 16
Background mean = 695.625
Background standard deviation = 393.192
One-sided normal tolerance factor (K) at 95% confidence = 2.523
Upper tolerance limit = 1687.65

Location	Date	Value	Significant
MW-16-01	9/22/2017	860	FALSE
MW-16-02	9/22/2017	980	FALSE
MW-16-03	9/22/2017	160	FALSE

Parametric Tolerance Interval Analysis

Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 16
Background mean = 3681.25
Background standard deviation = 1825.46
One-sided normal tolerance factor (K) at 95% confidence = 2.523
Upper tolerance limit = 8286.88

Location	Date	Value	Significant
MW-16-01	9/22/2017	1700	FALSE
MW-16-02	9/22/2017	1800	FALSE
MW-16-03	9/22/2017	910	FALSE