



Annual Groundwater Monitoring Report

JH Campbell Power Plant
Units 1-2 North and 1-2 South CCR Unit
West Olive, Michigan

January 2018



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*Prepared For
Consumers Energy Company*

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TRC | Consumers Energy 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 Consumers Energy Company (CEC) Units 1-2 North and 1-2 South (Unit 1-2) bottom ash ponds at the JH Campbell (JHC) Power Plant Site (the Site). 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 Environmental Corporation (TRC) prepared this Annual Groundwater Monitoring Report for the JHC Unit 1-2 CCR unit on behalf of CEC. 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 JHC Unit 1-2 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, calcium, chloride, pH, sulfate and total dissolved solids in one or more downgradient wells for the September 2017 monitoring event. 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 ~~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 SSIs over background limits noted during September 2017, CEC plans to prepare an Alternative Source Demonstration (ASD) to evaluate whether a source other than the CCR unit caused the SSIs prior to initiating assessment monitoring.

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 Consumers Energy Company (CEC) Units 1-2 North and 1-2 South (Unit 1-2) bottom ash ponds at the JH Campbell (JHC) Power Plant Site (the Site). 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 Environmental Corporation (TRC) prepared this Annual Groundwater Monitoring Report (Annual Report) for the JHC Unit 1-2 CCR unit on behalf of CEC. 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 JHC Unit 1-2 CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *JH Campbell Monitoring Program Sample and Analysis Plan (SAP)* (ARCADIS, 2016) and statistically evaluated per the *Groundwater Statistical Evaluation Plan (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 JH Campbell Plant is a coal fired power generation facility located in West Olive, Michigan, on the eastern shore of Lake Michigan. It is bordered by the Pigeon River on the south, 156th Avenue on the east, and Croswell Street to the north with Lakeshore Drive bisecting the site from north to south. The power generating plant consists of three coal fired electric generating units located on the western side of the site and the CCR disposal area is on the east side of the site, east of Lakeshore Drive. Figure 1 is a site location map showing the facility and the surrounding area.

The CCR disposal area contains two primary components: a system of wet ash ponds and a dry ash disposal facility (i.e., the JHC Landfill). The wet ash ponds area is approximately 267 acres and is bounded by perimeter dikes with a system of internal dikes separating the individual ash ponds. The CCR surface impoundments located within the wet ash pond area are Unit 1-2 Bottom Ash Ponds, Unit 3 Bottom Ash Pond, and Pond A. The existing dry ash disposal facility is a geomembrane lined landfill which is permitted for an area of about 108 acres and includes two leachate and contact water retention ponds. Site features are shown on Figure 2.

Dry, moisture-conditioned CCR from the three coal fired electric generating units continues to be managed in the licensed solid waste landfill which is regulated under Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and monitored in adherence to the facility's MDEQ-approved *Hydrogeological Monitoring Plan (HMP) for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III* (September 1996). Currently, the wet ash pond area only receives CCR in the form of slurried bottom ash into the bottom ash ponds. Bottom ash is sluiced into the bottom ash ponds along with the coal pile runoff which flows into the Unit 1-2 Bottom Ash Ponds. Water is retained in these ponds unless an overflow condition is reached leading to overflow into a series of surface ditches and buried pipes which discharge into the southwest corner of Pond A.

The wet ash pond area also has one lined and one unlined chemical treatment lagoon collectively referred to as the Chemical Treatment Ponds. These ponds are used to treat chemical cleaning wastes that discharge water via a manually controlled gate valve into the Units 1-2 Bottom Ash Pond overflow ditch. From Pond A, the effluent water travels through an outfall pipe penetrating the perimeter dike and into an open channel ditch leading to the recirculation pond. Water in the recirculation pond is then discharged through a National Pollutant Discharge Elimination System (NPDES) permitted outfall and into Pigeon River.

The purpose of the dry ash disposal facility is to contain dry bottom and fly ash produced as a result of burning coal for power production. The facility consists of the existing CCR landfill Cells 1 through 4. The state permit also identifies Cells 5 through 7 for future construction and operation. Dry ash from all of the generating units is stored in silos until it is placed into the facility or is sold and shipped off site. At this time, the north faces of Cells 1 and 2 and the eastern face of Cell 2 have been closed along with Cell 3. Cell 4 is currently being filled with ash. Cells 5 through 7 have not yet been constructed.

Currently, the only remaining active CCR surface impoundments are Bottom Ash Ponds Unit 1-2 and Pond A. In June 2017, closure of the Bottom Ash Pond Unit 3 North was underway subsequent to recovery of CCR from the pond for beneficial reuse, which will be followed by closure of the Bottom Ash Pond Unit 3 South. This report focuses on the JHC Unit 1-2 dry ash disposal CCR unit.

1.3 Geology/Hydrogeology

The upgradient/background wells are located to the north-northwest of the JHC Unit 1-2 CCR unit. Groundwater is typically encountered around 30 to 35 feet below ground surface (ft bgs) and generally flows to the south-southeast across the Site toward the Pigeon River. Mounding of groundwater is observed in the immediate vicinity of the CCR unit, such that there is a localized radial flow component around the unit. The subsurface materials encountered at the JH Campbell site generally consist of approximately 40 to 60 feet of poorly graded, fine-grained lacustrine sand. A laterally extensive clay-rich till is generally encountered within approximately 40 to 60 feet bgs across the site that according to deep drilling logs conducted at the JH Campbell Power Plant (just west of the CCR units) is on the order of 80 feet thick and extends to the top of shale bedrock approximately 140 feet bgs. Based on the hydrogeology at the site, particularly the conductive properties of the sandy aquifer and the prominent and consistent groundwater flow direction, an inter-well statistical approach is recommended for 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 JHC Unit 1-2 CCR unit, which established the monitoring well locations for detection monitoring. The detection monitoring well network for the JHC Unit 1-2 CCR unit currently consists of 11 monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Monitoring wells JHC-MW-15023 through JHC-MW-15028 are located north-northwest of the JHC Unit 1-2 and provide data on background groundwater quality that has not been affected by the CCR unit (total of six background wells). Monitoring wells JHC-MW-15001 through JHC-MW-15005 are located downgradient of the JHC Unit 1-2 CCR unit (total of five downgradient monitoring wells).

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only. Based on concentrations of several Appendix III parameters, cation/anion data, and the hydrogeology of the area, monitoring wells JHC-MW-15029 and JHC-MW-15030 do not appear to be representative of background groundwater conditions; therefore, these wells were excluded from the background monitoring network.

2.2 Background Sampling

Background groundwater monitoring was conducted at the JHC Unit 1-2 CCR unit from December 2015 through August 2017 in accordance with the SAP. Data collection included eight rounds (Rounds 1 through 8) 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 11 monitoring wells installed for the JHC Unit 1-2, in addition to JHC-MW-15029 and JHC-MW-15030. The Rounds 1 through 6 groundwater samples were collected and analyzed by CEC's Laboratory Services, Jackson, Michigan. Rounds 7 and 8 groundwater sampling was conducted by TRC in June and August 2017, respectively, and analyzed by Pace Analytical Services, LLC (Pace). Background data are included in Appendix A Tables 1 through 3, where: Table 1 is a summary of static water elevation data (site-wide water level data from CCR program monitoring wells); Tables 2 and 3 are a summary of groundwater analytical data compared to potentially relevant criteria; and Table 4 is a summary of field data.

In addition to the data tables, groundwater contour maps were developed using site-wide water level data from CCR program monitoring wells for each of the background events to evaluate groundwater flow directions. The contour maps for each background monitoring event are also included in Appendix A as 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 SAP. 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 25 through 27, 2017, by TRC personnel and samples were analyzed by Pace in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the six background monitoring wells and five 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 background sampling events showed that groundwater within the uppermost aquifer generally flows to the south-southeast across the Site, with a southwesterly groundwater flow component on the western edge of the Site. 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 since the background sampling events commenced in December 2015. The average hydraulic gradient throughout the Site during this event is estimated at 0.004 ft/ft. The gradient was calculated using the following well pairs: JHC-MW-15029/JHC-MW-15030, JHC-MW-15029/JHC-MW-15005, JHC-MW-15021/JHC-MW-15031 and JHC-MW-15023 / JHC-MW-15037 (Figure 3). Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity is approximately 0.58 ft/day or 210 ft/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 JHC Unit 1-2 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 eighth round of background monitoring using data collected from the seven established background monitoring wells (JHC-MW-15023 through JHC-MW-15028). The statistical evaluation of the background data is presented in detail in Appendix C. The Appendix III background limits will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the JHC Unit 1-2 CCR unit by comparing concentrations in the downgradient wells to the 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 JHC-MW-15023 through JHC-MW-15028. The comparisons are presented on Table 4.

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

- Boron at JHC-MW-15001, JHC-MW-15002, JHC-MW-15003, JHC-MW-15004, and JHC-MW-15005;
- Calcium at JHC-MW-15001 and JHC-MW-15004;
- Chloride at JHC-MW-15001;
- pH at JHC-MW-15002 and JHC-MW-15003;
- Sulfate at JHC-MW-15001, JHC-MW-15002, JHC-MW-15003, JHC-MW-15004, and JHC-MW-15005; and
- TDS at JHC-MW-15001, JHC-MW-15004, and JHC-MW-15005.

The initial observation of an indicator parameter concentration above the established background limits does not necessarily constitute a SSI. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern can be resampled within 30 days of the completion of the initial statistical analysis for verification purposes. There were no SSIs compared to background for fluoride at any of the downgradient wells.

Section 4

Conclusions and Recommendations

Potential SSIs over background limits were noted for boron, calcium, chloride, pH, sulfate and TDS 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 ~~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.

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 in the initial assessment monitoring event.

In response to the potential SSIs over background limits noted during September 2017, CEC plans to prepare an ASD to evaluate whether a source other than the JHC Unit 1-2 CCR unit caused the SSIs prior to initiating assessment monitoring. Based on the results from the ASD, CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Section 5

References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development – Bottom Ash Pond Unit 1-2N/1-2S. JH Campbell Electric Generation Facility – West Olive, Michigan. Prepared for Consumers Energy Company.

ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. JH Campbell Monitoring Program Sample and Analysis Plan, West Olive, Michigan. Prepared for Consumers Energy Company.

Consumers Power Company. September 1996. Hydrogeological Monitoring Plan for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – JH Campbell Power Plant, Units 1-2 North and 1-2 South, West Olive, Michigan. Prepared for Consumers Energy Company.

Tables

Table 1
 Summary of Groundwater Elevation Data – September 2017
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)		Screen Interval Elevation (ft)		Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft)	September 25, 2017			
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)		
Background													
JHC-MW-15023	617.01	619.98	Sand	14.0	to	24.0	603.0	to	593.0	25.0	592.01	18.23	601.75
JHC-MW-15024	613.79	616.62	Sand	7.0	to	17.0	606.8	to	596.8	20.0	593.79	13.34	603.28
JHC-MW-15025	614.14	617.17	Sand	7.0	to	17.0	607.1	to	597.1	20.0	594.14	12.60	604.57
JHC-MW-15026	615.09	618.04	Sand	8.0	to	18.0	607.1	to	597.1	20.0	595.09	14.12	603.92
JHC-MW-15027	614.77	617.30	Sand	10.0	to	20.0	604.8	to	594.8	20.0	594.77	14.50	602.80
JHC-MW-15028	611.02	613.80	Sand	8.0	to	18.0	603.0	to	593.0	20.0	591.02	13.41	600.39
JHC-MW-15029	608.08	610.95	Sand	8.0	to	18.0	600.1	to	590.1	20.0	588.08	9.61	601.34
JHC-MW-15030	604.05	607.17	Sand	4.0	to	14.0	600.1	to	590.1	20.0	584.05	7.85	599.32
Unit 1N, 1S, 2N, 2S													
JHC-MW-15001	607.02	609.53	Sand	3.5	to	8.5	603.5	to	598.5	15.0	592.02	9.55	599.98
JHC-MW-15002	625.97	628.87	Sand	28.0	to	38.0	598.0	to	588.0	38.0	587.97	24.99	603.88
JHC-MW-15003	628.31	630.63	Sand	28.0	to	38.0	600.3	to	590.3	38.0	590.31	30.14	600.49
JHC-MW-15004	624.92	628.44	Sand	24.0	to	34.0	600.9	to	590.9	40.0	584.92	30.85	597.59
JHC-MW-15005	624.37	627.30	Sand	27.0	to	37.0	597.4	to	587.4	40.0	584.37	32.85	594.45
Unit 3N, 3S													
JHC-MW-15012	632.59	635.66	Sand	28.0	to	38.0	604.6	to	594.6	38.0	594.59	25.27	610.39
JHC-MW-15013	632.40	635.25	Sand	28.0	to	38.0	604.4	to	594.4	38.0	594.40	24.82	610.43
JHC-MW-15015	632.46	635.20	Sand	28.0	to	38.0	604.5	to	594.5	40.0	592.46	26.60	608.60
JHC-MW-15016	631.81	634.64	Sand	28.0	to	38.0	603.8	to	593.8	40.0	591.81	29.03	605.61
Landfill													
JHC-MW-15017	613.69	616.61	Sand	10.0	to	20.0	603.7	to	593.7	20.0	593.69	14.75	601.86
JHC-MW-15018	614.26	617.02	Sand	10.0	to	20.0	604.3	to	594.3	20.0	594.26	15.47	601.55
JHC-MW-15019	609.81	612.86	Sand	6.0	to	16.0	603.8	to	593.8	16.0	593.81	11.95	600.91
JHC-MW-15020	609.04	611.90	Sand	6.0	to	16.0	603.0	to	593.0	16.0	593.04	11.44	600.46
JHC-MW-15021	610.70	613.65	Sand	6.0	to	16.0	604.7	to	594.7	16.0	594.70	13.54	600.11
JHC-MW-15022	620.92	623.79	Sand	23.0	to	33.0	597.9	to	587.9	33.0	587.92	28.87	594.92
JHC-MW-15031	632.94	635.87	Sand	33.0	to	43.0	599.9	to	589.9	45.0	587.94	42.28	593.59
JHC-MW-15032	611.32	614.29	Sand	13.0	to	23.0	598.3	to	588.3	25.0	586.32	17.41	596.88
JHC-MW-15033	618.08	620.99	Sand	16.0	to	26.0	602.1	to	592.1	30.0	588.08	22.40	598.59
JHC-MW-15034	612.90	615.97	Sand	11.0	to	21.0	601.9	to	591.9	25.0	587.90	16.29	599.68
JHC-MW-15035	632.53	634.28	Sand	33.0	to	43.0	599.5	to	589.5	43.5	589.03	39.89	594.39
JHC-MW-15036	617.94	618.34	Sand	20.0	to	30.0	597.9	to	587.9	30.5	587.44	26.38	591.96
JHC-MW-15037	614.28	616.06	Sand	23.0	to	28.0	591.3	to	586.3	28.5	585.78	25.02	591.04
Pond A													
JHC-MW-15006	624.74	627.58	Sand	25.0	to	35.0	599.7	to	589.7	40.0	584.74	28.44	599.14
JHC-MW-15007	624.82	627.70	Sand	22.0	to	32.0	602.8	to	592.8	40.0	584.82	28.36	599.34
JHC-MW-15008	632.43	635.30	Sand	28.0	to	38.0	604.4	to	594.4	38.0	594.43	37.28	598.02
JHC-MW-15009	632.33	635.32	Sand	30.0	to	40.0	602.3	to	592.3	40.0	592.33	35.58	599.74
JHC-MW-15010	632.55	635.57	Sand	30.0	to	40.0	602.6	to	592.6	40.0	592.55	34.87	600.70
JHC-MW-15011	627.71	630.83	Sand	27.0	to	37.0	600.7	to	590.7	40.0	587.71	34.32	596.51

Notes:

Survey conducted by Nederveld, November 2015
 Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).
 TOC: Top of well casing.
 ft BTOC: Feet below top of well casing.
 ft BGS: Feet below ground surface.

Table 2
 Summary of Groundwater Sampling Results (Analytical) – September 2017
 JH Campbell Unit 1-2N/1-2S – RCRA CCR Monitoring Program
 West Olive, Michigan

						Sample Location:	JHC-MW-15023	JHC-MW-15024	JHC-MW-15025	JHC-MW-15026	JHC-MW-15027	JHC-MW-15028
						Sample Date:	9/26/2017	9/26/2017	9/25/2017	9/25/2017	9/25/2017	9/25/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background						
Appendix III												
Boron	ug/L	NC	500	500	7,200	40.1	<20.0	29.5	<20.0	<20.0	<20.0	
Calcium	mg/L	NC	NC	NC	500	7.9	28.5	22.5	4.7	9.7	12.7	
Chloride	mg/L	250**	250	250	500	4.3	31.3	19.7	2.2	1.8	<1.0	
Fluoride	ug/L	4,000	NC	NC	NC	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.8	7.3	7.3	6.1	6.7	8.8	
Sulfate	mg/L	250**	250	250	500	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Total Dissolved Solids	mg/L	500**	500	500	500	<50.0	142	132	64	112	54	

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Groundwater Sampling Results (Analytical) – September 2017
 JH Campbell Unit 1-2N/1-2S – RCRA CCR Monitoring Program
 West Olive, Michigan

						Sample Location:	JHC-MW-15001	JHC-MW-15002	JHC-MW-15003	JHC-MW-15004	JHC-MW-15005
						Sample Date:	9/25/2017	9/25/2017	9/25/2017	9/25/2017	9/25/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient					
Appendix III											
Boron	ug/L	NC	500	500	7,200	287	927	1,120	376	481	
Calcium	mg/L	NC	NC	NC	500	68.0	30.5	30.1	78.6	40.3	
Chloride	mg/L	250**	250	250	500	73.6	25.8	19.3	41.5	21.8	
Fluoride	ug/L	4,000	NC	NC	NC	<1,000	<1,000	<1,000	<1,000	<1,000	
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.2	9.6	9.7	7.1	7.4	
Sulfate	mg/L	250**	250	250	500	129	33.9	51.9	64.6	61.9	
Total Dissolved Solids	mg/L	500**	500	500	500	563	144	136	382	300	

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Field Parameter Results – September 2017
 JH Campbell Unit 1-2N/1-2S – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
JHC-MW-15023	9/26/2017	0.86	84.1	5.8	85	12.70	2.16
JHC-MW-15024	9/26/2017	1.36	94.2	7.3	325	12.81	1.74
JHC-MW-15025	9/25/2017	3.69	74.5	7.3	228	13.68	1.36
JHC-MW-15026	9/25/2017	6.03	46.1	6.1	46	13.40	1.83
JHC-MW-15027	9/25/2017	5.21	18.4	6.7	80	12.27	2.58
JHC-MW-15028	9/25/2017	6.34	2.7	8.8	94	15.15	2.41
Unit 1/2							
JHC-MW-15001	9/25/2017	0.10	88.8	6.2	769	19.50	1.62
JHC-MW-15002	9/25/2017	0.18	45.2	9.6	295	14.83	11.8
JHC-MW-15003	9/25/2017	0.03	25.4	9.7	274	19.18	2.40
JHC-MW-15004	9/25/2017	3.15	53.4	7.1	673	20.55	3.16
JHC-MW-15005	9/25/2017	0.33	56.9	7.4	351	19.36	3.02

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 SU - Standard units
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.

Table 4
 Comparison of Appendix III Parameter Results to Background Limits – September 2017
 JH Campbell Unit 1-2N/1-2S – RCRA CCR Monitoring Program
 West Olive, Michigan

		Sample Location:	JHC-MW-15001	JHC-MW-15002	JHC-MW-15003	JHC-MW-15004	JHC-MW-15005
		Sample Date:	9/25/2017	9/25/2017	9/25/2017	9/25/2017	9/25/2017
Constituent	Unit	UTL	downgradient				
Appendix III							
Boron	ug/L	51	287	927	1,120	376	481
Calcium	mg/L	46	68.0	30.5	30.1	78.6	40.3
Chloride	mg/L	43	73.6	25.8	19.3	41.5	21.8
Fluoride	ug/L	1,000	<1,000	<1,000	<1,000	<1,000	<1,000
pH, Field	su	4.8 - 9.2	6.2	9.6	9.7	7.1	7.4
Sulfate	mg/L	14	129	33.9	51.9	64.6	61.9
Total Dissolved Solids	mg/L	258	563	144	136	382	300

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 Upper Tolerance Limit (UTL) using the number of significant figures in the UTL.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.



1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080

PROJECT: **CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN**

TITLE: **SITE LOCATION MAP**

DRAWN BY:	J. PAPEZ
CHECKED BY:	S. HOLMSTROM
APPROVED BY:	G. CROCKFORD
DATE:	JANUARY 2018
PROJ. NO.:	269767-005
FILE:	269767-005-009SLM.mxd

FIGURE 1



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRAIDENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRAIDENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRAIDENT LANDFILL MONITORING WELL
- DOWNGRAIDENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL

- NOTES**
1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
 2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
 3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.

0 600 1,200
Feet

1" = 600'
1:7,200

PROJECT: CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE: **SITE PLAN
WITH CCR MONITORING WELL LOCATIONS**

DRAWN BY: J. PAPEZ PROJ NO.: 269767-005

CHECKED BY: S. HOLMSTROM

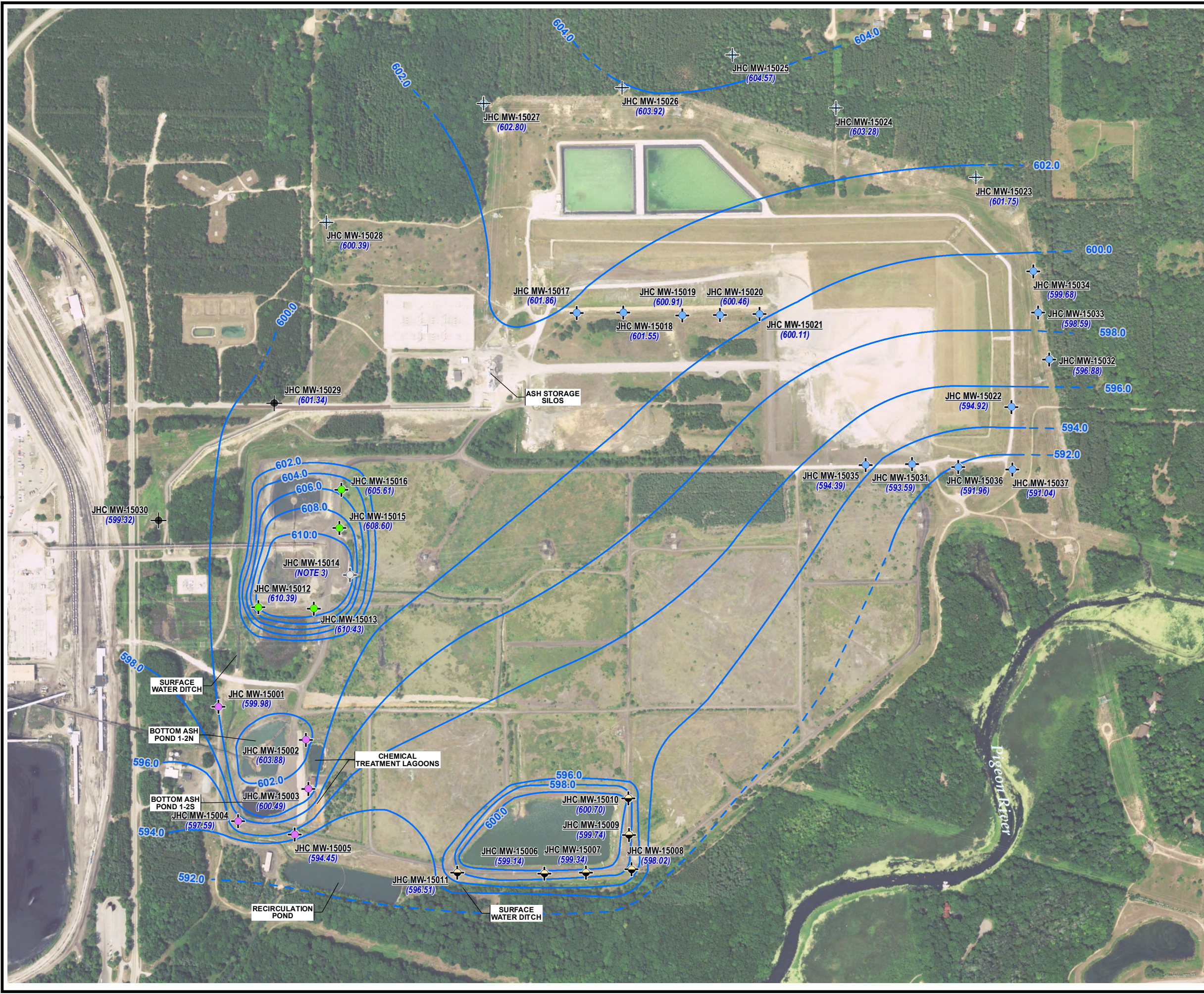
APPROVED BY: G. CROCKFORD

DATE: JANUARY 2018

FIGURE 2

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

FILE NO.: 269767-005-001.mxd

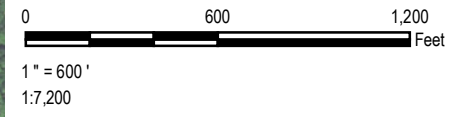
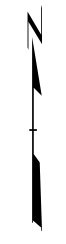


LEGEND

- BACKGROUND MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- DOWNGRADEMENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADEMENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADEMENT LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET)

NOTES

1. BASE MAP IMAGERY FROM USDAL-NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.



PROJECT:	
CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:	
GROUNDWATER CONTOUR MAP SEPTEMBER 25, 2017	
DRAWN BY: S. MAJOR	PROJ NO.: 269767-001
CHECKED BY: C. SCIESZKA	FIGURE 3
APPROVED BY: S. HOLMSTROM	
DATE: JANUARY 2018	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-005-012.mxd	

Appendix A

Background Data

Table 1
 Summary of Groundwater Elevation Data
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)		Screen Interval Elevation (ft)		Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft)	Round 1		Round 2		Round 3		Round 4			
										December 2, 2015		March 7, 2016		June 21, 2016		August 29, 2016			
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)		
Background																			
JHC-MW-15023	617.01	619.98	Sand	14.0	to	24.0	603.0	to	593.0	25.0	592.01	19.01	600.97	17.51	602.47	17.14	602.84	17.40	602.58
JHC-MW-15024	613.79	616.62	Sand	7.0	to	17.0	606.8	to	596.8	20.0	593.79	14.38	602.24	13.05	603.57	12.46	604.16	12.71	603.91
JHC-MW-15025	614.14	617.17	Sand	7.0	to	17.0	607.1	to	597.1	20.0	594.14	13.81	603.36	12.65	604.52	11.76	605.41	11.94	605.23
JHC-MW-15026	615.09	618.04	Sand	8.0	to	18.0	607.1	to	597.1	20.0	595.09	15.72	602.32	14.68	603.36	13.39	604.65	13.74	604.30
JHC-MW-15027	614.77	617.30	Sand	10.0	to	20.0	604.8	to	594.8	20.0	594.77	16.26	601.04	15.34	601.96	13.62	603.68	14.23	603.07
JHC-MW-15028	611.02	613.80	Sand	8.0	to	18.0	603.0	to	593.0	20.0	591.02	14.80	599.00	13.91	599.89	12.88	600.92	13.09	600.71
JHC-MW-15029	608.08	610.95	Sand	8.0	to	18.0	600.1	to	590.1	20.0	588.08	9.77	601.18	9.45	601.50	10.31	600.64	8.60	602.35
JHC-MW-15030	604.05	607.17	Sand	4.0	to	14.0	600.1	to	590.1	20.0	584.05	7.52	599.65	7.03	600.14	8.65	598.52	7.17	600.00
Unit 1N, 1S, 2N, 2S																			
JHC-MW-15001	607.02	609.53	Sand	3.5	to	8.5	603.5	to	598.5	15.0	592.02	9.25	600.28	9.08	600.45	9.83	599.70	9.30	600.23
JHC-MW-15002	625.97	628.87	Sand	28.0	to	38.0	598.0	to	588.0	38.0	587.97	24.83	604.04	23.95	604.92	25.49	603.38	24.63	604.24
JHC-MW-15003	628.31	630.63	Sand	28.0	to	38.0	600.3	to	590.3	38.0	590.31	28.15	602.48	29.95	600.68	30.80	599.83	29.50	601.13
JHC-MW-15004	624.92	628.44	Sand	24.0	to	34.0	600.9	to	590.9	40.0	584.92	29.67	598.77	31.33	597.11	31.58	596.86	30.29	598.15
JHC-MW-15005	624.37	627.30	Sand	27.0	to	37.0	597.4	to	587.4	40.0	584.37	31.53	595.77	33.14	594.16	33.29	594.01	32.53	594.77
Unit 3N, 3S																			
JHC-MW-15012	632.59	635.66	Sand	28.0	to	38.0	604.6	to	594.6	38.0	594.59	27.16	608.50	23.99	611.67	34.68	600.98	32.65	603.01
JHC-MW-15013	632.40	635.25	Sand	28.0	to	38.0	604.4	to	594.4	38.0	594.40	24.67	610.58	22.62	612.63	33.16	602.09	30.55	604.70
JHC-MW-15014*	635.13	638.18	Sand	39.0	to	49.0	596.1	to	586.1	50.0	585.13	28.69	609.49	27.29	610.89	NA*	--	NA*	--
JHC-MW-15015	632.46	635.20	Sand	28.0	to	38.0	604.5	to	594.5	40.0	592.46	27.52	607.68	26.30	608.90	33.44	601.76	26.98	608.22
JHC-MW-15016	631.81	634.64	Sand	28.0	to	38.0	603.8	to	593.8	40.0	591.81	29.72	604.92	29.19	605.45	33.10	601.54	26.72	607.92
Landfill																			
JHC-MW-15017	613.69	616.61	Sand	10.0	to	20.0	603.7	to	593.7	20.0	593.69	15.73	600.88	15.09	601.52	14.43	602.18	14.35	602.26
JHC-MW-15018	614.26	617.02	Sand	10.0	to	20.0	604.3	to	594.3	20.0	594.26	16.57	600.45	15.88	601.14	15.19	601.83	15.29	601.73
JHC-MW-15019	609.81	612.86	Sand	6.0	to	16.0	603.8	to	593.8	16.0	593.81	12.99	599.87	12.23	600.63	11.57	601.29	11.77	601.09
JHC-MW-15020	609.04	611.90	Sand	6.0	to	16.0	603.0	to	593.0	16.0	593.04	12.45	599.45	11.72	600.18	11.04	600.86	11.31	600.59
JHC-MW-15021	610.70	613.65	Sand	6.0	to	16.0	604.7	to	594.7	16.0	594.70	14.57	599.08	13.74	599.91	13.14	600.51	13.45	600.20
JHC-MW-15022	620.92	623.79	Sand	23.0	to	33.0	597.9	to	587.9	33.0	587.92	29.45	594.34	28.43	595.36	28.27	595.52	28.60	595.19
JHC-MW-15031	632.94	635.87	Sand	33.0	to	43.0	599.9	to	589.9	45.0	587.94	43.34	592.53	42.72	593.15	42.33	593.54	42.67	593.20
JHC-MW-15032	611.32	614.29	Sand	13.0	to	23.0	598.3	to	588.3	25.0	586.32	17.88	596.41	16.64	597.65	16.55	597.74	16.83	597.46
JHC-MW-15033	618.08	620.99	Sand	16.0	to	26.0	602.1	to	592.1	30.0	588.08	22.94	598.05	21.54	599.45	21.41	599.58	21.69	599.30
JHC-MW-15034	612.90	615.97	Sand	11.0	to	21.0	601.9	to	591.9	25.0	587.90	16.90	599.07	15.45	600.52	15.23	600.74	15.54	600.43
JHC-MW-15035	632.53	634.28	Sand	33.0	to	43.0	599.5	to	589.5	43.5	589.03	40.64	593.64	40.02	594.26	39.58	594.70	39.92	594.36
JHC-MW-15036	617.94	618.34	Sand	20.0	to	30.0	597.9	to	587.9	30.5	587.44	26.95	591.39	26.25	592.09	26.00	592.34	26.30	592.04
JHC-MW-15037	614.28	616.06	Sand	23.0	to	28.0	591.3	to	586.3	28.5	585.78	25.45	590.61	24.73	591.33	24.58	591.48	24.87	591.19
Pond A																			
JHC-MW-15006	624.74	627.58	Sand	25.0	to	35.0	599.7	to	589.7	40.0	584.74	28.50	599.08	28.83	598.75	28.80	598.78	28.57	599.01
JHC-MW-15007	624.82	627.70	Sand	22.0	to	32.0	602.8	to	592.8	40.0	584.82	28.48	599.22	29.10	598.60	28.92	598.78	28.69	599.01
JHC-MW-15008	632.43	635.30	Sand	28.0	to	38.0	604.4	to	594.4	38.0	594.43	37.21	598.09	37.99	597.31	38.02	597.28	37.60	597.70
JHC-MW-15009	632.33	635.32	Sand	30.0	to	40.0	602.3	to	592.3	40.0	592.33	35.44	599.88	36.79	598.53	36.65	598.67	36.20	599.12
JHC-MW-15010	632.55	635.57	Sand	30.0	to	40.0	602.6	to	592.6	40.0	592.55	35.21	600.36	36.23	599.34	35.93	599.64	35.52	600.05
JHC-MW-15011	627.71	630.83	Sand	27.0	to	37.0	600.7	to	590.7	40.0	587.71	34.09	596.74	34.46	596.37	34.54	596.29	34.22	596.61

Notes:

Survey conducted by Nederveld, November 2015

Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

ft BGS: Feet below ground surface.

* Representative water level data not available (NA) subsequent to March 2016 event due to monitoring well incurring damage.

Table 1
 Summary of Groundwater Elevation Data
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)		Screen Interval Elevation (ft)		Round 5		Round 6		Round 7		Round 8			
								November 14, 2016		April 17, 2017		June 19, 2017		August 14, 2017			
								Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)		
Background																	
JHC-MW-15023	617.01	619.98	Sand	14.0	to	24.0	603.0	to	593.0	17.46	602.52	15.81	604.17	16.63	603.35	17.57	602.41
JHC-MW-15024	613.79	616.62	Sand	7.0	to	17.0	606.8	to	596.8	12.93	603.69	11.28	605.34	11.72	604.90	12.65	603.97
JHC-MW-15025	614.14	617.17	Sand	7.0	to	17.0	607.1	to	597.1	12.41	604.76	10.63	606.54	11.03	606.14	12.08	605.09
JHC-MW-15026	615.09	618.04	Sand	8.0	to	18.0	607.1	to	597.1	14.36	603.68	12.54	605.50	12.67	605.37	13.80	604.24
JHC-MW-15027	614.77	617.30	Sand	10.0	to	20.0	604.8	to	594.8	14.88	602.42	12.87	604.43	13.13	604.17	13.75	603.55
JHC-MW-15028	611.02	613.80	Sand	8.0	to	18.0	603.0	to	593.0	13.33	600.47	12.07	601.73	12.24	601.56	15.51	598.29
JHC-MW-15029	608.08	610.95	Sand	8.0	to	18.0	600.1	to	590.1	8.50	602.45	10.46	600.49	9.11	601.84	9.40	601.55
JHC-MW-15030	604.05	607.17	Sand	4.0	to	14.0	600.1	to	590.1	7.06	600.11	7.50	599.67	7.29	599.88	7.66	599.51
Unit 1N, 1S, 2N, 2S																	
JHC-MW-15001	607.02	609.53	Sand	3.5	to	8.5	603.5	to	598.5	9.11	600.42	9.23	600.30	8.90	600.63	9.35	600.18
JHC-MW-15002	625.97	628.87	Sand	28.0	to	38.0	598.0	to	588.0	24.18	604.69	25.37	603.50	22.29	606.58	25.26	603.61
JHC-MW-15003	628.31	630.63	Sand	28.0	to	38.0	600.3	to	590.3	29.91	600.72	30.75	599.88	28.30	602.33	30.92	599.71
JHC-MW-15004	624.92	628.44	Sand	24.0	to	34.0	600.9	to	590.9	31.21	597.23	31.24	597.20	30.00	598.44	31.77	596.67
JHC-MW-15005	624.37	627.30	Sand	27.0	to	37.0	597.4	to	587.4	33.04	594.26	33.29	594.01	32.39	594.91	33.30	594.00
Unit 3N, 3S																	
JHC-MW-15012	632.59	635.66	Sand	28.0	to	38.0	604.6	to	594.6	32.05	603.61	26.23	609.43	23.64	612.02	24.00	611.66
JHC-MW-15013	632.40	635.25	Sand	28.0	to	38.0	604.4	to	594.4	29.69	605.56	25.31	609.94	21.58	613.67	23.57	611.68
JHC-MW-15014*	635.13	638.18	Sand	39.0	to	49.0	596.1	to	586.1	NA*	--	NA*	--	NA*	--	NA*	--
JHC-MW-15015	632.46	635.20	Sand	28.0	to	38.0	604.5	to	594.5	25.99	609.21	31.23	603.97	24.64	610.56	25.74	609.46
JHC-MW-15016	631.81	634.64	Sand	28.0	to	38.0	603.8	to	593.8	26.29	608.35	33.97	600.67	28.10	606.54	28.44	606.20
Landfill																	
JHC-MW-15017	613.69	616.61	Sand	10.0	to	20.0	603.7	to	593.7	14.63	601.98	13.60	603.01	13.71	602.90	14.12	602.49
JHC-MW-15018	614.26	617.02	Sand	10.0	to	20.0	604.3	to	594.3	15.48	601.54	14.44	602.58	14.50	602.52	14.90	602.12
JHC-MW-15019	609.81	612.86	Sand	6.0	to	16.0	603.8	to	593.8	11.98	600.88	10.91	601.95	10.95	601.91	11.33	601.53
JHC-MW-15020	609.04	611.90	Sand	6.0	to	16.0	603.0	to	593.0	11.42	600.48	10.41	601.49	10.39	601.51	10.81	601.09
JHC-MW-15021	610.70	613.65	Sand	6.0	to	16.0	604.7	to	594.7	13.55	600.10	12.60	601.05	12.54	601.11	12.90	600.75
JHC-MW-15022	620.92	623.79	Sand	23.0	to	33.0	597.9	to	587.9	28.55	595.24	27.66	596.13	27.93	595.86	28.45	595.34
JHC-MW-15031	632.94	635.87	Sand	33.0	to	43.0	599.9	to	589.9	42.74	593.13	42.08	593.79	41.97	593.90	42.33	593.54
JHC-MW-15032	611.32	614.29	Sand	13.0	to	23.0	598.3	to	588.3	16.79	597.50	15.67	598.62	16.26	598.03	16.92	597.37
JHC-MW-15033	618.08	620.99	Sand	16.0	to	26.0	602.1	to	592.1	21.68	599.31	20.37	600.62	21.08	599.91	21.85	599.14
JHC-MW-15034	612.90	615.97	Sand	11.0	to	21.0	601.9	to	591.9	15.50	600.47	14.08	601.89	14.83	601.14	15.96	600.01
JHC-MW-15035	632.53	634.28	Sand	33.0	to	43.0	599.5	to	589.5	40.00	594.28	39.28	595.00	39.08	595.20	39.52	594.76
JHC-MW-15036	617.94	618.34	Sand	20.0	to	30.0	597.9	to	587.9	26.35	591.99	25.74	592.60	25.71	592.63	26.09	592.25
JHC-MW-15037	614.28	616.06	Sand	23.0	to	28.0	591.3	to	586.3	24.85	591.21	24.27	591.79	24.37	591.69	24.77	591.29
Pond A																	
JHC-MW-15006	624.74	627.58	Sand	25.0	to	35.0	599.7	to	589.7	28.97	598.61	27.80	599.78	28.38	599.20	28.75	598.83
JHC-MW-15007	624.82	627.70	Sand	22.0	to	32.0	602.8	to	592.8	29.19	598.51	27.28	600.42	28.41	599.29	28.85	598.85
JHC-MW-15008	632.43	635.30	Sand	28.0	to	38.0	604.4	to	594.4	37.91	597.39	35.58	599.72	37.47	597.83	37.78	597.52
JHC-MW-15009	632.33	635.32	Sand	30.0	to	40.0	602.3	to	592.3	36.85	598.47	32.88	602.44	36.00	599.32	36.39	598.93
JHC-MW-15010	632.55	635.57	Sand	30.0	to	40.0	602.6	to	592.6	36.35	599.22	32.35	603.22	35.17	600.40	35.66	599.91
JHC-MW-15011	627.71	630.83	Sand	27.0	to	37.0	600.7	to	590.7	34.58	596.25	33.77	597.06	34.32	596.51	34.43	596.40

Notes:

Survey conducted by Nederveld, November 2015

Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

ft BGS: Feet below ground surface.

* Representative water level data not available (NA) subsequent to March 2016 event due to monitoring well incurring damage.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15023							
Sample Date:						12/4/2015	3/10/2016	6/23/2016	8/31/2016	11/16/2016	4/20/2017	6/21/2017	8/15/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	51	43	37	42	48	49	37.9	48.0
Calcium	mg/L	NC	NC	NC	500	16.1	16.9	9.89	12.3	15.5	9.60	5.3	5.8
Chloride	mg/L	250**	250	250	500	6.44	5.92	2.17	2.90	5.44	2.25	<1.0	1.8
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.26	5.8	5.5	5.6	5.8	5.5	5.79	5.76
Sulfate	mg/L	250**	250	250	500	10.5	12.3	14.1	12.6	12.3	13.7	10	12.9
Total Dissolved Solids	mg/L	500**	500	500	500	71	78	68	77	83	78	<50.0	60
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	2	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	22	33	23	20	26	35	21.7	23.2
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	<1	<1	<1	2	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.182	<0.163	<0.189	<0.328	<0.175	<0.26	<0.687	<0.686
Radium-226/228	pCi/L	5	NC	NC	NC	0.838	1.20	0.780	0.906	0.880	1.14	<1.35	<1.51
Radium-228	pCi/L	5	NC	NC	NC	0.672	1.05	0.652	0.780	0.827	1.01	<0.662	<0.819
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15024							
Sample Date:						12/4/2015	3/10/2016	6/23/2016	9/1/2016	11/16/2016	4/20/2017	6/21/2017	8/15/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	22	22	<20	23	23	27	22.6	24.8
Calcium	mg/L	NC	NC	NC	500	31.0	41.7	41.5	42.4	35.0	37.4	34.6	33.4
Chloride	mg/L	250**	250	250	500	25.2	36.5	33.0	42.0	21.8	33.6	42.4	43.4
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.35	7.3	7.3	7.4	7.1	7.5	7.67	7.36
Sulfate	mg/L	250**	250	250	500	9.85	9.32	9.20	9.59	8.38	9.20	8.1	10.9
Total Dissolved Solids	mg/L	500**	500	500	500	180	200	210	270	180	210	176	218
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	18	19	19	21	19	19	18.5	18.1
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	<1	<1	1	2	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.179	<0.238	<0.196	0.317	<0.245	0.245	<0.701	<0.709
Radium-226/228	pCi/L	5	NC	NC	NC	0.631	0.548	<0.576	0.568	<0.514	<0.641	<1.40	<1.55
Radium-228	pCi/L	5	NC	NC	NC	0.523	0.548	<0.576	<0.473	<0.514	<0.641	<0.697	<0.841
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15025							
Sample Date:						12/4/2015	3/10/2016	6/23/2016	9/1/2016	11/16/2016	4/20/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	32	25	<20	23	27	20	20.7	25.4
Calcium	mg/L	NC	NC	NC	500	29.5	31.0	20.2	25.7	25.4	20.5	18.9	17.1
Chloride	mg/L	250**	250	250	500	29.7	26.2	19.3	34.1	22.3	19.9	27.1	15.9
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.08	8.0	7.4	7.4	7.5	7.5	7.43	7.29
Sulfate	mg/L	250**	250	250	500	10.6	8.07	8.03	8.19	8.83	7.56	7.3	10.4
Total Dissolved Solids	mg/L	500**	500	500	500	170	160	120	200	150	120	66	154
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	7	7	15	10	7	11	10.1	7.8
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	1	<1	1	2	2	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.313	<0.176	<0.191	<0.270	<0.198	<0.360	<0.820	<0.763
Radium-226/228	pCi/L	5	NC	NC	NC	0.714	0.666	0.676	1.09	<0.498	0.919	<1.50	<1.54
Radium-228	pCi/L	5	NC	NC	NC	0.629	0.623	0.565	0.997	<0.498	0.690	0.794	<0.772
Selenium	ug/L	50	50	50	5	<1	<1	3	<1	<1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15026							
Sample Date:						12/7/2015	3/10/2016	6/24/2016	9/1/2016	11/16/2016	4/20/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	<20	<20	<20	<20	<20	<20	<20.0	<20.0
Calcium	mg/L	NC	NC	NC	500	<1	7.83	11.1	11.9	7.68	5.81	4.1	8.6
Chloride	mg/L	250**	250	250	500	1.13	2.32	5.95	6.94	3.03	4.37	3.0	5.9
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.44	6.2	5.7	6.6	6.2	5.9	6.15	6.76
Sulfate	mg/L	250**	250	250	500	7.59	7.02	7.88	7.82	8.07	6.62	5.2	9.4
Total Dissolved Solids	mg/L	500**	500	500	500	40	43	62	79	47	34	68	156
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	9	9	13	12	9	9	7.1	9.4
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	1	<1	<1	1	1	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.156	<0.170	<0.176	<0.248	<0.218	<0.357	<0.897	<0.803
Radium-226/228	pCi/L	5	NC	NC	NC	1.12	<0.557	1.70	1.58	2.85	1.36	<1.61	1.75
Radium-228	pCi/L	5	NC	NC	NC	1.06	<0.557	1.62	1.58	2.85	1.18	1.01	1.12
Selenium	ug/L	50	50	50	5	<1	<1	2	<1	<1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

[^] - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15027							
Sample Date:						12/7/2015	3/11/2016	6/24/2016	9/1/2016	11/17/2016	4/21/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	23	<20	<20	<20	<20	<20	<20.0	<20.0
Calcium	mg/L	NC	NC	NC	500	27.3	16.4	19.6	18.3	18.2	9.06	6.0	8.7
Chloride	mg/L	250**	250	250	500	7.25	3.04	11.7	8.93	5.90	2.64	1.4	1.6
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.75	6.9	6.7	6.2	6.8	6.5	6.46	6.77
Sulfate	mg/L	250**	250	250	500	10.4	9.91	9.16	8.75	8.89	9.26	6.7	9.0
Total Dissolved Solids	mg/L	500**	500	500	500	120	80	100	89	85	57	70	50
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	15	13	22	16	14	11	31.7	10.8
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	1	<1	1	1	1	2	1.1	1.1
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.199	<0.239	<0.165	<0.218	<0.266	<0.418	<0.842	<0.628
Radium-226/228	pCi/L	5	NC	NC	NC	0.900	0.738	0.777	1.18	2.51	0.897	1.87	<1.36
Radium-228	pCi/L	5	NC	NC	NC	0.900	0.738	0.759	1.18	2.43	0.702	1.45	0.964
Selenium	ug/L	50	50	50	5	<1	<1	2	<1	<1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15028							
Sample Date:						12/7/2015	3/11/2016	6/24/2016	9/1/2016	11/17/2016	4/21/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	26	<20	<20	<20	20	<20	<20.0	<20.0
Calcium	mg/L	NC	NC	NC	500	13.1	16.0	11.4	14.4	12.6	10.4	13.7	11.4
Chloride	mg/L	250**	250	250	500	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.24	8.7	7.9	7.5	8.4	8.1	8.79	8.83
Sulfate	mg/L	250**	250	250	500	5.08	5.10	5.05	4.93	5.08	5.87	3.3	5.3
Total Dissolved Solids	mg/L	500**	500	500	500	63	60	61	69	64	56	<50.0	54
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	<5	<5	<5	<5	<5	5	5.3	5.4
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	<1	<1	1	1	1.2	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.181	<0.149	0.166	<0.189	<0.181	<0.346	<0.566	<0.905
Radium-226/228	pCi/L	5	NC	NC	NC	<0.573	0.461	<0.529	<0.519	<0.522	<0.714	<1.12	<1.87
Radium-228	pCi/L	5	NC	NC	NC	<0.573	0.446	<0.529	<0.519	<0.522	<0.714	0.666	<0.962
Selenium	ug/L	50	50	50	5	3	5	3	2	4	3	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15029							
Sample Date:						12/8/2015	3/11/2016	6/24/2016	9/1/2016	11/17/2016	4/20/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	178	227	310	404	401	251	418	435
Calcium	mg/L	NC	NC	NC	500	29.2	6.40	28.6	32.3	32.0	50.7	29.3	24.7
Chloride	mg/L	250**	250	250	500	20.3	14.2	17.1	13.1	12.7	67.4	15.7	15.5
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.5	8.6	8.3	8.0	8.3	7.1	8.34	8.46
Sulfate	mg/L	250**	250	250	500	32.9	33.2	30.1	32.0	33.7	53.6	40.5	38.6
Total Dissolved Solids	mg/L	500**	500	500	500	160	150	160	230	170	320	232	154
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	<5	<5	<5	<5	<5	15	3.4	3.0
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	<1	<1	<1	5	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	6	7	<5	6	6	9.9	12.6
Radium-226	pCi/L	5	NC	NC	NC	<0.153	<0.154	0.226	<0.198	<0.169	<0.363	<0.725	<0.723
Radium-226/228	pCi/L	5	NC	NC	NC	<0.383	<0.470	0.691	<0.465	<0.736	0.673	<1.46	<1.67
Radium-228	pCi/L	5	NC	NC	NC	<0.383	<0.470	0.465	<0.465	<0.736	0.620	<0.736	0.966
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	<1	2	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Analytical Results for Background Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15030							
Sample Date:						12/8/2015	3/11/2016	6/24/2016	9/1/2016	11/17/2016	4/20/2017	6/21/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	620	481	501	568	871	484	653	396
Calcium	mg/L	NC	NC	NC	500	22.9	6.67	24.7	21.7	17.3	20.7	19.0	20.6
Chloride	mg/L	250**	250	250	500	18.4	18.0	15.1	18.3	13.8	18.5	16.4	14.3
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.87	6.9	7.5	7.0	6.8	7.1	6.84	7.09
Sulfate	mg/L	250**	250	250	500	36.4	38.4	47.5	37.1	36.1	40.9	37.7	51.5
Total Dissolved Solids	mg/L	500**	500	500	500	140	160	140	140	120	130	106	390
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<10	<1.0	<1.0
Barium	ug/L	2,000	2,000	2,000	670	18	27	12	36	31	12	14.5	12.5
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	1	<1	<1	<1	2	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	8	<5	<5	<5	<5	6.7	7.0
Radium-226	pCi/L	5	NC	NC	NC	<0.171	<0.165	<0.159	<0.345	<0.208	<0.319	0.535	<0.742
Radium-226/228	pCi/L	5	NC	NC	NC	<0.472	0.801	<0.355	<0.673	<0.707	<0.593	1.63	<1.77
Radium-228	pCi/L	5	NC	NC	NC	<0.472	0.661	<0.355	<0.673	<0.707	<0.593	1.09	<1.03
Selenium	ug/L	50	50	50	5	<1	<1	2	<1	<1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Analytical Results for Unit 1-2N/1-2S Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15001							
Sample Date:						12/7/2015	3/8/2016	6/21/2016	8/29/2016	11/15/2016	4/19/2017	6/20/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	396	235	195	271	309	149	368	238
Calcium	mg/L	NC	NC	NC	500	85.6	84.1	80.7	74	75.5	70.3	50.7	70.9
Chloride	mg/L	250**	250	250	500	12.3	48.4	152	98.5	105	7.1	51.8	94.8
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.59	6.4	6.2	6.0	6.4	6.3	6.22	6.33
Sulfate	mg/L	250**	250	250	500	142	46.2	34.9	46.4	68.3	42.1	88.0	114
Total Dissolved Solids	mg/L	500**	500	500	500	630	190	570	550	560	440	340	562
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	6	3	3	4	3	4	1.8	2.2
Barium	ug/L	2,000	2,000	2,000	670	160	148	164	148	141	172	106	142
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	1	2	2	2	3	2	1.0	1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5.0	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.234	<0.211	0.344	<0.389	<0.379	<0.352	<1.63	<0.708
Radium-226/228	pCi/L	5	NC	NC	NC	1.90	1.53	2.58	1.77	1.89	2.13	<2.26	1.61
Radium-228	pCi/L	5	NC	NC	NC	1.67	1.34	2.24	1.56	1.60	2.07	<0.628	1.20
Selenium	ug/L	50	50	50	5	<1	1	1	<1	1	<1	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criteria based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Analytical Results for Unit 1-2N/1-2S Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15002							
Sample Date:						12/7/2015	3/8/2016	6/21/2016	8/30/2016	11/15/2016	4/19/2017	6/20/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	661	426	433	831	757	602	768	869
Calcium	mg/L	NC	NC	NC	500	21.9	35.8	36.4	36.1	18.9	28.0	24.6	25.7
Chloride	mg/L	250**	250	250	500	13.2	18.5	23.4	17.4	14.4	25.7	20.7	20.7
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.77	8.7	8.5	8.6	8.8	8.8	9.19	9.24
Sulfate	mg/L	250**	250	250	500	33.3	47.8	46.9	54.0	51.4	64.2	52.8	54.5
Total Dissolved Solids	mg/L	500**	500	500	500	150	160	180	190	140	190	160	236
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	4	3	1	<1	3.3	1.9
Arsenic	ug/L	10	10	10	10	34	40	36	34	46	33	35.4	44.5
Barium	ug/L	2,000	2,000	2,000	670	10	9	8	8	8	8	7.2	7.8
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	<1	<1	1	2	<1.0	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	12.1	10.1	<10	<10	11	<10	<10	11
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	10	93	18	18	16	48	21.4	19.0
Radium-226	pCi/L	5	NC	NC	NC	<0.33	<0.244	<0.219	<0.487	<0.251	<0.409	<0.562	0.749
Radium-226/228	pCi/L	5	NC	NC	NC	1.09	<0.737	<0.649	2.90	<0.496	<0.702	<1.33	<1.43
Radium-228	pCi/L	5	NC	NC	NC	0.986	<0.737	<0.649	2.83	<0.496	<0.702	<0.765	<0.797
Selenium	ug/L	50	50	50	5	<1	4	<1	<1	2	4	7.8	3.5
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

[^] - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criteria based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Analytical Results for Unit 1-2N/1-2S Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15003							
Sample Date:						12/5/2015	3/8/2016	6/21/2016	8/29/2016	11/15/2016	4/18/2017	6/20/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	439	455	426	882	1,670	1,280	1,240	1,150
Calcium	mg/L	NC	NC	NC	500	27.9	46.7	38.3	44.3	31.8	34.6	28.8	36.0
Chloride	mg/L	250**	250	250	500	21.7	25.7	28.5	20.1	30.8	27.9	24.0	22.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	9.01	9.3	9.2	9.11	8.6	8.7	9.25	9.34
Sulfate	mg/L	250**	250	250	500	41.3	52.7	48.1	45.8	63.0	71.8	61.8	61.9
Total Dissolved Solids	mg/L	500**	500	500	500	160	200	190	220	230	260	146	208
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	2	1	<1.0	1.3
Arsenic	ug/L	10	10	10	10	38	31	27	27	36	26	20.4	23.7
Barium	ug/L	2,000	2,000	2,000	670	21	16	15	19	18	16	18.0	18.0
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	2	5	2	1	5	12	12.3	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	11.1	<10	<10	<10	11	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	9	11	20	13	24	30	21.1	28.2
Radium-226	pCi/L	5	NC	NC	NC	<0.250	<0.236	<0.211	<0.365	<0.249	<0.302	<1.12	1.15
Radium-226/228	pCi/L	5	NC	NC	NC	<0.412	<0.575	<0.539	<0.724	<0.369	0.769	<1.84	1.81
Radium-228	pCi/L	5	NC	NC	NC	<0.412	<0.575	<0.539	<0.724	<0.369	0.633	<0.722	<0.938
Selenium	ug/L	50	50	50	5	<1	3	<1	<1	2	3	<1.0	1.1
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

[^] - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criteria based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Analytical Results for Unit 1-2N/1-2S Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15004							
Sample Date:						12/5/2015	3/8/2016	6/22/2016	8/30/2016	11/15/2016	4/18/2017	6/20/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	546	268	412	469	578	260	473	660
Calcium	mg/L	NC	NC	NC	500	43.1	42.8	45.8	64.6	101	36.9	37.7	51.2
Chloride	mg/L	250**	250	250	500	41.6	35.5	26.4	23.7	70.8	46.8	67.5	95.1
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.64	7.3	7.1	6.8	7.3	7.6	7.43	7.55
Sulfate	mg/L	250**	250	250	500	55.0	42.5	48.7	47.8	244	58.6	85.6	122
Total Dissolved Solids	mg/L	500**	500	500	500	290	220	230	370	560	290	322	402
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	1	1	<1	<1	<1.0	<1.0
Arsenic	ug/L	10	10	10	10	21	9	11	8	6	4	4.8	5.7
Barium	ug/L	2,000	2,000	2,000	670	73	65	117	181	241	110	93.2	193
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	1	1	1	1	1	3	6.9	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	12	12	<10	<10	10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	9	8	10	5	10	6	10.1	11.2
Radium-226	pCi/L	5	NC	NC	NC	<0.295	0.259	<0.189	<0.29	<0.311	<0.333	<0.502	0.915
Radium-226/228	pCi/L	5	NC	NC	NC	0.702	0.711	0.633	1.85	1.12	0.497	<1.19	1.66
Radium-228	pCi/L	5	NC	NC	NC	0.422	0.452	0.605	1.62	0.856	0.366	<0.685	<0.920
Selenium	ug/L	50	50	50	5	8	2	2	7	1	2	<1.0	<1.0
Thallium	ug/L	2	2	2	3.7	2.16	<2	2	4	3	<2	<2.0	2.1

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criteria based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 3
 Summary of Analytical Results for Unit 1-2N/1-2S Groundwater Samples
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15005							
Sample Date:						12/5/2015	3/8/2016	6/22/2016	8/30/2016	11/15/2016	4/18/2017	6/20/2017	8/14/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	275	959	1,370	706	1,500	524	468	546
Calcium	mg/L	NC	NC	NC	500	55.0	60.2	55.1	51.6	73.4	56.8	53.6	48.0
Chloride	mg/L	250**	250	250	500	27.7	42	46.9	19.2	29.3	64.2	50.4	27.1
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.26	7.4	7.4	7.3	7.1	7.5	7.37	7.46
Sulfate	mg/L	250**	250	250	500	51.2	53.0	57.9	46.5	61.8	58.3	66.0	64.9
Total Dissolved Solids	mg/L	500**	500	500	500	270	300	310	230	320	360	306	282
Appendix IV													
Antimony	ug/L	6	6	6	130	4	2	2	3	5	3	3.8	4.2
Arsenic	ug/L	10	10	10	10	4	3	3	5	3	2	3.3	2.5
Barium	ug/L	2,000	2,000	2,000	670	99	74	97	72	159	128	113	109
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Chromium	ug/L	100	100	100	11	4	5	12	2	3	4	3.7	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15.0	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1.0	<1.0
Lithium	ug/L	NC	170	350	440	41.3	25.5	28	31	49	38	39	36
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
Molybdenum	ug/L	NC	73	210	3,200	12	13	25	16	15	18	14.0	10.0
Radium-226	pCi/L	5	NC	NC	NC	<0.277	<0.355	0.192	<0.286	<0.246	0.461	<0.717	<0.877
Radium-226/228	pCi/L	5	NC	NC	NC	0.564	<0.426	<0.395	1.78	0.974	0.841	<1.45	<1.73
Radium-228	pCi/L	5	NC	NC	NC	0.436	<0.426	<0.395	1.58	0.745	<0.383	<0.728	<0.856
Selenium	ug/L	50	50	50	5	28	12	33	18	165	10	15.5	15.7
Thallium	ug/L	2	2	2	3.7	3.04	<2	2	2	4	<2	<2.0	<2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

[^] - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. Chromium GSI criteria based on hexavalent chromium per footnote (H).

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 4
 Summary of Field Parameters
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	pH	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	SU	umhos/cm	°C	NTU
Background							
JHC-MW-15023	12/04/15	0.9	104.6	6.26	112	10.65	1.1
	03/10/16	1.0	155.5	5.8	139	10.4	<1
	06/23/16	5.4	120.8	5.5	86	13.7	<1
	08/31/16	3.9	131.2	5.6	70	14.0	<1
	11/16/16	1.4	129.5	5.8	99	12.4	1.5
	04/20/17	2.1	239.7	5.5	76	11.4	<1
	06/21/17	3.43	212.9	5.79	39	11.13	2.29
	08/15/17	1.52	86.1	5.76	59.5	12.15	3.66
JHC-MW-15024	12/04/15	0.56	114	7.35	285	10.14	1.57
	03/10/16	1.7	121.6	7.3	375	8.2	<1
	06/23/16	1.5	50.0	7.3	351	13.4	<1
	09/01/16	1.6	153.2	7.4	374	13.0	<1
	11/16/16	2.1	80.8	7.1	304	12.3	1.4
	04/20/17	1.0	147.2	7.5	344	8.9	<1
	06/21/17	0.81	152.3	7.67	248	11.46	<1
	08/15/17	0.63	99.0	7.36	371.7	12.56	1.16
JHC-MW-15025	12/04/15	1.35	-60.5	8.08	369	10.42	1.85
	03/10/16	5.3	121.6	8.0	286	7.7	4.3
	06/23/16	6.4	69.2	7.4	200	11.6	<1
	09/01/16	4.9	153.3	7.4	279	13.0	<1
	11/16/16	5.3	68.9	7.5	286	11.9	<1
	04/20/17	6.4	149.8	7.5	238	9.0	<1
	06/21/17	6.24	157.3	7.43	157	12.45	1.98
	08/14/17	4.64	117.6	7.29	188.1	13.83	1.23
JHC-MW-15026	12/07/15	5.86	96.1	6.44	52	8.97	5.13
	03/10/16	5.0	178.5	6.2	55	8.10	1
	06/24/16	3.3	166.0	5.7	66	10.3	<1
	09/01/16	4.0	147.5	6.6	90	11.6	<1
	11/16/16	8.2	131.2	6.2	52	11.3	<1
	04/20/17	5.7	214.9	5.9	52	11.7	<1
	06/21/17	5.11	189.0	6.15	30	11.78	1.85
	08/14/17	5.49	107.2	6.76	86.8	13.26	1.84
JHC-MW-15027	12/07/15	1.91	107.4	6.75	160	8.94	2.11
	03/11/16	7.2	202.2	6.9	101	7.3	1.6
	06/24/16	5.2	69.5	6.7	164	11.1	<1
	09/01/16	6.27	101.9	6.2	120	12.3	2.6
	11/17/16	4.5	107.7	6.8	114	11.6	<1
	04/21/17	7.9	177.1	6.5	83	7.7	3
	06/21/17	6.62	153.2	6.46	36	11.0	4.03
	08/14/17	4.60	68.4	6.77	72.3	12.19	3.85

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.
 SU - Standard Unit

Table 4
 Summary of Field Parameters
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	pH	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	SU	umhos/cm	°C	NTU
Background							
JHC-MW-15028	12/07/15	6.73	85.5	8.24	85	10.13	1.66
	03/11/16	7.2	145.2	8.7	102	8.7	<1
	06/24/16	8.5	43.6	7.9	84	14.0	<1
	09/01/16	7.9	63.9	7.5	95	14.3	<1
	11/17/16	8.6	46.6	8.4	84	14.0	<1
	04/21/17	9.3	157.3	8.1	75	9.3	<1
	06/21/17	6.02	103.8	8.79	68	12.47	4.33
	08/14/17	6.35	22.2	8.83	88.5	15.68	3.56
JHC-MW-15029	12/08/15	0.14	-109.4	8.5	258	13.39	5.14
	03/11/16	0.3	157.6	8.6	261	9.3	2.4
	06/24/16	0.4	63.3	8.3	255	12.5	1.2
	09/01/16	0.6	-8.0	8.0	266	16.7	<1
	11/17/16	0.8	121.5	8.3	256	15.8	1.5
	04/20/17	1.2	157.4	7.1	552	12.4	1.0
	06/21/17	0.44	72.0	8.34	191	14.64	3.89
	08/14/17	0.13	49.2	8.46	218.1	17.98	1.70
JHC-MW-15030	12/08/15	0.4	-96.1	7.87	228	12.19	2.31
	03/11/16	1.0	22.6	6.9	251	8.1	3.6
	06/24/16	0.5	-38.1	7.5	222	12.8	4.7
	09/01/16	0.7	-22.9	7.0	212	16.6	2.3
	11/17/16	1.2	64.7	6.8	193	14.5	1
	04/20/17	0.2	57.8	7.1	220	10.6	<1
	06/21/17	0.40	41.4	6.84	139	12.07	2.86
	08/14/17	0.15	61.6	7.09	213.5	15.23	2.81
Unit 1/2							
JHC-MW-15001	12/07/15	0.33	-79.4	6.59	830	11.76	<1
	03/08/16	0.2	-31.3	6.4	801	8.9	<1
	06/21/16	0.3	-68.1	6.2	958	14.8	<1
	08/29/16	0.5	-41.4	6.0	878	19.8	<1
	11/15/16	0.7	-43.0	6.4	883	14.5	<1
	04/19/17	0.1	-44.1	6.3	676	9.7	<1
	06/20/17	0.41	-92.6	6.22	678	13.0	<1
	08/14/17	0.24	7.6	6.33	722	16.87	2.10
JHC-MW-15002	12/07/15	0.27	-165.7	8.77	239	18.49	4.49
	03/08/16	0.3	-143.4	8.7	297	14.5	<1
	06/21/16	0.3	-47.3	8.5	312	11.6	<1
	08/30/16	0.5	-84.6	8.6	293	14.7	<1
	11/15/16	0.6	-160.6	8.8	217	18.7	<1
	04/19/17	0.2	-11.1	8.8	315	12	<1
	06/20/17	0.34	87.6	9.19	203	13.86	<1
	08/14/17	0.33	-5.4	9.24	221	17.18	2.56

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.
 SU - Standard Unit

Table 4
 Summary of Field Parameters
 JH Campbell – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	pH	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	SU	umhos/cm	°C	NTU
Unit 1/2							
JHC-MW-15003	12/05/15	0.2	-141.6	9.01	288	17.76	3.21
	03/08/16	2.4	40.8	9.3	342	14.5	3.8
	06/21/16	0.5	150.4	9.2	334	10.6	2.5
	08/29/16	0.4	102.1	9.1	335	17.6	<1
	11/15/16	0.5	63.3	8.6	379	19.5	2.4
	04/18/17	2.3	141.8	8.7	383	8.8	1.5
	06/20/17	0.33	73.0	9.25	229	12.32	3.00
	08/14/17	0.12	-248.4	9.34	299	16.56	3.14
JHC-MW-15004	12/05/15	1.79	-74.1	7.64	499	16.25	2.59
	03/08/16	0.4	50.3	7.3	374	7.2	<1
	06/22/16	0.5	106.3	7.1	398	17.9	<1
	08/30/16	1.5	151.7	6.8	494	23.3	<1
	11/15/16	0.4	59.1	7.3	820	21.4	<1
	04/18/17	1.3	132.1	7.6	425	7.0	<1
	06/20/17	0.53	-46.1	7.43	538	11.8	3.8
	08/14/17	0.22	12.9	7.55	634	19.27	2.47
JHC-MW-15005	12/05/15	1.77	-11.4	7.26	459	20.04	1.72
	03/08/16	7.6	134.3	7.4	507	10.6	<1
	06/22/16	1.5	151.3	7.4	525	11.8	<1
	08/30/16	1.0	110.7	7.3	369	16.0	<1
	11/15/16	1.5	61.2	7.1	516	21.3	<1
	04/18/17	4.4	127.5	7.5	571	8.5	<1
	06/20/17	4.31	52.1	7.37	591	10.7	27.6
	08/14/17	0.82	49.5	7.46	332	13.97	3.94

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

umhos/cm - Micromhos per centimeter.

NTU - Nephelometric Turbidity Unit.

SU - Standard Unit

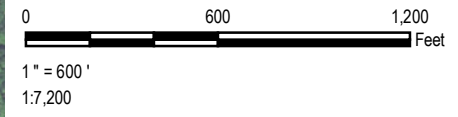


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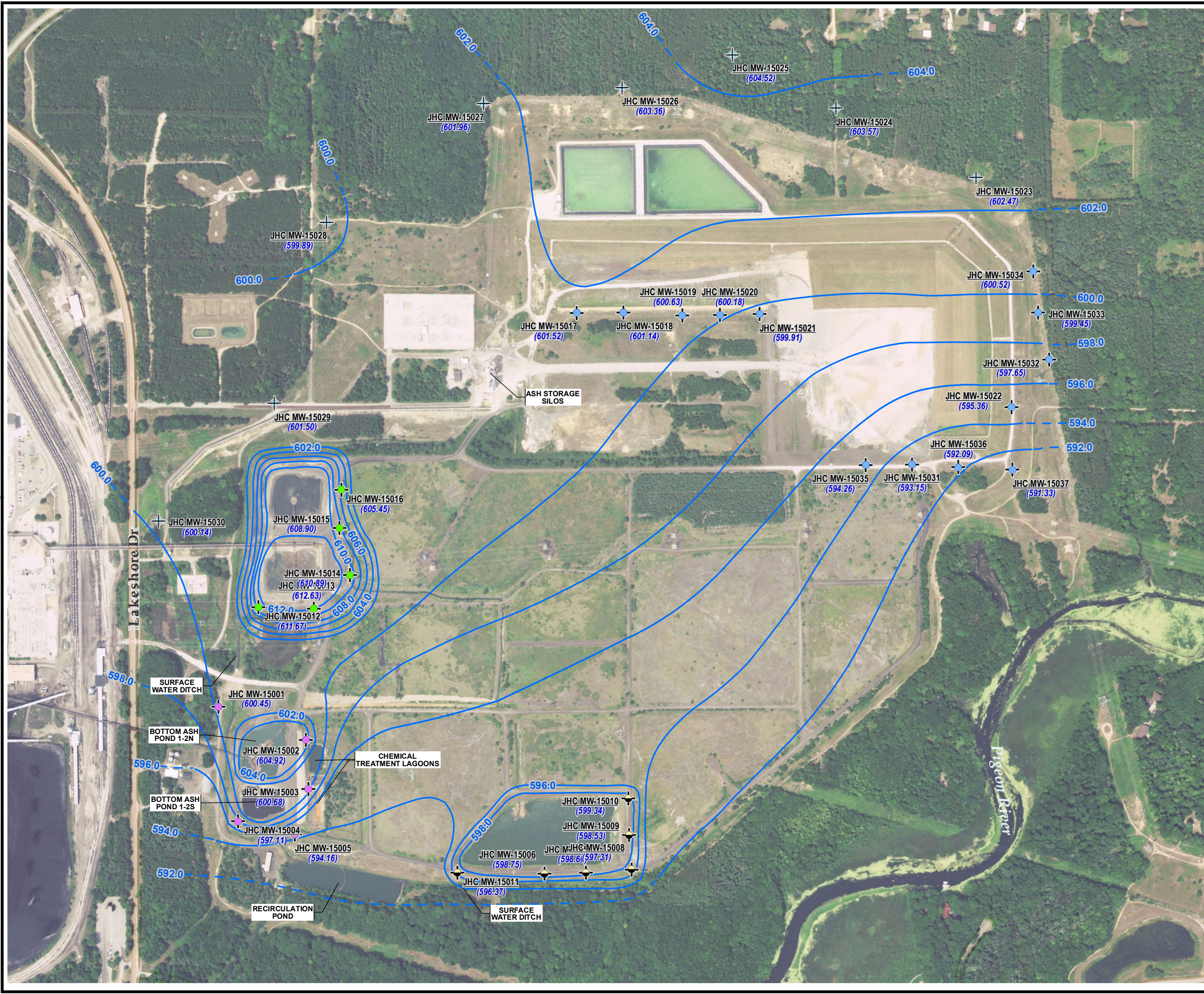
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- DOWNGRADE BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADE LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP DECEMBER 2, 2015	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 1	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-002.mxd		

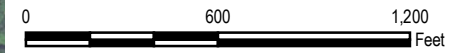


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- BACKGROUND MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADE LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

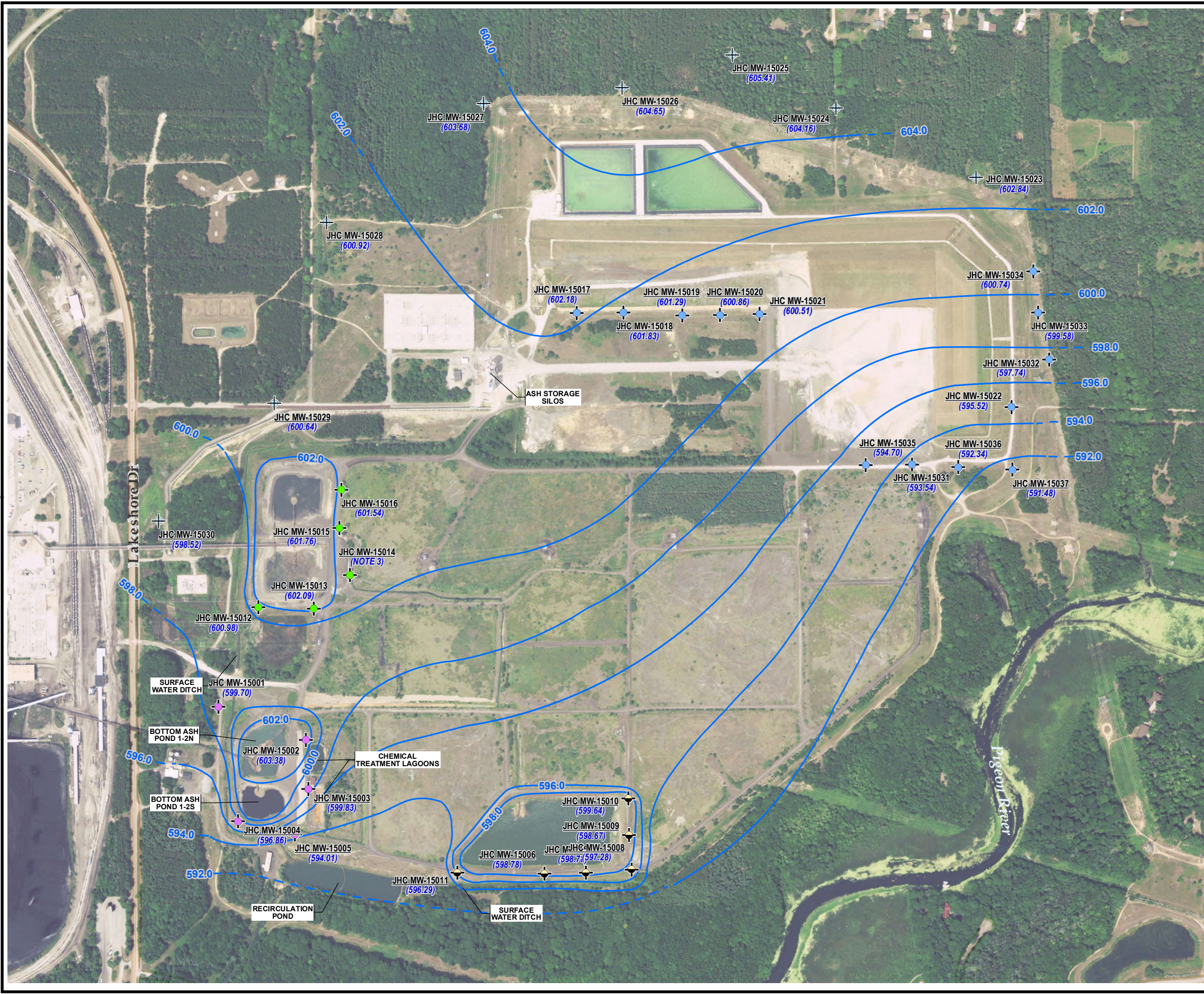
NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.



1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP MARCH 7, 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 2	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-003.mxd		

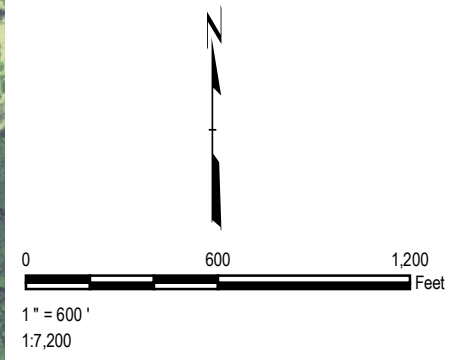


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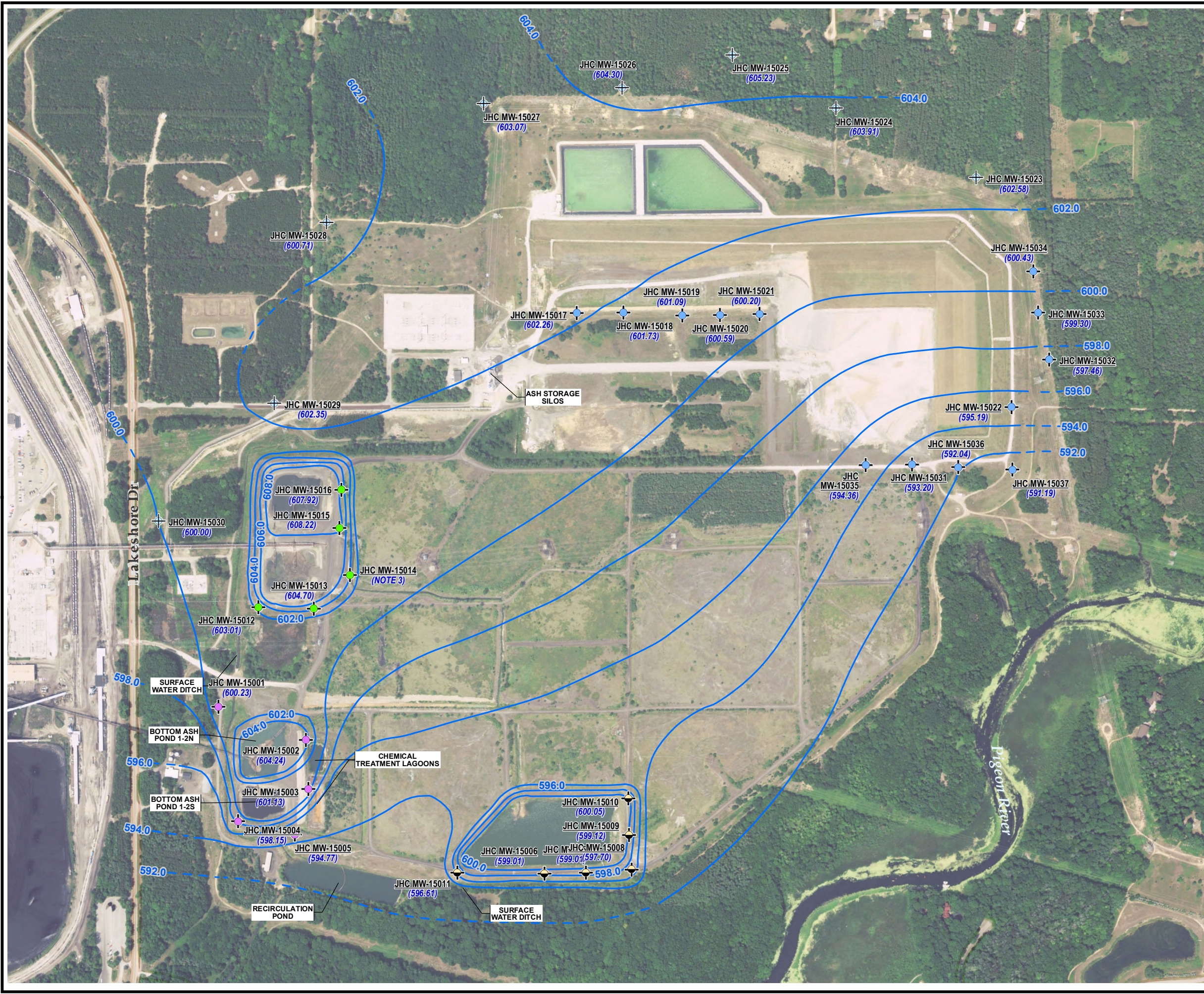
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- DOWNGRADE BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADE LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97) GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DAMAGED, DATA NOT USED.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP JUNE 21, 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 3	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-004.mxd		

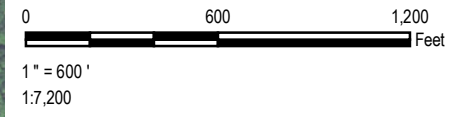


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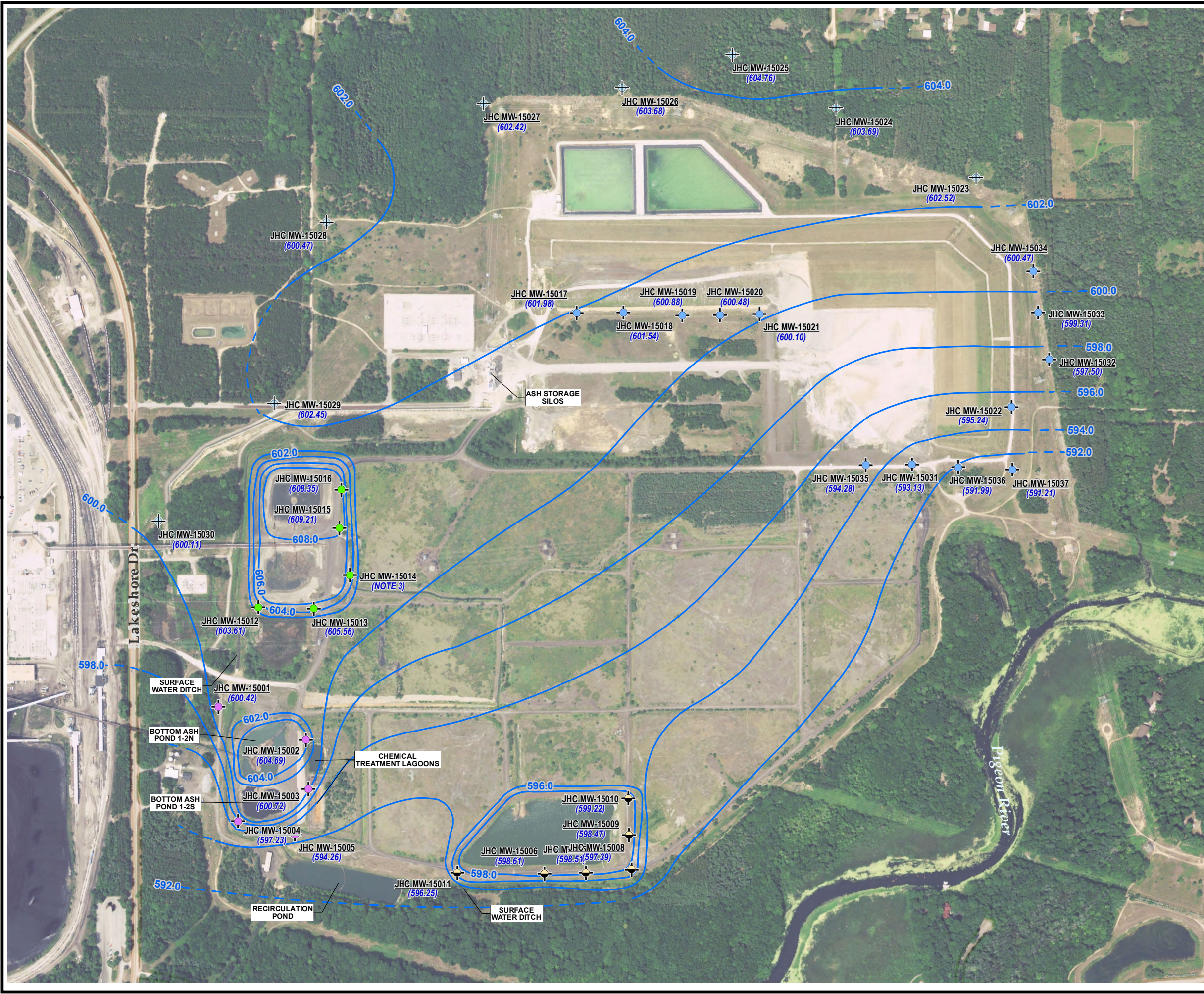
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- DOWNGRAIDENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRAIDENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRAIDENT LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

NOTES

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2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DAMAGED, DATA NOT USED.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP AUGUST 29, 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 4	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-005.mxd		

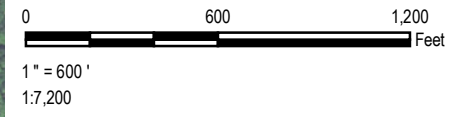
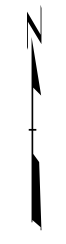


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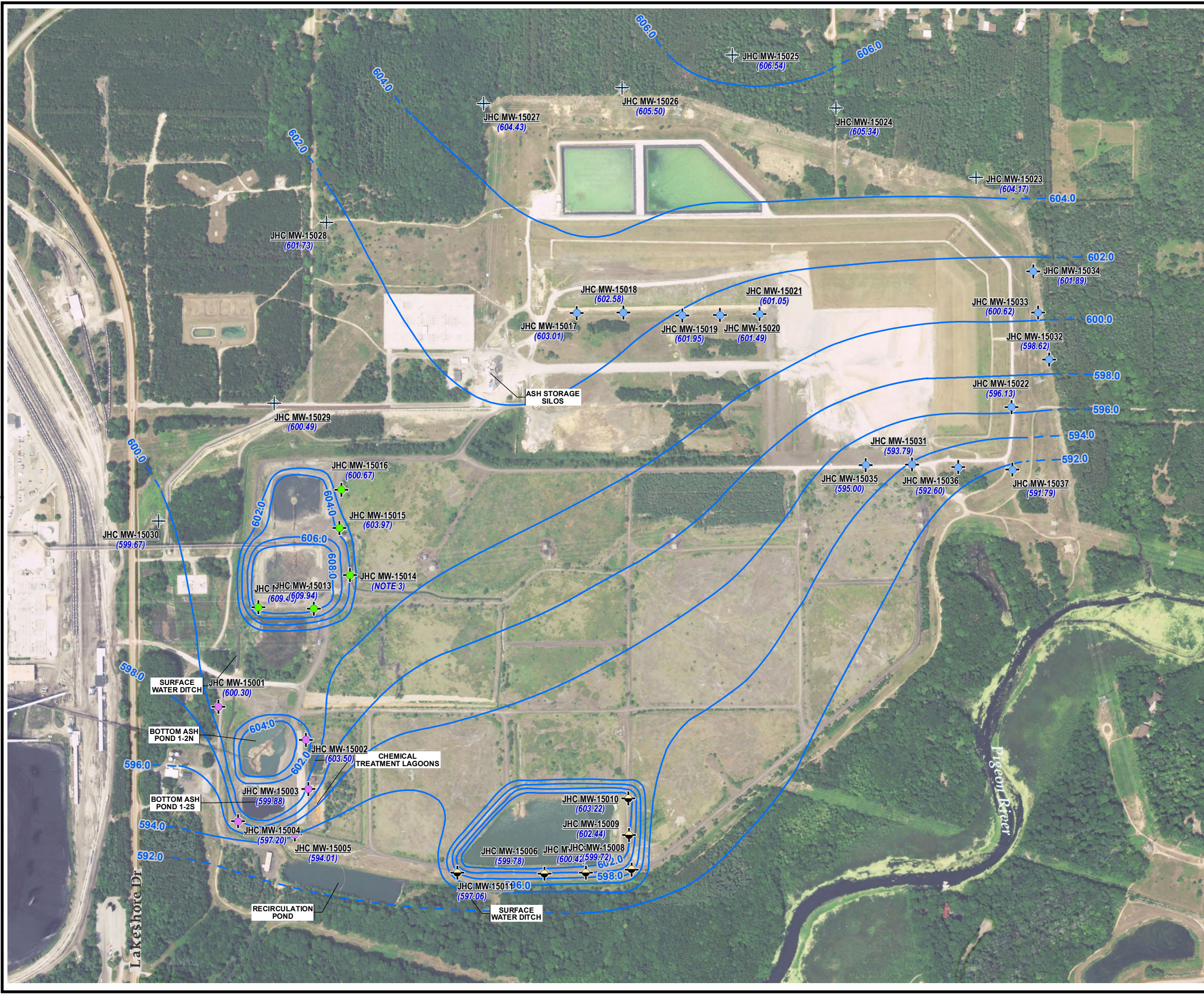
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- DOWNGRADENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADENT LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

NOTES

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3. MONITORING WELL DAMAGED, DATA NOT USED.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP NOVEMBER 14, 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 5	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-006.mxd		

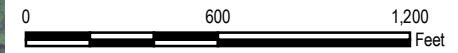


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- BACKGROUND MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADE BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADE LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

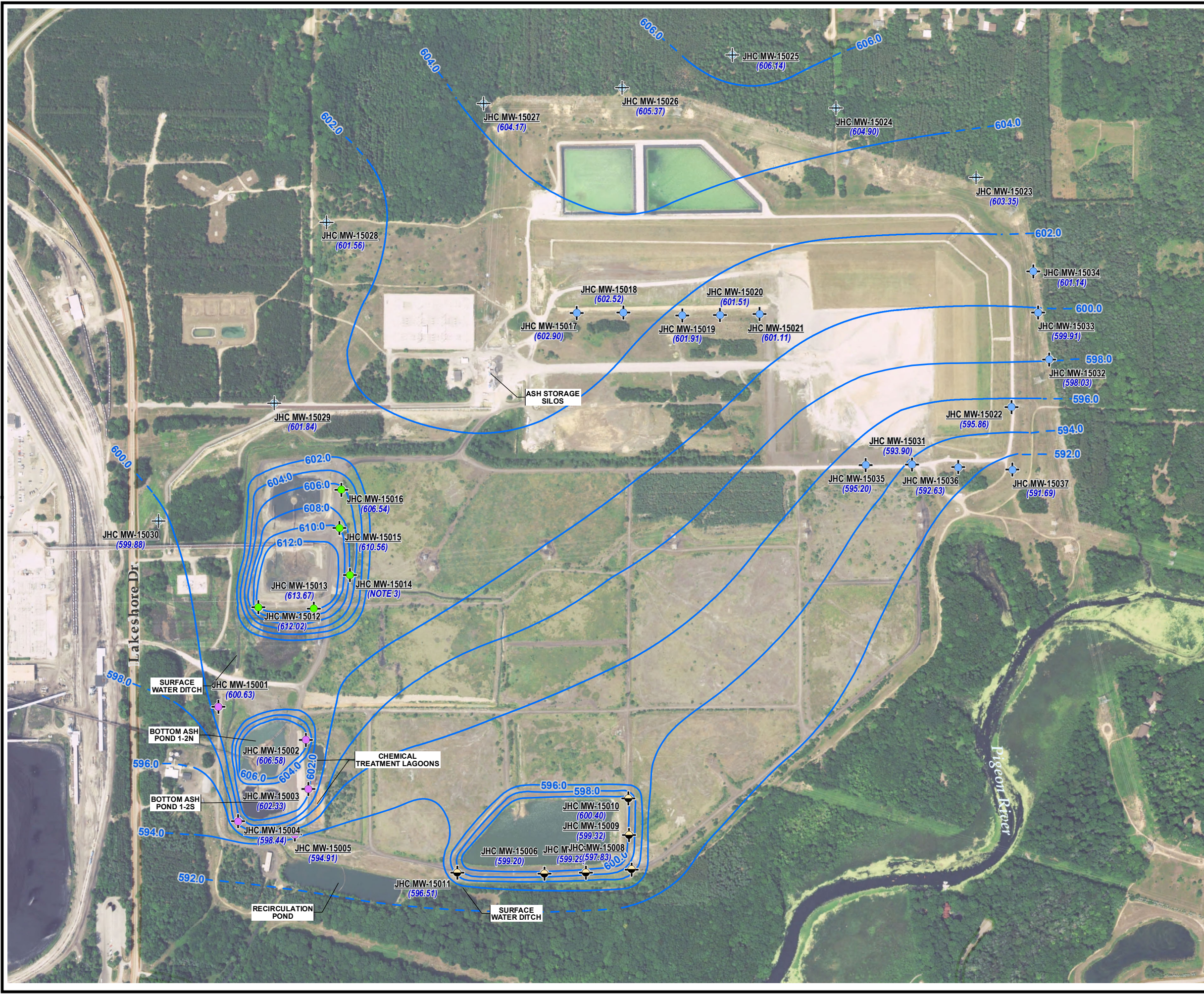
NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DAMAGED, DATA NOT USED.



1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP APRIL 17, 2017	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 6	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-007.mxd		

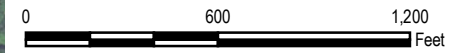


LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97)** GROUNDWATER ELEVATION (FEET, MSL)

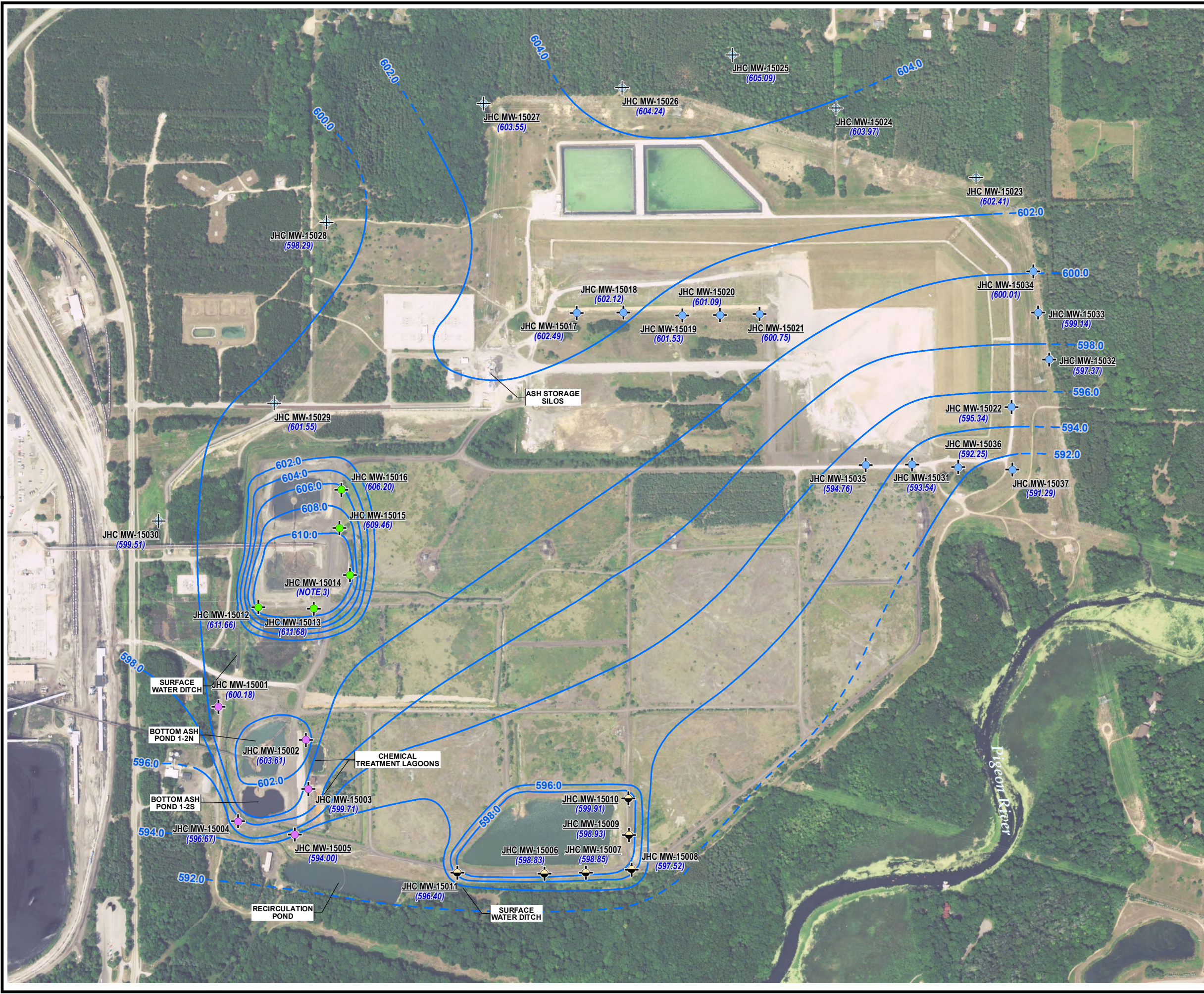
NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DAMAGED, DATA NOT USED.



1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP JUNE 19, 2017	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 7	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:		269767-005-008.mxd	

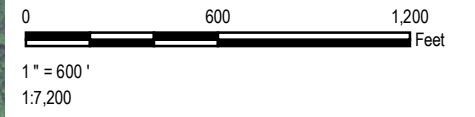
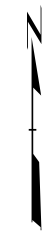


LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADENT LANDFILL MONITORING WELL
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- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
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3. MONITORING WELL DAMAGED, DATA NOT USED.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP AUGUST 14, 2017	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S. HOLMSTROM	FIGURE 8	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-005-011.mxd		

Appendix B

Data Quality Review

Laboratory Data Quality Review Groundwater Monitoring Event September 2017 CEC JH Campbell Background

Groundwater samples were collected by TRC for the September 2017 sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Pace Analytical Services, LLC (Pace), located in Grand Rapids, Michigan. The laboratory analytical results are reported in laboratory report 462815.

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

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028
- JHC-MW-15029
- JHC-MW-15030

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
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 Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods 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 laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for laboratory duplicates, when available. 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:

- MS/MSDs were performed on sample JHC-MW-15029. Recoveries and relative percent differences (RPDs) were within QC limits.
- Laboratory duplicate analyses were performed on sample JHC-MW-15030; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits. No non-conformance issues were noted.

Laboratory Data Quality Review
Groundwater Monitoring Event September 2017
CEC JH Campbell
Unit 1-2N & 1-2S Monitoring Wells

Groundwater samples were collected by TRC for the September 2017 sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Pace Analytical Services, LLC (Pace), located in Grand Rapids, Michigan. The laboratory analytical results are reported in laboratory report 462817.

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

- JHC-MW-15001
- JHC-MW-15002
- JHC-MW-15003
- JHC-MW-15004
- JHC-MW-15005

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
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, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and 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, when available. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method.
- 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 field blank (FB-01) and one equipment blank (EB-01) were collected; no analytes were detected in the blank samples.
- Dup-01 corresponds with JHC-MW-15002; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicates were performed on samples JHC-MW-15002 and JHC-MW-15005; RPDs between the parent and duplicate sample were within the QC limits.
- Sample receipt: Although the temperature was recorded as <6°C for the temperature blank, three samples had measured temperatures >6°C (ranging from 8.2-9.8°C). However, the coolers were hand delivered to the courier/received by the lab on the same day they were collected and contained ice; thus, there was no impact to data usability.

- MS/MSD was performed on samples JHC-MW-15002 and JHC-MW-15005.
 - Laboratory MS/MSD performed on sample JHC-MW-15005 for batch 5745. The boron recovery in the MS was below the lower laboratory control limit. The boron concentration in the parent sample was >4x the spike concentration; therefore, the laboratory control limit is not applicable.
 - Laboratory MS/MSD performed on sample JHC-MW-15005 for batch 6208. The sulfate recoveries in the MS/MSD were below the lower laboratory control limits. The sulfate results in samples analyzed in the same batch may be biased low.

Appendix C

Statistical Background Limits

Technical Memorandum

Date: January 15, 2018

To: J.R. Register, CEC
Beth Swanberg, CEC
Brad Runkel, CEC

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Joyce Peterson, TRC

Project No.: 269767.0000 Phase 005, Task 003

Subject: Background Statistical Evaluation (R1-R8) – Consumers Energy, JH Campbell Units 1-2 North and 1-2 South

Pursuant to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Coal Combustion Residual rule ("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 Consumers Energy Company (CEC) Units 1-2 North and 1-2 South (Unit 1-2) bottom ash ponds at the JH Campbell (JHC) Power Plant Site (the Site).

The CCR disposal area contains two primary components: a system of wet ash ponds and a dry ash disposal facility (i.e., the JHC Landfill). The wet ash ponds area is approximately 267 acres and is bounded by perimeter dikes with a system of internal dikes separating the individual ash ponds. The dry ash disposal facility is a geomembrane lined landfill which covers an area of about 108 acres and includes two leachate and contact water retention ponds. In response to the CCR Rule, CEC initially had 37 groundwater monitoring wells installed at the JHC Site, of which, 11 were selected to serve as a groundwater monitoring system for the Unit 1-2 CCR unit (in accordance with 40 CFR §257.91). Six monitoring wells serve as background wells for the Unit 1-2 CCR unit in addition to the other three CCR units (Dry Ash Landfill, Pond A, and Unit 3 North/3 South) at the JHC Site. Five of the monitoring wells, JHC-MW-15001 through JHC-MW-15005, serve as downgradient wells for the Unit 1-2 CCR unit.

Following the baseline data collection period (December 2015 through August 2017), the background data for the JHC Site were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). The JHC Site groundwater data are maintained within a database

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accessible through Sanitas™ statistical software. Sanitas™ 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 Sanitas™ statistical program (and the UG), tolerance limits were selected to perform the statistical calculation for background limits. Use of tolerance limits is a streamlined approach that offers adequate statistical power under the current, initial stage of establishing background and developing the monitoring program and is an acceptable approach for detection monitoring under the CCR rule. Upper tolerance limits (UTLs) were calculated for each of the CCR Appendix III parameters. The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

The set of background wells utilized for the Unit 1-2 CCR unit includes JHC-MW-15023 through JHC-MW-15028. The background evaluation included the following steps:

- Review of data quality reports 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;
- Graphical representation of cumulative baseline background data sorted from lowest to highest concentration for each constituent;
- 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 UTL for each cumulative baseline/background data set (upper and lower tolerance limits 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 matrix spike and matrix spike duplicates (MS/MSDs) recoveries, 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.

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Time versus Concentration Graphs

The time versus concentration (T v. C) graphs (Figure 1) do not show potential or suspect outliers for the seven 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. The data sets are of relatively short duration for making such observations.

Cumulative Baseline Data Sets

Ideally, the background data sets provide a continuous concentration distribution. The ideal is rarely achieved by multiple background wells representing a relatively large geographic area, such as in the case at the JH Campbell site. When sorted by concentration, the data generally group by smaller subsets of the overall background well network (Figure 2). Most of the parameters have a relatively consistent distribution, but chloride clearly has some wells with higher values than the other background wells. These results need to be taken into consideration as they represent potential non-CCR upgradient contributions to downgradient wells.

Outlier Testing

Because the baseline T v. C graphs (Figure 1) did not show potential outliers, outlier testing was not performed for the JHC background data sets. Had candidate values been present, the Dixon's Outlier Test in Sanitas™ would have been used to test the potential outliers.

Percentage of Nondetects

The Table 1 summarizes the percentage of results below the reporting limit for each w/c pair.

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Table 1
Summary of Percentage of Baseline Results Below Reporting Limit

WELL	CONSTITUENT	PERCENT NON-DETECT
JHC-MW-15023	Boron	0
	Calcium	0
	Chloride	12.5
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	12.5
JHC -MW-15024	Boron	12.5
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
JHC -MW-15025	Boron	12.5
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
JHC -MW-15026	Boron	100
	Calcium	12.5
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
JHC -MW-15027	Boron	87.5
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0

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Table 1
Summary of Percentage of Baseline Results Below Reporting Limit

WELL	CONSTITUENT	PERCENT NON-DETECT
JHC -MW-15028	Boron	75
	Calcium	0
	Chloride	100
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	12.5
COMBINED	Boron	48
	Calcium	2
	Chloride	19
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	4

Distribution of the Data Sets

The distribution of the data sets is determined by the Sanitas™ software during calculation of the upper tolerance limit. The Shapiro-Wilk test is used for samples sizes fewer than 50. Non-detect/censored data were handled in accordance with the Groundwater Statistical Evaluation Plan. If the data appear to be non-normal, mathematical transformations of the data may be utilized such that the transformed data follow a normal distribution (e.g., lognormal distributions). Alternatively, non-parametric tests may be utilized when data cannot be normalized. Table 2 summarizes the distributions determined by the Sanitas™ software. The distribution is based on the combined baseline results for all six background monitoring wells.

Table 2
Summary of Background/Baseline Data Distributions

CONSTITUENT	DISTRIBUTION
Boron	Nonnormal
Calcium	Normalized by square root transformation
Chloride	Nonnormal
Fluoride	All ND – use highest RL
Field pH	Normal
Sulfate	Normal
Total Dissolved Solids	Normalized by cube root transformation

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Upper Tolerance Limits

Table 3 presents the calculated upper tolerance limits for the background/baseline data sets. For normal and lognormal distributions, UTLs are calculated for 95 percent coverage and 95 percent confidence using parametric tolerance limits. For nonnormal background datasets, a nonparametric tolerance limit is utilized, resulting in the highest value from the background dataset as the UTL. The achieved confidence and/or coverage rates depend entirely on the number of background data points, and coverage rates for various confidence levels are shown in the Sanitas™ outputs for nonparametric tolerance limits. Verification resampling (1 of 2) is recommended per the Stats Plan and UG to achieve a site-wide false positive rate within the range specified in the CCR rules.

Table 3
Summary of Baseline Upper Tolerance Limits

CONSTITUENT	UPPER TOLERANCE LIMIT – FROM SANITAS™
Boron	51 µg/L*
Calcium	46 mg/L
Chloride	43 mg/L*
Fluoride	1,000 µg/L*
Field pH	4.8 – 9.2 s.u.
Sulfate	14 mg/L
Total Dissolved Solids	258 mg/L

*Nonparametric Tolerance Limit

Attachments

Figure 1 – Background Concentration Time-Series Charts

Figure 2 – Combined Background Distribution

Sanitas™ Output Files

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Figures

Figure 1
Background Time Versus Concentration Graphs

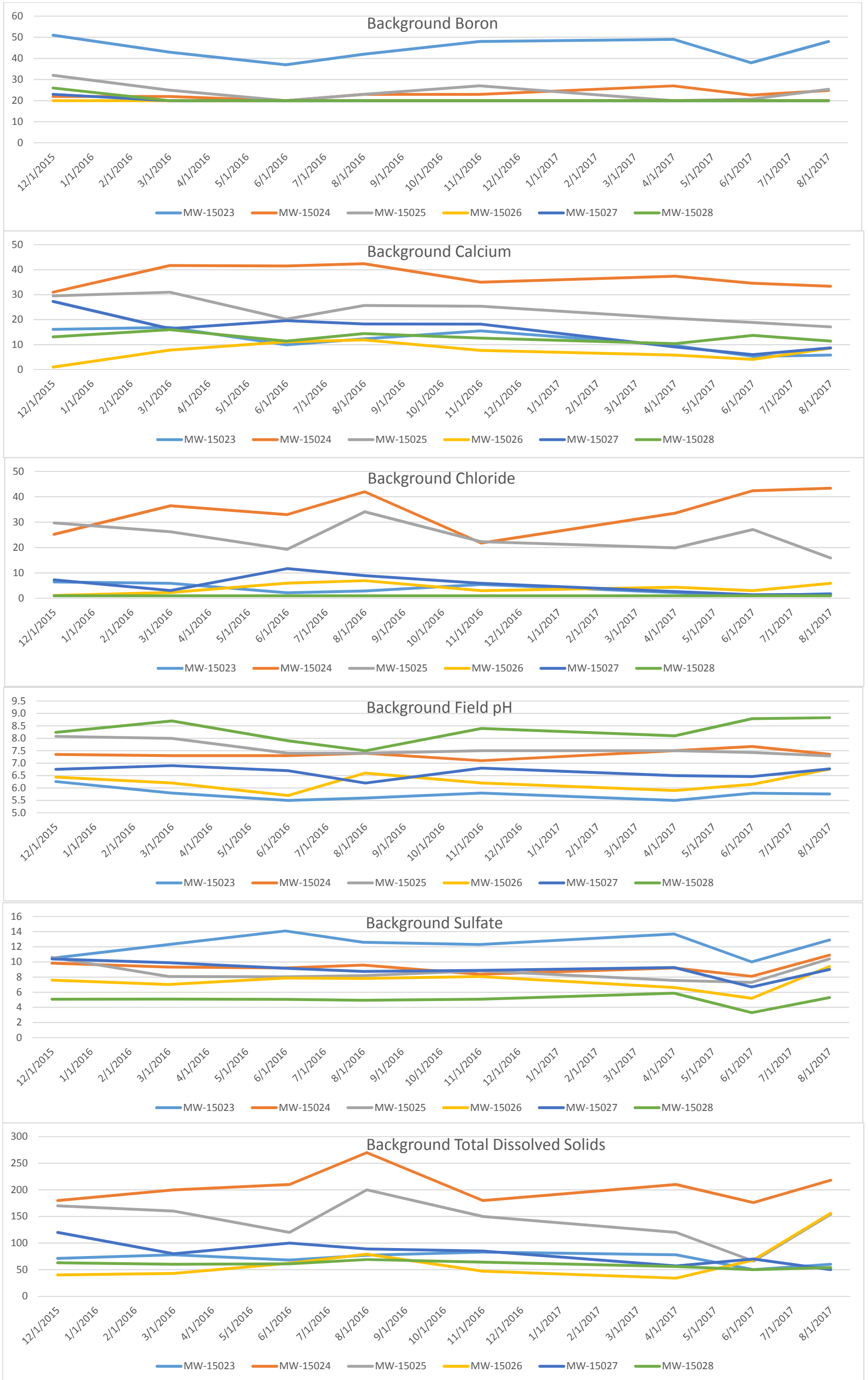
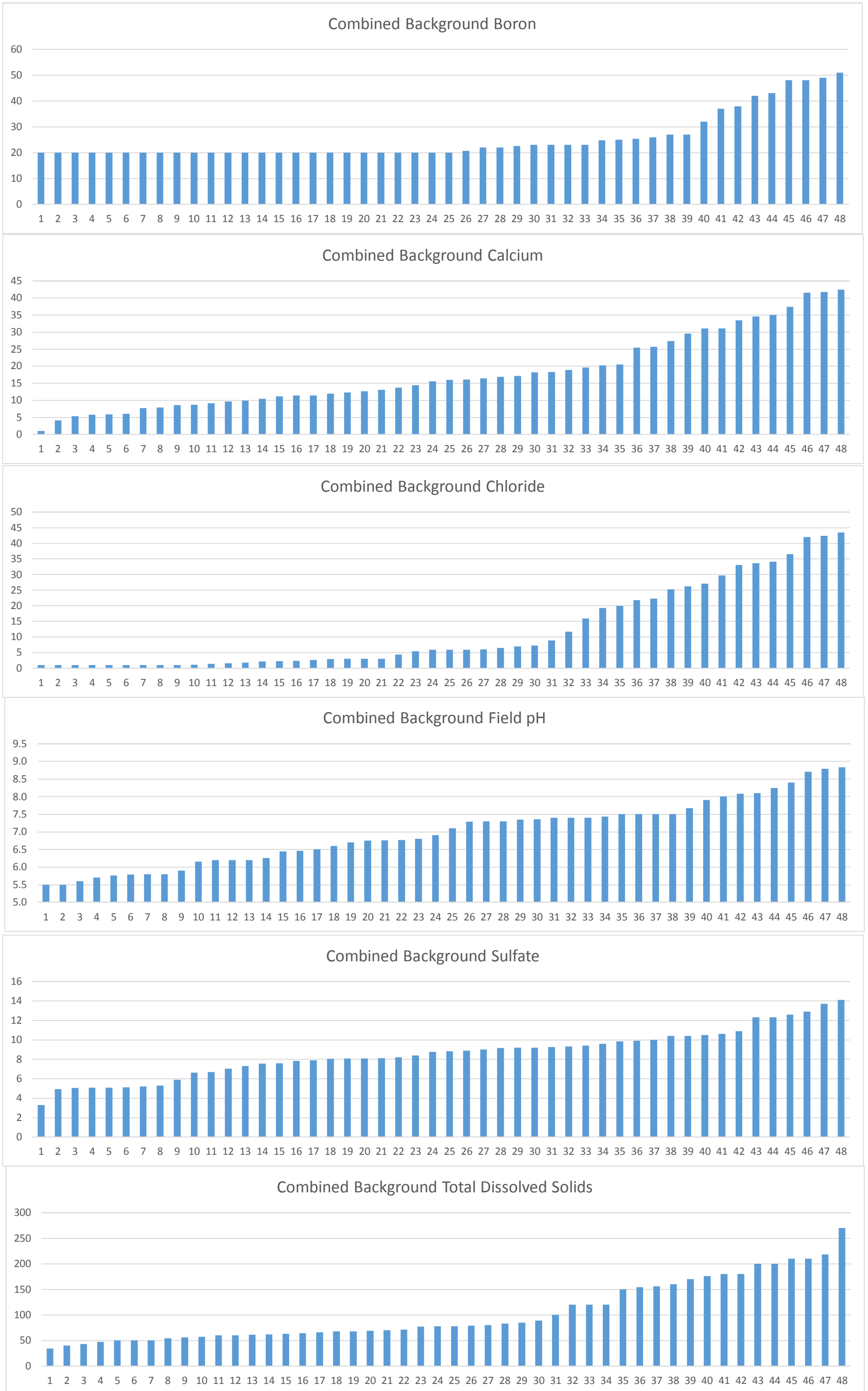


Figure 2
Combined Background Data

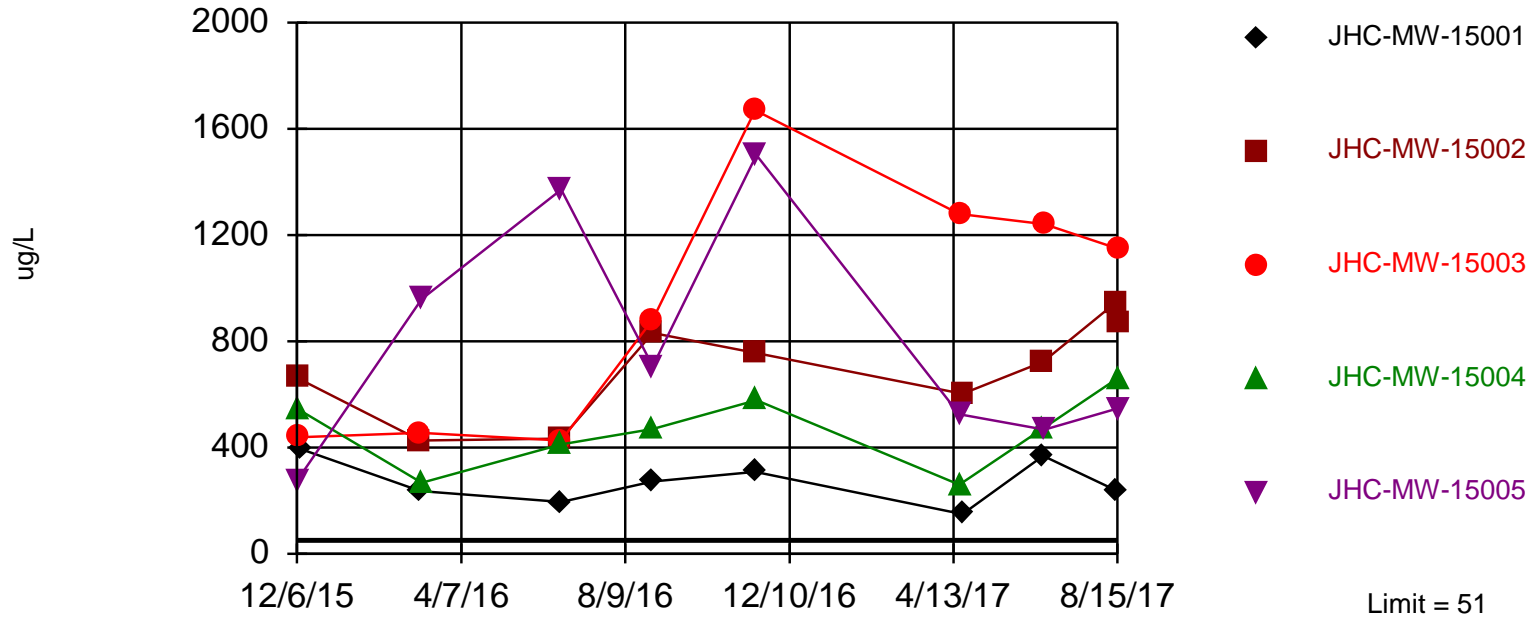


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Sanitas™ Output Files

Exceeds Limit: JHC-MW-15001, JHC-MW-15002, JHC-MW-15003, JHC-MW-15004...

Tolerance Limit Interwell Non-parametric

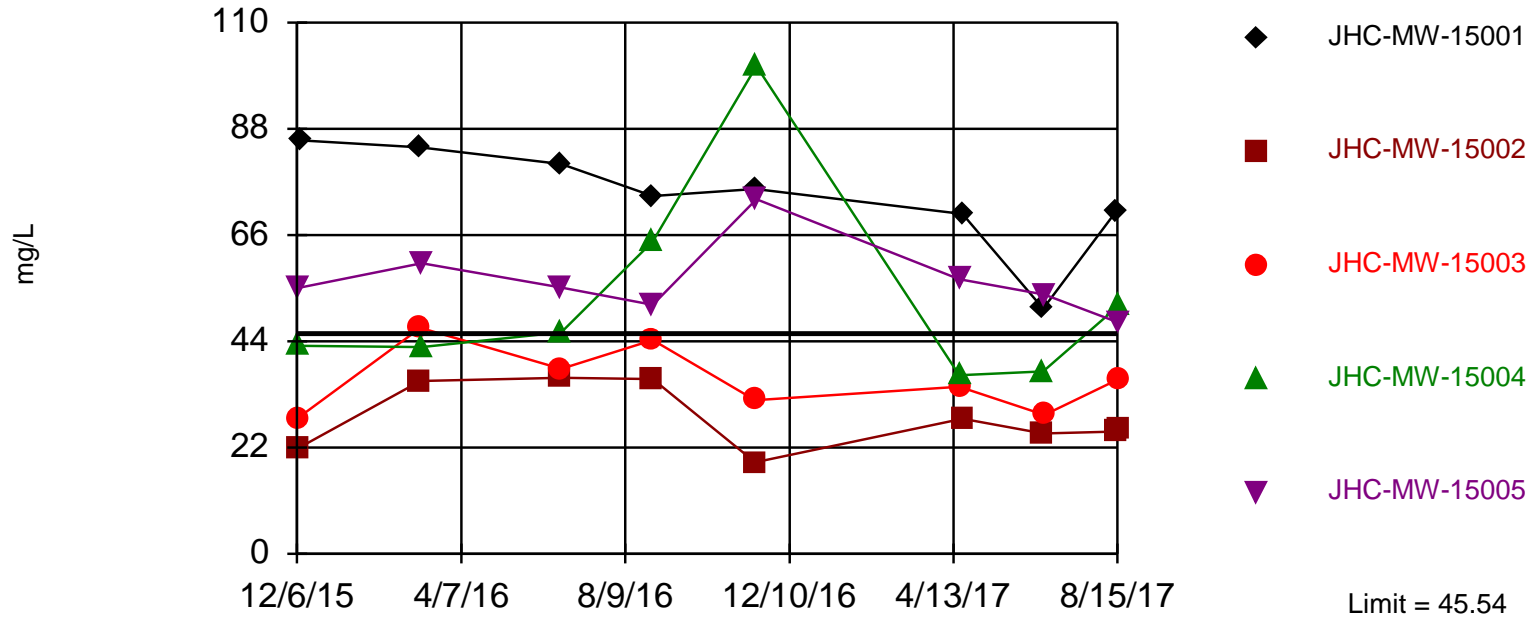


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Most recent observation is compared with limit. Limit is highest of 48 background values. 47.92% NDs. 90.82% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08526.

Constituent: Boron, Total Analysis Run 11/27/2017 3:40 PM
Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Exceeds Limit: JHC-MW-15001, JHC-MW-15004, JHC-MW-15005

Tolerance Limit Interwell Parametric



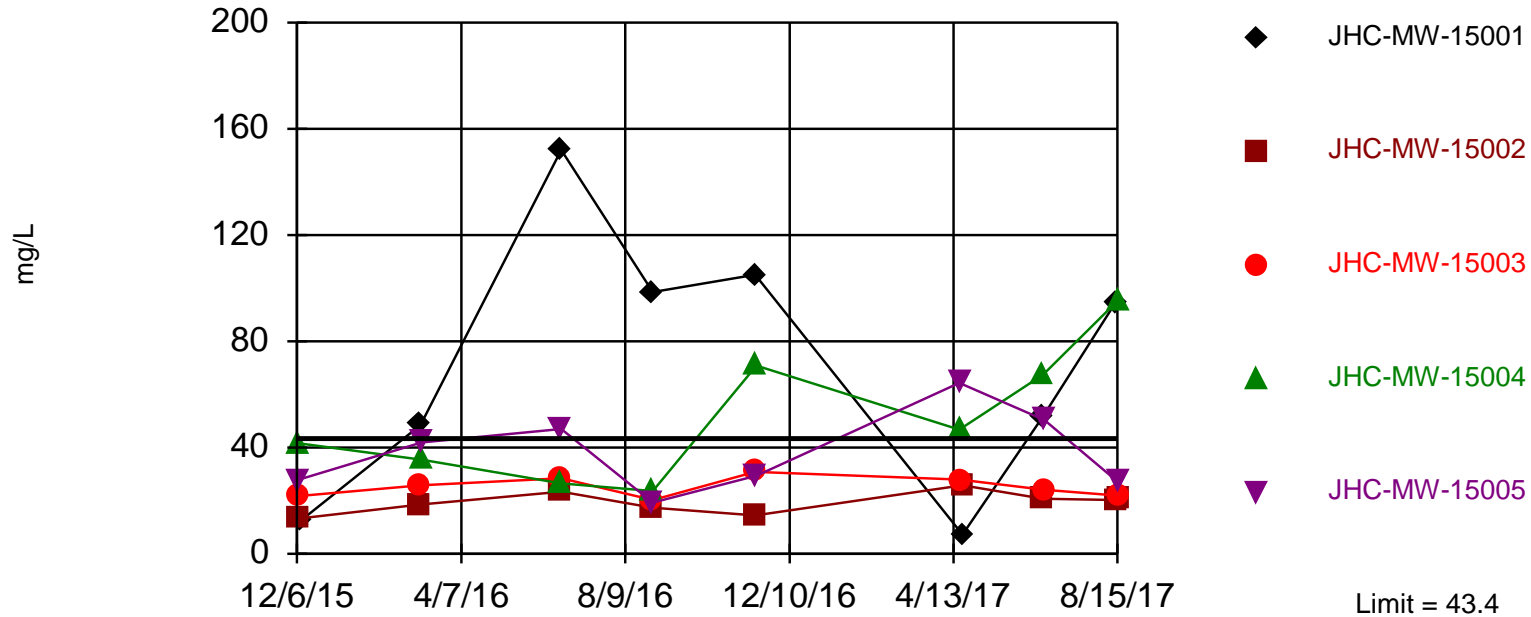
95% coverage. Most recent observation is compared with limit. Background Data Summary (based on square root transformation): Mean=4.032, Std. Dev.=1.309, n=48, 2.083% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9684, critical = 0.929. Report alpha = 0.05.

Constituent: Calcium, Total Analysis Run 11/27/2017 3:39 PM

Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Exceeds Limit: JHC-MW-15001, JHC-MW-15004

Tolerance Limit Interwell Non-parametric



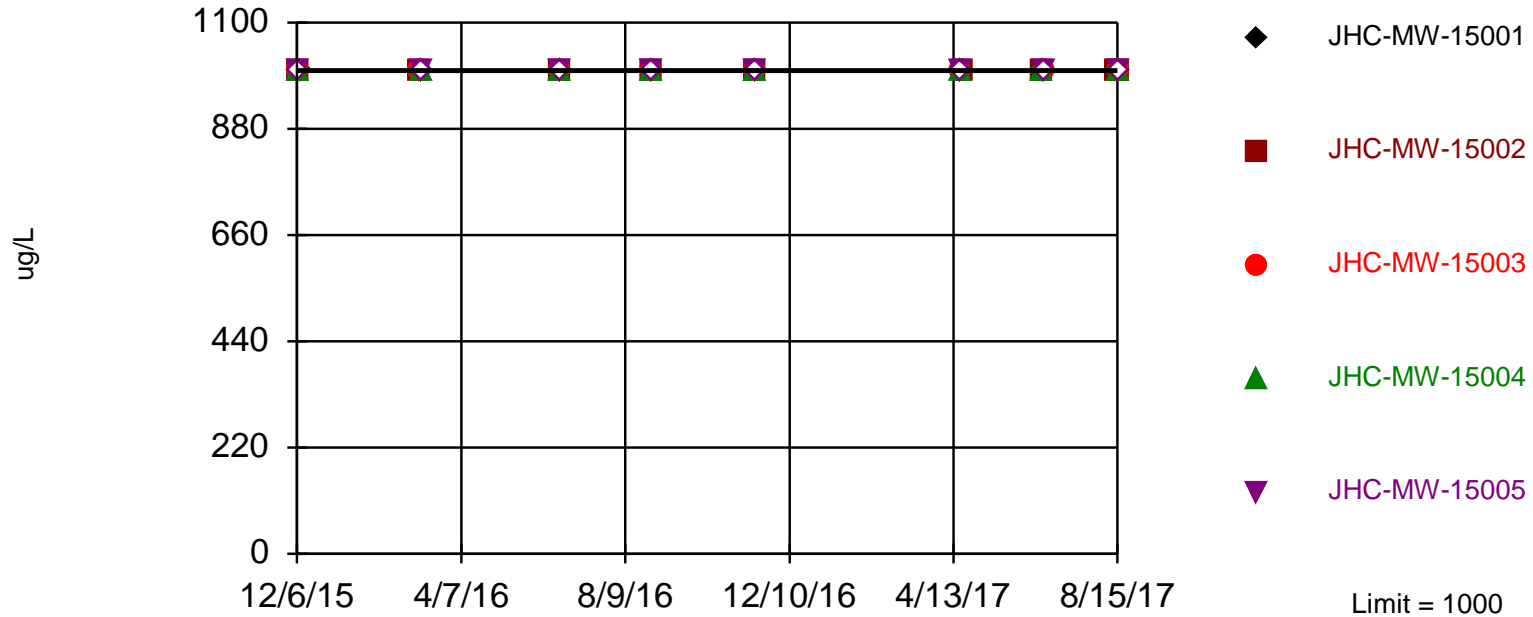
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Most recent observation is compared with limit. Limit is highest of 48 background values. 18.75% NDs. 90.82% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08526.

Constituent: Chloride Analysis Run 11/27/2017 3:41 PM

Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Within Limit

Tolerance Limit Interwell Non-parametric



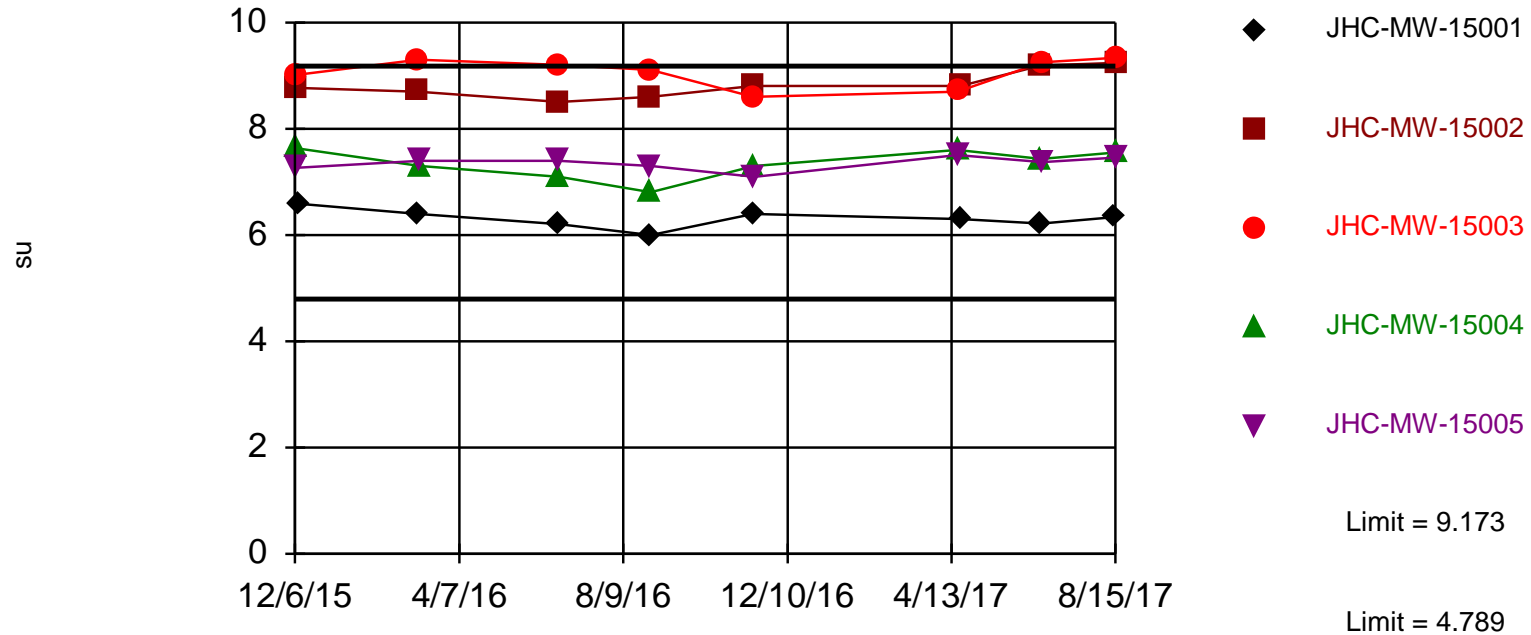
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Most recent observation is compared with limit. All background values were censored; limit is most recent reporting limit. 90.82% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08526.

Constituent: Fluoride Analysis Run 11/27/2017 3:41 PM

Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Exceeds Limits: JHC-MW-15002, JHC-MW-15003

Tolerance Limit Interwell Parametric



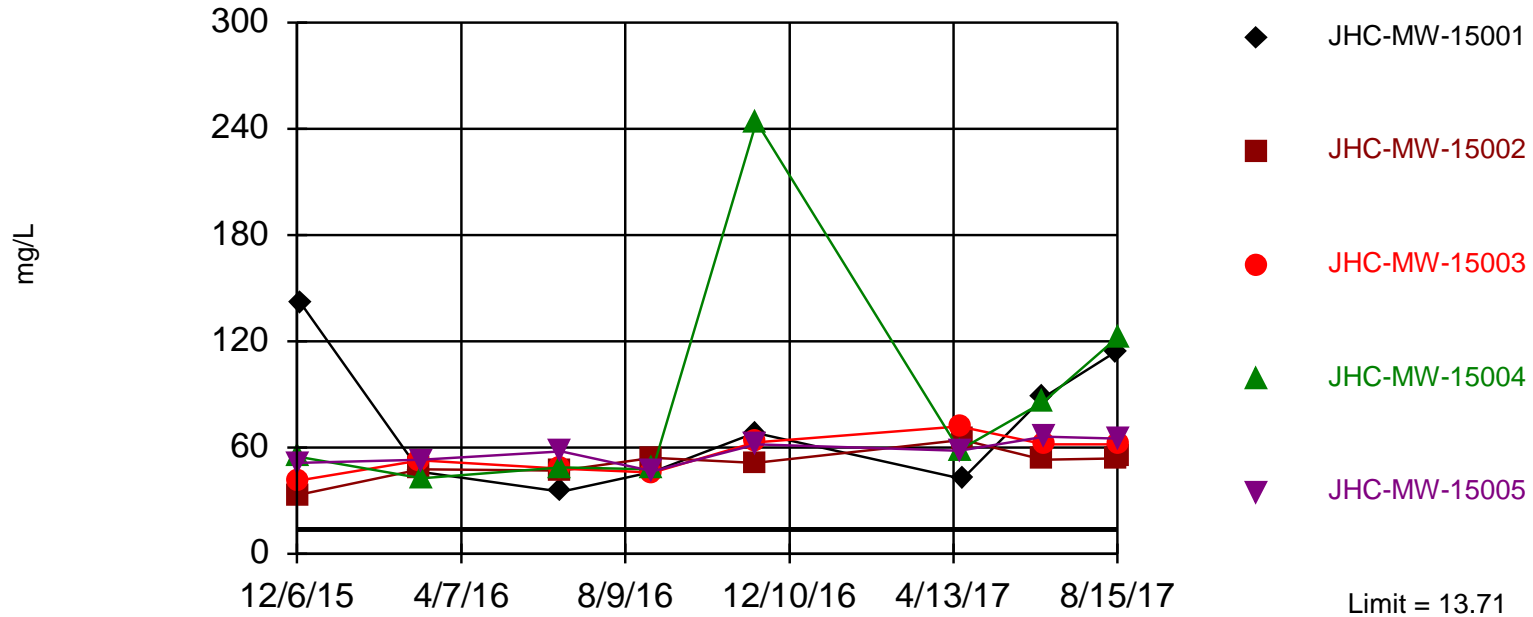
95% coverage. Most recent observation is compared with limit. Background Data Summary: Mean=6.981, Std. Dev.=0.9169, n=48. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9513, critical = 0.929. Report alpha = 0.025 per tail.

Constituent: pH, Field Analysis Run 11/27/2017 3:41 PM

Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Exceeds Limit: JHC-MW-15001, JHC-MW-15002, JHC-MW-15003, JHC-MW-15004...

Tolerance Limit Interwell Parametric

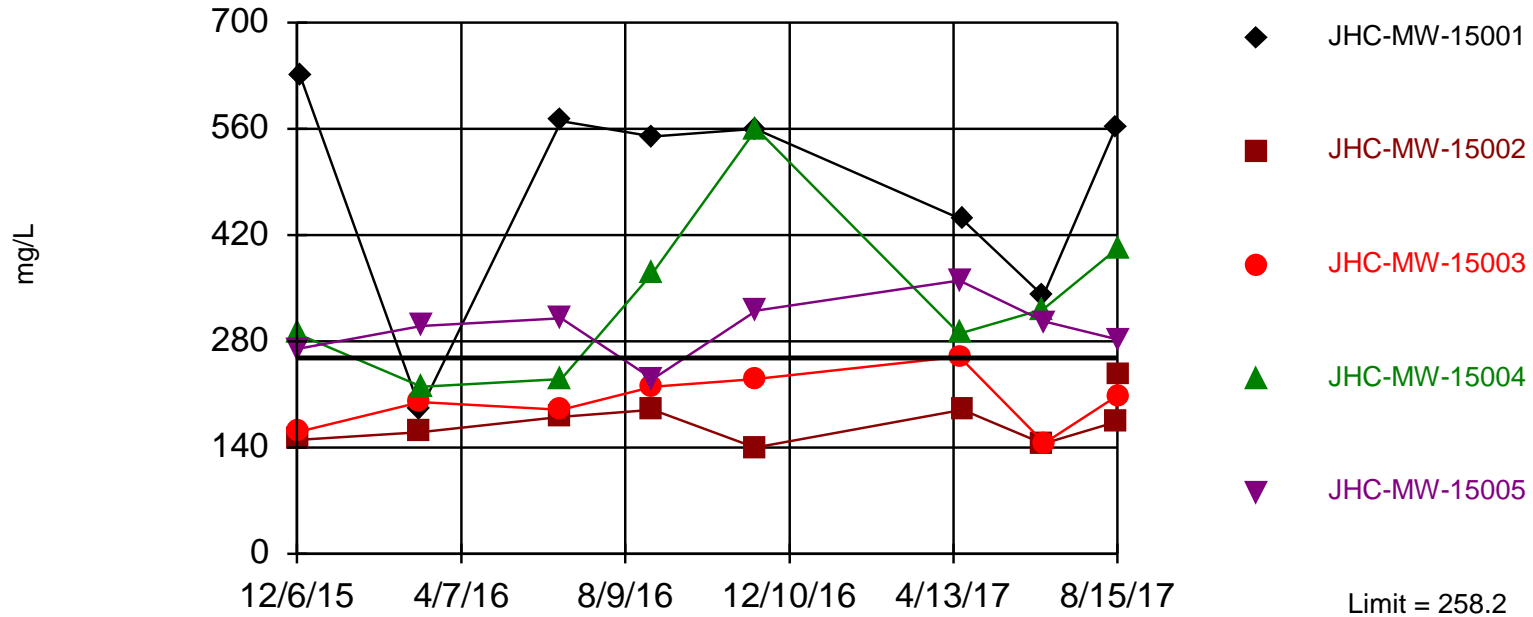


95% coverage. Most recent observation is compared with limit. Background Data Summary: Mean=8.61, Std. Dev.=2.458, n=48. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9709, critical = 0.929. Report alpha = 0.05.

Constituent: Sulfate Analysis Run 11/27/2017 3:42 PM
Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas

Exceeds Limit: JHC-MW-15001, JHC-MW-15004, JHC-MW-15005

Tolerance Limit Interwell Parametric



95% coverage. Most recent observation is compared with limit. Background Data Summary (based on cube root transformation): Mean=4.522, Std. Dev.=0.8891, n=48, 4.167% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9351, critical = 0.929. Report alpha = 0.05.

Constituent: Total Dissolved Solids, Dissolved Analysis Run 11/27/2017 3:40 PM

Client: Consumers Energy Data: JHC_Unit_1_2_Sanitas