Groundwater Monitoring System
Summary Report

DTE Electric Company
St. Clair Power Plant Bottom Ash Basins
Coal Combustion Residual Unit

4901 Pointe Drive
East China Township, Michigan

October 2017

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Prepared For
DTE Electric Company

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www.TRCsolutions.com

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Section 1
Introduction

1.1 Background and Objective

The United States Environmental Protection Agency (U.S. EPA) established a comprehensive set of requirements for management and disposal of coal combustion residuals (CCR) in landfills and surface impoundments in the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule) on April 17, 2015. The DTE Electric Company (DTE Electric) St. Clair Power Plant (SCPP) CCR bottom ash basins (BABs) unit is subject to the CCR Rule.

The objective of this report is to document and certify that the CCR Groundwater Monitoring System for the SCPP BABs CCR unit has been designed and constructed to meet the requirements of Title 40 Code of Federal Regulations (CFR) §257.91 (a)(1) and (2) of the CCR Rule. TRC Engineers Michigan, Inc. (TRC) was retained by DTE Electric to provide this report documenting the construction of the CCR groundwater monitoring system for the SCPP BABs.

1.2 Site Location

The SCPP BABs are located in Section 19, Township 4 North, Range 17 East, at 4901 Pointe Drive, East China Township in St. Clair County, Michigan (**Figure 1**). The SCPP including the BABs CCR unit was constructed in the early 1950s, just south of the DTE Electric SCPP. The power plant is located on the peninsula formed by the St. Clair and Belle Rivers, approximately three miles south of St. Clair, Michigan immediately to the west of the St. Clair River.

1.3 Description of SCPP CCR Unit

The property has been used continuously as a coal fired power plant since Detroit Edison Company (now DTE Electric) began power plant operations at SCPP in 1953 and is constructed over a natural continuous clay-rich soil base as shown in historical soil borings performed at the SCPP property. The BABs have been in operation at the SCPP since the plant began operation and have collected CCR bottom ash that is routinely cleaned out and either sold for beneficial reuse or disposed of at the Range Road Landfill (RRLF).

The SCPP BABs are two adjacent sedimentation basins that are incised CCR surface impoundments (**Figure 2**). The impoundments are sheet piled around the perimeters to approximately 13 feet below ground surface (feet-bgs) into the native clay-rich soil. The BABs are located south of the SCPP and adjacent to the St. Clair River and are used for receiving bottom ash and other process flow water from the power plant, which is first sent to the East BAB then to the West BAB through a connecting concrete canal. Discharge water from the

basins flows with other site wastewater into the Overflow Canal in accordance with an National Pollution Discharge Elimination System (NPDES) permit.

The West and East BABs are located south of the SCPP main building and run roughly north to south with the following approximate dimensions:

- The West BAB is approximately 300 feet long by 90 feet wide with a bottom elevation of approximately 572 feet (when fully cleaned out) relative to the North American Vertical Datum (NAVD) 1988 with an outflow weir elevation of approximately 579.3 feet relative to the NAVD 1988; and
- The East BAB is approximately 400 feet long by 70 feet wide with a bottom elevation of approximately 572 feet (when fully cleaned out) relative to the NAVD 1988 with an outflow weir elevation of approximately 579.4 feet relative to the NAVD 1988.

Section 2
Hydrogeology

2.1 Regional Hydrogeologic Setting

The geology of St. Clair County consists of approximately 101 to 400 feet of glacial deposits, primarily lacustrine deposits, till, and, to a lesser extent, sand and gravel outwash, overlying a variety of bedrock surfaces[1]. The thicker glacial deposits are present toward the central portion of the county. Bedrock in the county includes the Michigan Formation, Marshall Sandstone, Coldwater Shale, Sunbury Shale, Berea Sandstone, Bedford Shale, and Antrim Shale.

In the vicinity of the site, the Devonian Bedford and/or Antrim Shale bedrock dips to the northwest and is generally covered by more than 100 feet of unconsolidated clay, silt, sand, and gravel. In this area, generally on the eastern side of the county, the glacial deposits are predominantly silty-clay till and lacustrine deposits with lenses of sand and gravel. Where present, unconsolidated sand and gravel deposits within the till and lacustrine deposits are generally used for water supply throughout the county. Approximately 85 percent of the water supply wells in St. Clair County are completed in the glacial deposits compared to approximately 13 percent installed in bedrock [1].

The current topography of the St. Clair area gently undulates reflecting floodplain, stream terrace, and lakeshore deposits. The St. Clair River is the major surface water body in the county and runs along the eastern boundary of the county. Regional groundwater and surface water flow would be expected to be to the east towards the St. Clair River.

2.2 SCPP Hydrogeology

The subsurface geology presented within this report is based on information from historical borings advanced during initial design and later expansion of the SCPP, in addition to the soil boring data collected from around the BABs during the groundwater monitoring system installation detailed in Section 3. Soil borings from the groundwater monitoring system are included in Appendix A and generalized geologic cross sections are provided in **Figures 3 through 5**.

This information documents that the SCPP CCR unit is underlain by glacial silty-clay till, with few isolated sand lenses, and a silt and clay-rich hardpan base directly overlying the shale bedrock (likely the Bedford Shale). The shale bedrock is generally encountered below

[1] Beth A. Apple and Howard W. Reeves, 2007, Summary of Hydrogeologic Conditions by County for the State of Michigan. U.S. Geological Survey Open-File Report 2007-1236, 78 p.

130 feet-bgs (see cross-sections in **Figures 3 through 5**). No significant soil or gravel intervals were encountered at any of the groundwater monitoring system well locations. However, during soil boring advancement for the groundwater monitoring system well locations, some signs of saturation were observed throughout a 5-foot interval along the interface between the overlying till/hardpan and the underlying shale bedrock. The underlying shale does not yield groundwater, rather it is an aquiclude that prevents groundwater flow (i.e., is not an aquifer). Although the encountered zone of saturation along the interface did not yield significant groundwater, it was conservatively interpreted as the first underlying saturated zone that would presumably become affected with CCR constituents, since it was saturated, and although the hydraulic conductivity was low, exhibited a much higher conductivity than the clay-rich soils between the bottom of the basin and the monitored zone.

No water supply wells are present within the unconsolidated sediment or bedrock within one mile of the SCPP. Surface water bodies present in the area of the SCPP include the Belle River (as close as 3,000 feet southwest of SCPP) and the St. Clair River (located immediately adjacent to the east of the SCPP BABs CCR unit).

2.2.1 Uppermost Aquifer

Definition

The 40 CFR §257.53 definitions of an aquifer and uppermost aquifer are as follows:

- *Aquifer* means a geologic formation, group of formations, or portion of a formation capable of yielding useable quantities of groundwater to wells or springs.
- *Uppermost aquifer* means the geologic formation nearest the natural ground surface that is an aquifer, as well as the lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.

Site Uppermost Aquifer

As described above, the potential uppermost aquifer as defined in 40 CFR §257.53 was present beneath at least a 120 feet of vertically contiguous silty clay-rich till that serves as a natural confining hydraulic barrier that isolates the underlying uppermost potential aquifer (**Figures 3 through 5**). The overlying silty clay-rich low permeability clay-rich soil consistently has a hydraulic conductivity on the order of 2 to 3 x 10^{-8} centimeters per second (cm/s) as found in soil testing performed during the CCR monitoring well installation in the area of the BABs. The first underlying saturated zone that would presumably become affected with CCR constituent's is located at the silty clay hardpan/shale bedrock interface (130.5 to 132 feet-bgs) and is limited to no more than five feet thick (**Figures 3 through 5** and Appendix A).

2.2.2 Groundwater Flow

Groundwater Flow Direction

Groundwater flow is generally to the east-southeast based potentiometric surface data measured during the collection of the first seven independent samples from the groundwater monitoring system in accordance with the CCR Rule since August 2016. The representative February 2017 potentiometric static water level elevations are displayed on **Figure 6**. As can be seen on **Figure 6**, CCR monitoring well MW-16-04 (up gradient) to the west of the BABs CCR unit has a slightly higher potentiometric elevation than the CCR monitoring wells MW-16-01, MW-16-02 and MW-16-03 (down gradient) to the east of the BABs CCR unit. These potentiometric groundwater elevations suggest that overall, beneath the more than 120 feet of clay-rich confining till, there is a potential horizontal groundwater flow direction to east-southeast with a mean hydraulic gradient of 0.0036 foot/foot in the area of the BABs CCR unit.

The elevation of CCR-affected water maintained within the BABs is similar to slightly higher than to the potentiometric surface elevations in the uppermost aquifer at the BABs CCR unit. Flow potential from the CCR unit to the surrounding area would likely be radially outward from all sides. However, with the very thick continuous silty clay-rich confining unit beneath the SCPP it is not possible for the uppermost aquifer to have been affected by CCR from SCPP operations that began in the 1950s (see vertical time of travel discussion below).

Uppermost Aquifer Hydraulic Conductivity

Hydraulic conductivities measured within the CCR monitoring wells using single well hydraulic conductivity tests (e.g., slug tests) range from approximately 0.009 to 0.017 feet/day with a mean of approximately 0.013 feet/day. These low hydraulic conductivities further demonstrate the low groundwater yield potential across the conservatively interpreted, potential uppermost aquifer encountered at the site.

Horizontal Time of Travel

Assuming an average porosity of 0.4 for the silt/clay-rich soil within the uppermost aquifer, the mean hydraulic conductivity of 0.013 feet/day and a hydraulic gradient of 0.0036 foot/foot for the potential upper aquifer, the potential horizontal groundwater flow rate is approximately 0.00012 feet/day or 0.044 feet/year. Given the low flow velocity of this zone, inter-well (upgradient to downgradient) statistical tests are inappropriate for detection monitoring of this basin.

Vertical Time of Travel

The SCPP is a natural silty-clay site, and the natural hydraulic barrier has been verified by numerous historical soil borings and further confirmed by the four soil borings installed as part of the CCR monitoring well installation program. Therefore, the geology and hydrogeology of the site provides a very high level of environmental protection of the potential uppermost aquifer. Based on the site geology and hydrogeology, there is extremely low potential for the impoundments to affect the off-site uppermost aquifer groundwater in the future. Groundwater present within the deep confined potential uppermost aquifer is protected from CCR constituents by the over 120 feet thick clay-rich aquitard with low hydraulic conductivity. Using the hydrogeologic information for the site, the time of travel for water from the base-grade elevation of the SCPP CCR unit down to the uppermost aquifer can be calculated using the following formula:

$$V = Ki/N_e$$

Where:

V = Velocity (feet/day)

K = Hydraulic Conductivity (3×10^{-8} cm/s based on high end silty clay-rich soil geotechnical measurements)

i = Downward Vertical Gradient (conservatively assumed to be one foot/foot)

N_e = Effective Porosity (0.5 for clay-rich soil)

From the above formula, the maximum downward flow velocity through the silty-clay confining till unit to the uppermost aquifer is 6×10^{-8} cm/sec, or 0.063 feet/year (lower than typical hydraulic conductivity requirement of 1×10^{-7} cm/sec for landfill liners). Therefore, the time of travel for liquid from the base of the SCPP through at least 120 feet of silty-clay (thinnest section of silty-clay confining unit found on SCPP above the potential uppermost aquifer) to the potential uppermost aquifer is approximately 1,900 years. Given that SCPP operations began in 1953, approximately 64 years ago, there is no potential for the uppermost aquifer CCR groundwater monitoring system wells to be affected from the SCPP CCR unit.

Section 3
Groundwater Monitoring System

3.1 Groundwater Monitoring System Installation

During 2016, TRC, on behalf of DTE Electric oversaw the installation and development of the groundwater monitoring system in accordance with the 40 CFR §257.91. Four monitoring wells (MW-16-01 through MW-16-04) were installed at the SCPP CCR unit by a Michigan-licensed well driller at the SCPP in order to establish the groundwater monitoring system as described below:

3.1.1 Soil Boring Advancement

In March and April 2016, four soil borings were advanced to evaluate the subsurface geology and to allow monitoring well installation using sonic drilling techniques with 4-inch and 6-inch tooling along to the west and east of the SCPP BABs. Soil samples were collected continuously in 10-foot sections from the ground surface to the termination of the soil boring. A TRC geologist was present to log each boring and describe the soil samples in accordance with the Unified Soil Classification System (USCS).

The soil borings were advanced to depths of approximately 138 feet-bgs through the unconsolidated clay-rich and hard pan deposits, and into the underlying shale bedrock encountered at depths ranging from 130.5 to 132 feet-bgs. The clay-rich deposits changed to a hard pan over the final interval of 5 to 5.5 feet above the shale bedrock. No significant sand-rich units were encountered within any of these soil borings. However, some saturation was noted at the clay-rich till or hard pan interface with the shale bedrock. As discussed above, this was the only interval where any significant saturation was encountered; therefore, the clay-rich till/shale bedrock interface is considered to be a potential uppermost aquifer for the SCPP CCR unit.

3.1.2 Monitoring Well Installation

Based on the saturation noted to be present, CCR monitoring wells MW-16-01 through MW-16-04 were screened at the clay till/shale bedrock interface. Screened intervals in these monitoring wells range from 125 to 131 feet-bgs to 127 to 132 feet-bgs, with three locations on the eastern side of the BABs (presumed down hydraulic gradient adjacent to the St. Clair River) and one to the west of the BABs (presumed up hydraulic gradient) (**Figure 2**). Given the presence of the natural clay-rich till hydraulic barrier and the relatively small footprint of the BABs, the horizontal spacing of the wells is adequate to detect constituents from the CCR unit.

Monitoring wells were constructed within each borehole using 2-inch-diameter, Schedule 40 PVC casing and 5-foot long screens with 0.010-inch factory cut slots. Monitoring well construction diagrams from the installed monitoring wells accompany the soil boring logs in Appendix A. Following well installation, the grout and bentonite seal materials were allowed to stabilize for more than 24-hours before monitoring well development began.

3.1.3 Monitoring Well Development and Surveying

Following installation, each CCR monitoring well was developed by air lifting methods. In addition, a Michigan-licensed surveyor located each monitoring well utilizing the Michigan State Plan South Zone-2113, North American Datum 1983, International feet. Vertical elevations of the ground surface at each soil boring and monitoring well location and the top of casing for each monitoring well were also surveyed in feet relative to the North American Vertical Datum of 1988 (NAVD 88). Monitoring well coordinates, elevations, screened intervals, and other monitoring well details are included in Table 1.

3.1.4 Detection Monitoring

The SCPP CCR unit groundwater monitoring system, as shown on **Figure 2**, will serve as the detection monitoring locations pursuant to Title 40 CFR §257.93 and §257.94 of the CCR Rule. Due to the relatively small footprint of the BABs, the low vertical and horizontal groundwater flow velocity, and the fact that the saturated unit being monitored is isolated by a laterally contiguous silty-clay unit which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone from potentially being affected by CCR, monitoring of the SCPP CCR unit using intra well statistical methods is appropriate. As such, intra-well statistical approaches will be evaluated for use during detection monitoring. Using the data collected from the monitoring well system, a statistical evaluation plan is being developed to evaluate compliance with the CCR Rule.

Section 4
Groundwater Monitoring System Certification

Groundwater Monitoring System Certification per 40 CFR §257.91(f)
St. Clair Power Plant Bottom Ash Basins
East China Township, Michigan

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.91 requires that the owner or operator of an existing CCR unit install a groundwater monitoring system. The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of Title 40 CFR §257.91.

CERTIFICATION

I hereby certify that the groundwater monitoring system presented within this document for the SCPP BABs CCR unit has been designed and constructed to meet the requirements of Title 40 CFR §257.91 of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.91.

Name	Expiration Date	
David B. McKenzie, P.E.	October 31, 2017	
Company	Date	
TRC Engineers Michigan, Inc.	October 13, 2017	Stamp

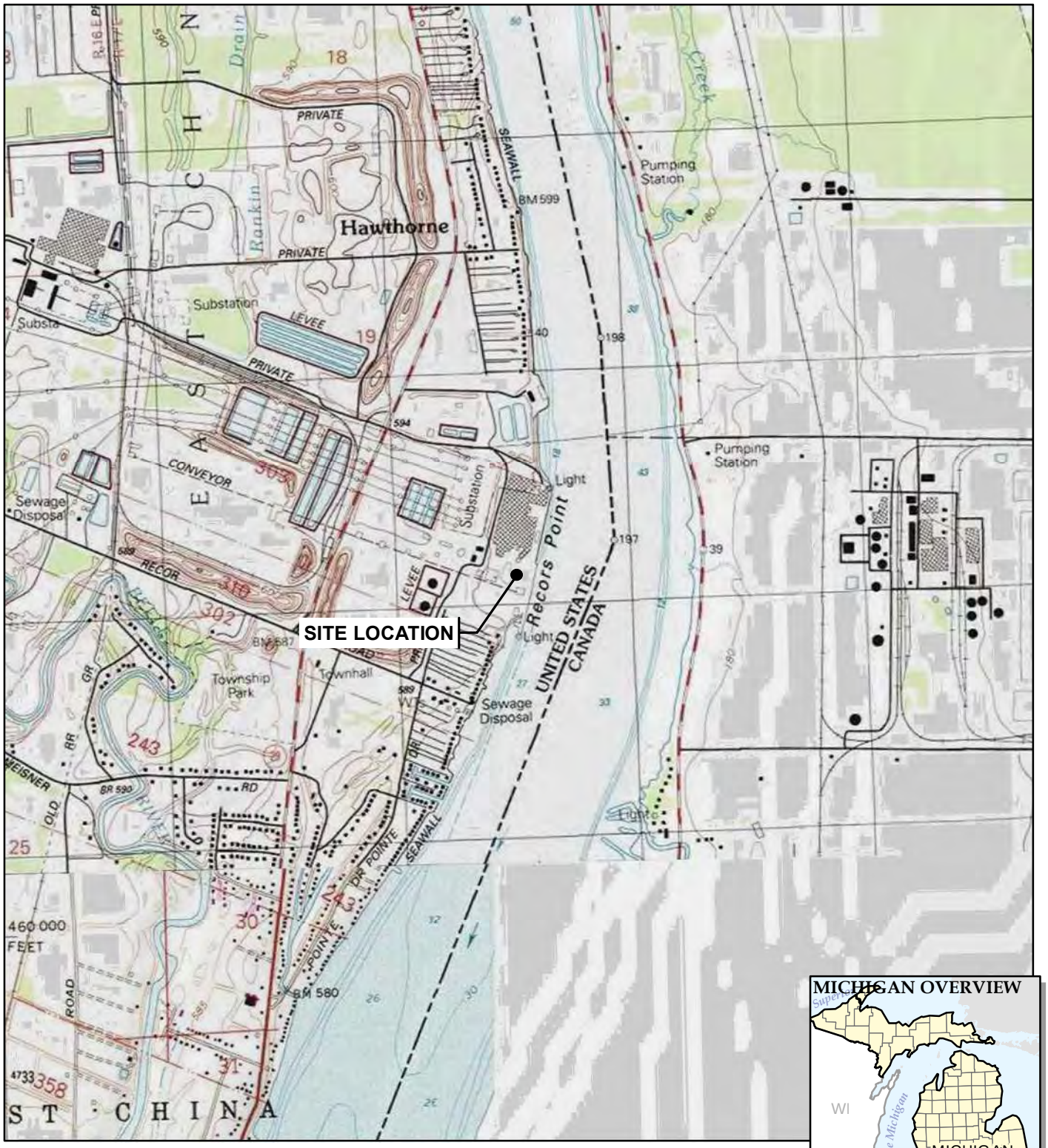
Tables

Table 1
Monitoring Well Information Summary
DTE Electric Company – St. Clair Power Plant
China Township, Michigan

Well Location	Date Installed	Northing	Easting	Ground Surface Elevation (ft AMSL)	TOC Elevation (ft AMSL)	Geologic Unit of Screen Interval	Well Construction	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft AMSL)	Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft AMSL)
St. Clair Power Plant											
MW-16-01	3/31/2016	465440.66	13631612.80	585.12	584.74	Silty Clay at 127-131.5 ft BGS, and Shale bedrock at 131.5-132 ft BGS	2" PVC	127.0 to 132.0	458.1 to 453.1	138.0	447.1
MW-16-02	3/29/2016	465503.41	13632151.32	582.18	581.43	Silty Clay at 126-130.5 ft BGS, and Shale bedrock at 130.5-131 ft BGS	2" PVC	126.0 to 131.0	456.2 to 451.2	138.0	444.2
MW-16-03	3/25/2016	465353.06	13632114.23	582.08	581.39	Silty Clay Hardpan and Shale	2" PVC	127.0 to 132.0	455.1 to 450.1	138.0	444.1
MW-16-04	3/23/2016	465173.94	13632077.11	581.99	580.95	Silty Clay Hardpan and Shale	2" PVC	127.0 to 132.0	455.0 to 450.0	138.0	444.0

Notes:
Coordinates are Michigan State Plane South Zone-2113, International Feet
Elevation in feet above NAVD88.
TOC: Top of well casing.
ft AMSL: Feet above mean sea level.
ft BGS: Feet below ground surface.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 2,000 4,000 FEET

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

PROJECT:

DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
4901 POINTE DRIVE
EAST CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0004
FILE:	265996-SLMMB.mxd

FIGURE 1

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

LEGEND

- MONITORING WELLS
- SURFACE WATER MEASURING POINT

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, APRIL 2015.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN APRIL 2016.

N

0 100 200 Feet

1 " = 100 '

1:1,200

PROJECT:

DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
4901 POINTE DRIVE
CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE PLAN

DRAWN BY:	J PAPEZ	PROJ NO.:	254222.0004
CHECKED BY:	S HOLMSTROM		
APPROVED BY:	V BUENING		**FIGURE 2**
DATE:	OCTOBER 2017		

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Phone: 734.971.7080
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FILE NO.: 265996-0004-002.mxd

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

LEGEND

- MONITORING WELLS
- SURFACE WATER MEASURING POINT

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, APRIL 2015.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN APRIL 2016.

N

0 100 200 Feet

1 " = 100 '

1:1,200

PROJECT:

DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
4901 POINTE DRIVE
CHINA TOWNSHIP, MICHIGAN

TITLE:

CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0004
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	OCTOBER 2017		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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FILE NO.: 265996-0004-010.mxd

TRC - GIS
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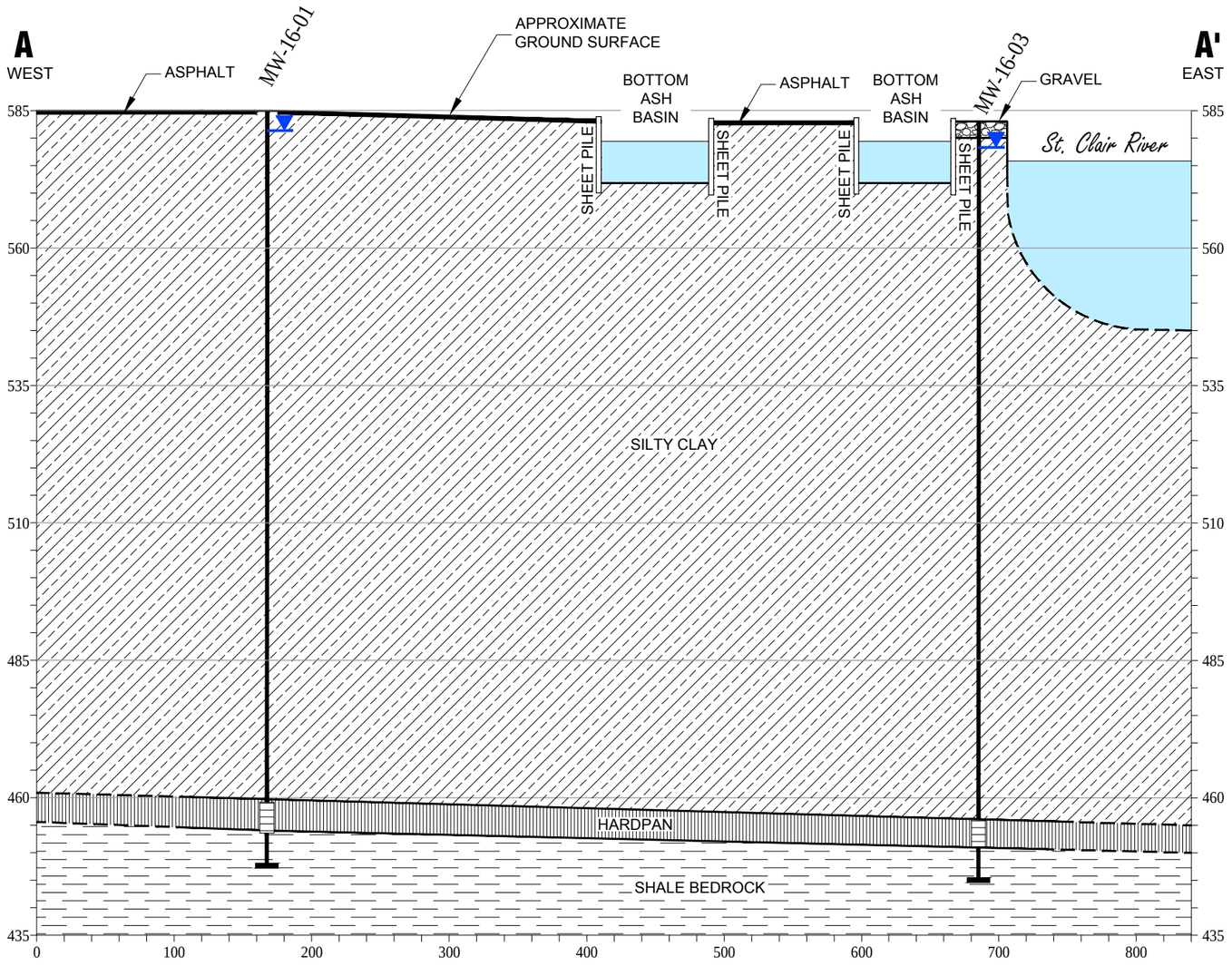
GENERALIZED GEOLOGIC CROSS-SECTION A-A'



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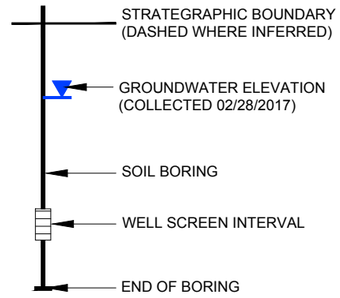

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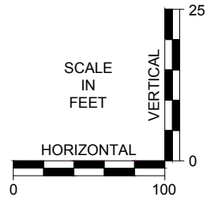

PROJECT:
DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
EAST CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED
GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0004.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 4**
DATE:	SEPTEMBER 2017		

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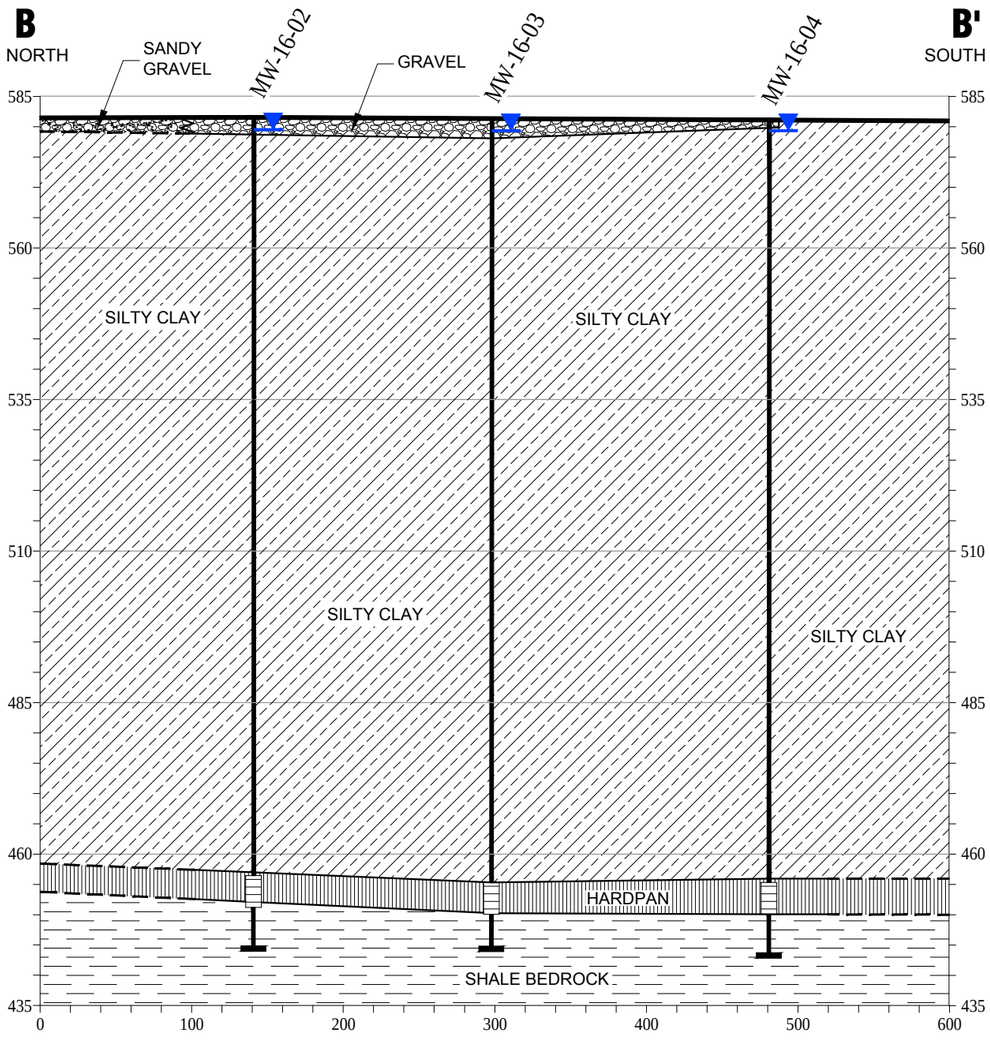
FILE NO.: 265996.0004.01.01.04-05.dwg

GENERALIZED GEOLOGIC CROSS-SECTION B-B'



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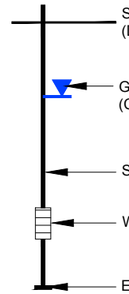
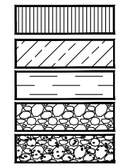
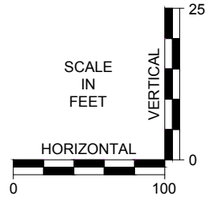


Lithology Key





PROJECT:
DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
EAST CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0004.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	SEPTEMBER 2017		

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FILE NO.: 265996.0004.01.01.04-05.dwg

LEGEND

- MONITORING WELLS
- SURFACE WATER MEASURING POINT
- (579.85) GROUNDWATER ELEVATION (FT MSL)
- GROUNDWATER ELEVATION CONTOUR (0.5-FT INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN APRIL 2016.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL.

0 100 200 Feet

1 " = 100 '

1:1,200

PROJECT:
DTE ELECTRIC COMPANY
ST. CLAIR POWER PLANT
4901 POINTE DRIVE
CHINA TOWNSHIP, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP FEBRUARY 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0004
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 6**
DATE:	OCTOBER 2017		

TRC
1540 Eisenhower Place
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FILE NO.: 265996-0004-007.mxd

Plot Date: 10/9/2017, 15:38:35 PM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0004-007.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

Appendix A
Soil Boring and Monitoring Well Installation Logs

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Saint Clair Power Plant	3/31/16	3/31/16	231828.0004.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	585.12	584.74	138.0	6

Boring Location: S side of median, in parking lot W of ash basin.	Personnel	Drilling Equipment:
N: 465440.66 E: 13631612.80	Logged By - J. Reed Driller - A. Goldsmith	Terrasonic

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Saint Clair	Saint Clair	MI	While Drilling: Date/Time After Drilling: Date/Time 4/8/16 08:45 ▼ Depth (ft bgs) 14.08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90		0	**GRAVEL WITH SAND** mostly gravel, little sand, brown (10YR 5/3), no odor, moist.				
				CLAY mostly clay, few silt, grayish brown (10YR 5/2), no odor, moist, dense.				
			5					
			10	Change to medium dense at 10.0 feet.				
				Change to soft to medium dense at 12.5 feet. ▼				
			15					
			20		CL			
			25					
2 CS	95		30					
			35					

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

Signature: for J. Reed

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan

734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
3 ST				**CLAY** mostly clay, few silt, grayish brown (10YR 5/2), no odor, moist, soft to medium dense.				
				Change to few fine to coarse sand at 43.0 feet.				
			45					
			50	Change to gray (10YR 5/1) at 50.0 feet.				
4 CS	100							
			55					
			60		CL			
			65					
			70					
5 CS	100							
			75					
			80					
				Sand seam, 8 inches thick, mostly coarse sand, black (10YR 2/1) at 80.25 feet.	SP			
				CLAY WITH SAND mostly clay, little fine to coarse sand, few silt, gray (10YR 5/1), no odor, medium dense.	CL			
			85					
				Sand seam, 8 inches thick, mostly coarse sand, black (10YR 2/1) at 85.0 feet.	SP			
				CLAY WITH SAND mostly clay, little fine to coarse sand, few silt, gray (10YR 5/1), no odor, medium dense.	CL			
6 CS	100		90	Change to few to little fine to coarse sand at 90.0 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			95	**CLAY WITH SAND** mostly clay, few to little fine to coarse sand, few silt, gray (10YR 5/1), no odor, medium dense.				
			100					
			105					
7 CS	100		110		CL			
			115					
			120	Change to soft at 120.0 feet.				
8 CS	100		125					
				SILTY CLAY mostly clay, some silt, very dark gray, (10YR 3/1), no odor, dry to moist, hard.	CL-ML			
			130					
				SHALE very dark gray (10YR 3/1) to light gray (10YR 7/1), no odor, moist.				
9 CS	100		135					
				End of boring at 138.0 feet below ground surface.				
			140					
			145					

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Saint Clair Power Plant	3/28/16	3/28/16	231828.0004.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	582.18	581.43	138.0	6

Boring Location: NE side of ash basin.	Personnel	Drilling Equipment:
N: 465503.41 E: 13632151.32	Logged By - A. Knutson Driller - A. Goldsmith	Terrasonic

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Saint Clair	Saint Clair	MI	While Drilling: Date/Time After Drilling: Date/Time 4/8/16 08:38 ▼ Depth (ft bgs) 1.76

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	95		0	**GRAVEL** mostly coarse gravel, few coarse sand, black (10YR 2/1), no odor, moist, loose.				
				SAND WITH GRAVEL mostly fine to coarse sand, some fine to coarse gravel, brown (10YR 5/3), no odor, moist, loose.				
			5	**CLAY** mostly clay, few silt, grayish brown (10YR 5/1), no odor, moist, stiff.				
2 CS	100		10	Change to soft at 8.0 feet.				
3 CS	100		15					
			20		CL			
			25					
4 CS	100		30					
			35					

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

Signature: for A. Knutson

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan

734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, grayish brown (10YR 5/1), no odor, moist, soft. Change to few silt at 45.0 feet. Change to no silt at 46.0 feet.	CL			
6 CS	100		50					
7 CS	100		55	**SILTY CLAY** mostly silt, little clay, dark grayish brown (10YR 5/3), no odor, moist, stiff.				
8 CS	100		60					
9 CS	100		65					
			70	Change to few fine to coarse sand at 73.5 feet.	CL-ML			
			75	Change to no sand at 76.5 feet.				
			80					
			85					
			90					

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
10 CS	100		95	**SILTY CLAY** mostly silt, little clay, dark grayish brown (10YR 5/3), no odor, moist, stiff.	CL-ML			
11 CS	100		100					
12 CS	100		105					
13 CS	80		110					
14 CS	100		115					
			120					
			125	**SILTY CLAY** mostly clay, some silt, very dark gray (10YR 3/1), no odor, dry, hard.	CL-ML			
			130	**SHALE** very dark gray (10YR 3/1) to light gray (10YR 7/1), no odor, moist.				
			135					
			140	End of boring at 138.0 feet below ground surface.				
			145					

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Saint Clair Power Plant	3/24/16	3/24/16	231828.0004.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	582.08	581.39	138.0	6

Boring Location: E side of ash basin.	Personnel	Drilling Equipment:
N: 465353.06 E: 13632114.23	Logged By - J. Reed Driller - A. Goldsmith	Terrasonic

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Saint Clair	Saint Clair	MI	While Drilling: Date/Time After Drilling: Date/Time 4/8/16 08:35 ▼ Depth (ft bgs) 2.16

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			0	**GRAVEL WITH SAND** mostly gravel, some sand, black (10YR 2/1), no odor, moist, loose.				
				▼ **SAND AND GRAVEL** brown (10YR 5/3), no odor, moist, loose.				
1 CS	95		5	**CLAY** mostly clay, few to little silt, grayish brown (10YR 5/2), no odor, moist, stiff.				
			10	Change to medium stiff at 10.0 feet.				
2 CS	100		15					
			20		CL			
3 CS	100		25					
			30	Change to trace to few sand at 30.0 feet.				
				Change to no sand at 32.5 feet.				
4 CS	100		35					

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

Signature: Christopher for J. Reed

Checked By: C. Scieszka

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 ST				**CLAY** mostly clay, few to little silt, grayish brown (10YR 5/2), no odor, moist, medium stiff.				
6 CS	100		45					
			50		CL			
7 CS	100		55					
			60	**SILTY CLAY** mostly clay, little silt, dark grayish brown (10YR 5/2), no odor, moist, dense.				
8 CS	100		65					
			70					
9 CS	100		75		CL-ML			
			80					
10 CS	100		85					
			90					

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		95	**SILTY CLAY** mostly clay, little silt, dark grayish brown (10YR 5/2), no odor, moist, dense.	CL-ML			
12 CS	100		100					
13 CS	100		105					
14 CS	100		110					
15 CS	100		115					
			120					
			125					
			130	**SILTY CLAY HARDPAN AND SHALE** very dark gray (10YR 3/1), no odor, dry to slightly moist, hard.	CL-ML			
			135	**SHALE** very dark gray (10YR 3/1) to light gray (10YR 7/1), no odor, moist.				
			140	End of boring at 138.0 feet below ground surface.				
			145					

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Saint Clair Power Plant	3/22/16	3/23/16	231828.0004.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	581.99	580.95	138.0	6

Boring Location: SE side of ash basin.	Personnel	Drilling Equipment:
N: 465173.94 E: 13632077.11	Logged By - J. Reed Driller - A. Goldsmith	Terrasonic

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Saint Clair	Saint Clair	MI	While Drilling: Date/Time After Drilling: Date/Time 4/8/16 08:28 ▼ Depth (ft bgs) 2.19

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	80		0	**GRAVEL** mostly gravel, few to little fine to coarse sand, very dark gray (10YR 3/1), no odor, moist.				
				CLAY WITH SAND mostly clay, little to some fine to coarse sand, dark grayish brown (10YR 4/2), no odor, moist, medium dense.	CL			
			5					
				SAND WITH CLAY mostly sand, little to some clay, dark grayish brown (10YR 4/2), no odor, moist.	SW-SC CL			
				CLAY WITH SAND mostly clay, little to some fine to coarse sand, medium plasticity, dark grayish brown (10YR 4/2), no odor, moist, medium dense.				
2 CS	95		10	**CLAY** mostly clay, trace fine to medium sand, medium plasticity, grayish brown (10YR 5/2), no odor, moist, stiff.				
			15					
			20					
3 CS	100		25	Change to medium stiff at 25.0 feet.	CL			
			30					
4 CS	100		35					

SOIL BORING WELL CONSTRUCTION LOG 231828.0004.0000.GPJ TRC_CORP.GDT 6/3/16

Signature: for J. Reed.

Checked By: C. Scieszka

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 ST					CL			
6 CS	100		45	**SILTY CLAY** mostly clay, little to some silt, few fine to coarse sand, dark grayish brown (10YR 5/2), no odor, moist, medium stiff.				
7 CS	100		50 55		CL-ML			
8 CS	100		60 65	**CLAY** mostly clay, few to little silt, few fine to coarse sand, grayish brown (10YR 5/2), no odor, moist, medium stiff.				
9 CS	100		70 75		CL			
10 CS	100		80 85	Change to wet at 79.5 feet. Change to moist at 83.0 feet.				
			90					

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		95	**CLAY** mostly clay, few to little silt, few fine to coarse sand, grayish brown (10YR 5/2), no odor, moist, medium stiff.	CL			
12 CS	100		100					
13 CS	100		105					
14 CS	100		110					
15 CS	100		115					
			120					
			125	**SILTY CLAY HARDPAN/SHALE** mostly clay and silt, very dark gray (10YR 3/1), no odor, dry to moist, hard.	CL-ML			
			130	**SHALE** light gray (10YR 7/1) to very dark gray (10YR 3/1), no odor, dry.				
			135					
			140	End of boring at 138.0 feet below ground surface.				
			145					

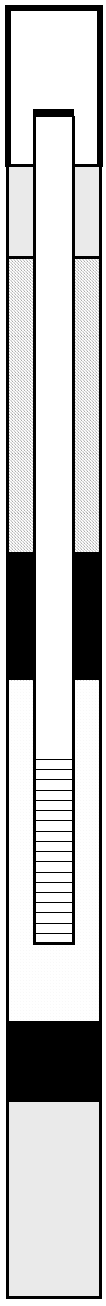
WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE EC: SCPP CCR MW Installation	WELL ID:	**MW-16-01**
PROJ. NO:	2381828.0004	DATE INSTALLED: 3/31/2016 INSTALLED BY: J. REED	CHECKED BY: C. SCIESZKA

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
585.12	0.0 GROUND SURFACE
584.74	0.4 TOP OF CASING
	1.5 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
	GROUT/BACKFILL METHOD: TREMIE
126.6	118.0 GROUT
	BENTONITE SEAL MATERIAL: TIME RELEASE PELLETS
	122.0 BENTONITE SEAL
458.1	127.0 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
453.1	132.0 BOTTOM OF SCREEN
	132.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
447.1	138.0 HOLE BOTTOM

RISER PIPE LENGTH: 126.6

SCREEN LENGTH: 5.0



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 138 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: SURGE AND PUMP

TIME DEVELOPING: 2.5 HOURS

WATER REMOVED: 50 GALLONS

WATER ADDED: NA GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: CLOUDY

COLOR BEFORE: GRAY

CLARITY AFTER: SLIGHTLY CLOUDY

COLOR AFTER: CLEAR TO VERY LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	132.00	T/PVC	4/5/16	940
DTB AFTER DEVELOPING:	132.00	T/PVC	4/5/16	1420
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	13.70	T/PVC	4/8/16	828
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE EC: SCPP CCR MW Installation	WELL ID:	**MW-16-02**
PROJ. NO:	2381828.0004	DATE INSTALLED: 3/29/2016 INSTALLED BY: A. Knutson	CHECKED BY: C. SCIESZKA

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
582.18	0.0	GROUND SURFACE
581.43	0.8	TOP OF CASING
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
125.3		RISER PIPE LENGTH
	117.0	GROUT
		BENTONITE SEAL MATERIAL: TIME RELEASE PELLETS
	121.0	BENTONITE SEAL
456.2	126.0	TOP OF SCREEN
5.0		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
451.2	131.0	BOTTOM OF SCREEN
	131.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: WASHED SAND
444.2	138.0	HOLE BOTTOM

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 138 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: SURGE AND PUMP

TIME DEVELOPING: 2.5 HOURS

WATER REMOVED: 55 GALLONS

WATER ADDED: NA GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: CLOUDY

COLOR BEFORE: GRAY

CLARITY AFTER: SLIGHTLY CLOUDY

COLOR AFTER: CLEAR TO VERY LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	131.90	T/PVC	4/4/16	--
DTB AFTER DEVELOPING:	132.00	T/PVC	4/4/16	--
SWL BEFORE DEVELOPING:	1.40	T/PVC	4/4/16	--
SWL AFTER DEVELOPING:	1.10	T/PVC	4/8/16	838
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE EC: SCPP CCR MW Installation	WELL ID:	**MW-16-03**
PROJ. NO:	2381828.0004	DATE INSTALLED: 3/25/2016 INSTALLED BY: J. Reed	CHECKED BY: C. SCIESZKA

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
582.08	0.0	GROUND SURFACE
581.39	0.7	TOP OF CASING
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
126.3		RISER PIPE LENGTH
	112.0	GROUT
		BENTONITE SEAL MATERIAL: TIME RELEASE PELLETS
	116.0	BENTONITE SEAL
455.1	127.0	TOP OF SCREEN
5.0		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
450.1	132.0	BOTTOM OF SCREEN
	132.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: WASHED SAND
444.1	138.0	HOLE BOTTOM

NOTES:

APPROXIMATELY 8.6 FEET OF MEDIUM, WASHED SAND WAS UNINTENTIONALLY PLACED IN WELL DURING INSTALLATION. THE SAND WAS REMOVED DURING WELL DEVELOPMENT.

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 138 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: SURGE AND PUMP

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 74 GALLONS

WATER ADDED: NA GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: CLOUDY/SUSPENDED SAND

COLOR BEFORE: GRAY

CLARITY AFTER: SLIGHTLY CLOUDY

COLOR AFTER: VERY LIGHT GRAY TO CLEAR

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	123.40	T/PVC	4/4/16	950
DTB AFTER DEVELOPING:	132.00	T/PVC	4/4/16	1420
SWL BEFORE DEVELOPING:	1.00	T/PVC	4/4/16	950
SWL AFTER DEVELOPING:	1.47	T/PVC	4/8/16	835
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

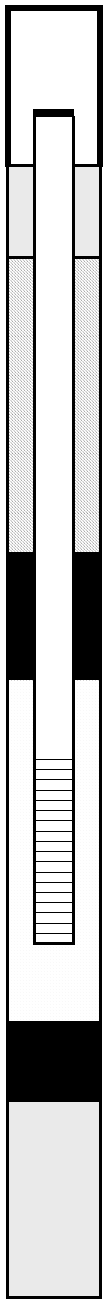
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE EC: SCPP CCR MW Installation	WELL ID:	**MW-16-04**
PROJ. NO:	2381828.0004	DATE INSTALLED: 3/23/2016 INSTALLED BY: J. Reed	CHECKED BY: C. SCIESZKA

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
581.99	0.0	GROUND SURFACE
580.95	1.0	TOP OF CASING
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
126.0		RISER PIPE LENGTH
	118.0	GROUT
		BENTONITE SEAL MATERIAL: TIME RELEASE PELLETS
	122.0	BENTONITE SEAL
455.0	127.0	TOP OF SCREEN
5.0		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
450.0	132.0	BOTTOM OF SCREEN
	132.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: WASHED SAND
444.0	138.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 138 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: SURGE AND PUMP

TIME DEVELOPING: 2 HOURS

WATER REMOVED: 40 GALLONS

WATER ADDED: NA GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: CLOUDY/GRAY

COLOR BEFORE: GRAY

CLARITY AFTER: SLIGHTLY CLOUDY

COLOR AFTER: LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	133.10	T/PVC	4/4/16	945
DTB AFTER DEVELOPING:	132.00	T/PVC	4/4/16	1700
SWL BEFORE DEVELOPING:	1.01	T/PVC	4/4/16	945
SWL AFTER DEVELOPING:	1.15	T/PVC	4/8/16	828
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120