Groundwater Monitoring System
Summary Report

DTE Electric Company
Sibley Quarry Coal Combustion Residual Landfill

801 Fort Street
Trenton, Michigan

October 2017

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Prepared For
DTE Electric Company

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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) Sibley Quarry Landfill (SQLF) CCR 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 SQLF 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 SQLF.

1.2 Site Location

The SQLF is located in Section 7, Township 4 South, Range 11 East, at 801 Fort Street (a.k.a. 502 Quarry Road) in Trenton, Wayne County, Michigan (**Figure 1**). The SQLF is located about two miles north of the DTE Electric Trenton Power Plant. The SQLF is bounded mostly by Fort Street to the west, Sibley Road to the north, the former Detroit and Toledo Shore Line Railroad and West Jefferson to the east, and the former Vulcan Mold & Iron Company (now owned by Danou Enterprises) and the DTE Electric Jefferson Substation to the south.

1.3 Description of CCR Unit

The Sibley quarry was originally developed to mine limestone beginning in the mid-1800s and was mined to over 300 feet below ground surface (feet-bgs) in some areas before becoming inactive. In 1951, Detroit Edison (now DTE Electric) acquired Sibley Quarry and began to manage CCR in the SQLF[1]. The property has been used continuously for the operation of the SQLF since approximately 1951. The SQLF is a licensed Type III solid waste disposal facility owned and operated by DTE Electric in compliance with the current operating license number 9394 in accordance with Michigan Part 115 rules. The disposal facility currently receives the majority of CCRs from the Trenton Channel and River Rouge Power Plants. In addition, a small amount of CCR is also received from the Monroe Power Plant.

[1] AECOM, 2016, Run-On/Run-Off Control System Plan For Coal Combustions Residuals Disposal Facility – Sibley Quarry Landfill, Existing Landfill

The SQLF is approximately 207 acres with 92.1 acres authorized to receive waste (**Figure 2**). Of those 92.1 acres, 64.2 acres are active landfilling areas occupied by CCR material. Approximately 90 acres along the exterior perimeters of the SQLF to the north, west, and south are at final grade and had received final cover prior to September 2, 1999, and are considered to be closed[1].

As part of normal operations, the SQLF quarry is dewatered to approximately 300 feet-bgs maintaining a water level in the bottom of the quarry at approximately 304 feet relative to the North American Vertical Datum of 1988 (NAVD 88). Groundwater and storm water are pumped from the quarry sump to an upper treatment pond located at the top of the quarry (referred to as "upper ponds"). Water from the upper ponds discharges into a conveyance channel which conveys the water approximately one-half mile to the lower ponds. The discharge, which is authorized via a National Pollution Discharge Elimination System (NPDES) permit, is pumped from a station at the southern end of the lower ponds and discharges the water to the Detroit River. The discharge rate averages approximately 1.5 million gallons per day (MGD), which maintains the water level in the quarry at its current elevation and prevents exposed CCR material from contacting the groundwater that interfaces at the bottom of the quarry[1].

Section 2
Hydrogeology

2.1 Regional Hydrogeologic Setting

The SQLF resides in an area characterized by near surface deposits of glacio-lacustrine clay and silt units on top of thick strata of dolomite and limestone bedrock. The uppermost bedrock units in Wayne County consist of Paleozoic sedimentary rock strata of marine origin[2]. According to the bedrock geology map of Wayne County, the site is located in an area where the Dundee Formation (mostly limestone) and the Detroit River Group (limestone, dolostone and some sandstone) underlie the unconsolidated glacial drift. The stratigraphic succession (from youngest to oldest) in the subject area is: Dundee Formation (Limestone), Detroit River Group, Sylvania Sandstone, Bois Blanc, followed by the Bass Island and Salina Group. The general regional bedrock groundwater flow pattern, outside of the influence of the quarry dewatering, in the subject area is west to east toward the Detroit River and Lake Erie[3].

2.2 SQLF Hydrogeology

Information provided on local geology is primarily based on soil boring data collected by TRC Engineers Michigan, Inc. (TRC) during installation of the groundwater monitoring system during 2016 and 2017 (Section 3), in addition to well logs from Golder and Associates Inc. (Golder). Golder, on behalf of DTE Electric, oversaw the installation and development of four open-hole bedrock wells (MW-101 through MW-104) during July 2015. Soil borings from the Golder work and the TRC work are included in Appendix A. These data were used to develop the generalized geologic cross sections provided in **Figures 3 through 5**.

The borings advanced at the SQLF (MW-101 through MW-108 and MW-108A) documented that the SQLF uppermost aquifer is within the Dundee Formation limestone bedrock. The Dundee Formation is overlain by anywhere from less than 15 feet to more than 70 feet of unconsolidated material, most of which is clay-rich soil with some fill. The top of the Dundee Formation limestone/dolostone bedrock was encountered at depths ranging from 16.5 to 74.5 feet-bgs and, including the underlying Detroit River Group limestone/dolostone/sandstone, extended to depths ranging from 235 to over 310 feet-bgs (in many cases present to the bottom of the boring/well). The underlying Sylvania Sandstone was encountered at monitoring wells MW-101 (at ~300 feet-bgs), MW-105 (at ~300 feet-bgs) and at MW-108A (at ~235 feet-bgs).

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[2] Mozola, A. J., 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geological Survey Division Report R 3, 25 p.

[3] 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.

There are two modes of groundwater movement through the carbonate bedrock: (i) primary porosity (pore spaces in the rock), and (ii) secondary porosity[4] (along an intersecting system of fractures, joints, and bedding planes). Groundwater flow in the carbonate bedrock aquifer in Wayne County is primarily through secondary porosity consisting of fractures, most of which are evident along bedding-plane partings[4]. As expected, data show that groundwater levels are significantly lower within the bedrock in monitoring wells that are the closest to the quarry where significant pumping is occurring (MW-101 through MW-104, MW-106 and MW-107), with water levels ranging from 120 to more than 210 feet bgs. Monitoring wells MW-105 and MW-108A located further away from the quarry have less depressed groundwater elevations (on the order of 22 to 55 feet-bgs) due to their greater distance away from the quarry.

The Detroit River is located within one-half mile to the east of the SQLF and if the quarry were not actively being dewatered, groundwater flow in the SQLF area would likely be to the east towards the Detroit River. Given the high level of continuous pumping from the quarry, groundwater flow in the uppermost aquifer throughout the area and the perimeter of Sibley Quarry is inward on all sides towards Sibley Quarry.

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 SQLF uppermost aquifer as defined in 40 CFR §257.53 consists of the Dundee Formation and/or the Detroit River Group limestone and/or dolostone that was present beneath at least 16.5 and up to 74.5 foot thick unconsolidated material (mostly clay-rich) (**Figures 3 through 5**) throughout the SQLF. CCR groundwater monitoring wells MW-16-101 through MW-16-107 and MW-108A were set as open-hole

[4] Reeves, H.W., Wright, KV and Nicholas, J.R., 2004, Hydrogeology and Simulation of Regional Ground-Water-Level Declines in Monroe County, Michigan, Water-Resources Investigations Report 03-4312, U.S. Department of the Interior, U.S. Geological Survey, Lansing, Michigan, 69 p.

bedrock wells to the total depth drilled (ranging from 270 to 320 feet-bgs) within the uppermost aquifer limestone and/or dolostone. In addition, the underlying, hydraulically connected Sylvania Sandstone was encountered in the lower portions of monitoring wells MW-101, MW-105, and MW-108A. Much of the primarily limestone/dolostone uppermost aquifer has been dewatered in the immediate vicinity of the quarry where significant active pumping keeps the water table depressed to around 304 feet NGVD 88 within the quarry. Boring and well logs for the CCR monitoring wells are included Appendix A.

2.2.2 Groundwater Flow

Groundwater Flow Direction

Groundwater flow is consistently inward toward the base of the quarry due to continuous pumping at the quarry that hydraulically controls groundwater flow. This groundwater flow regime is demonstrated using potentiometric surface data measured during the 8 background groundwater sampling events performed by TRC since August 2016. A representative groundwater potentiometric surface elevation map showing the groundwater elevations and inward flow toward the base of the quarry for April 2017 is illustrated on **Figure 6**. As shown, overall the quarry pumping is keeping groundwater elevations depressed with groundwater flow universally being maintained into the quarry. Quarry dewatering results in all the perimeter CCR monitoring wells being upgradient of the CCR landfill. The potentiometric groundwater elevation data collected in 2016 and 2017 show that overall there is consistent horizontal groundwater flow within the upper aquifer towards the quarry.

Uppermost Aquifer Hydraulic Conductivity

Hydraulic conductivities within three of the CCR monitoring wells set in the SQLF uppermost aquifer were evaluated using single well hydraulic conductivity tests (e.g., slug tests) performed in 2015 by Golder. The measured hydraulic conductivities ranged from approximately 1 to 16 feet/day with a mean hydraulic conductivity of 6.8 feet/day, which is consistent with other sources for the hydraulic conductivity of the Dundee Formation and Detroit River Group Formation[5].

[5] Reeves, H.W., Wright, KV and Nicholas, J.R., 2004, Hydrogeology and Simulation of Regional Ground-Water-Level Declines in Monroe County, Michigan, Water-Resources Investigations Report 03-4312, U.S. Department of the Interior, U.S. Geological Survey, Lansing, Michigan, 69 p.

Horizontal Time of Travel

Using the groundwater potentiometric surface elevations measured at the SQLF in 2016 and 2017, the mean gradient from the perimeter of the SQLF towards the quarry pumping basin is as follows:

- From the west (MW-106) 0.087 foot/foot;
- From the north (MW-107) 0.082 foot/foot;
- From the east (MW-101) 0.103 foot/foot; and
- From the south (MW-108A) 0.070 foot/foot.

Assuming an average porosity of 0.1 for the limestone in the uppermost aquifer, a mean hydraulic conductivity of 6.8 feet/day, and a hydraulic gradient ranging from 0.070 to 0.103 foot/foot inwards to the quarry, results in a low mean groundwater flow rate towards the quarry ranging from approximately 4.7 feet/day (1,717 feet/year) to 7.0 feet/day (2,557 feet/year), with a mean of approximately 5.8 feet/day (2,118 feet/year). Overall, the inward gradient to the SQLF is relatively uniform with a slightly higher gradient and flow rate from the east where the distance to the quarry wall is lower.

Section 3
Groundwater Monitoring System

3.1 Groundwater Monitoring System Installation

During July 2015, Golder, on behalf of DTE Electric, oversaw the installation and development of four open-hole bedrock wells (MW-101 through MW-104) by Michigan-licensed wells drillers on the west and east sides of SQLF. In March and April 2016, TRC, on behalf of DTE Electric oversaw the installation and development of four additional open-hole bedrock monitoring wells (MW-105 through MW-108) by a Michigan-licensed well driller. In January 2017, monitoring well MW-108 was decommissioned after that location was found to be unsuitable for monitoring the SQLF southern boundary and a new monitoring well, MW-108A, was installed further to the south. These monitoring wells were installed to establish the groundwater monitoring system in accordance with the 40 CFR Section § 257.91 as described below:

3.1.1 Boring/Bedrock Well Advancement

In July 2015, March/April of 2016, and January 2017, nine borings were advanced to evaluate the subsurface geology and to allow bedrock monitoring well installation using sonic drilling techniques (two wells) and air/water rotary (seven wells) drilling methods along the perimeter of the SQLF. Soil was logged from the ground surface to the top of bedrock, then surface casings were cemented into the upper bedrock interface to isolate the overlying soil from the bedrock prior to drilling through the bedrock. After the cement set in the surface casings, the bedrock was logged from sonic cores (MW-102 and MW-104) or from the rotary cuttings during boring/well advancement to the termination of the boring/open-hole bedrock monitoring well. A Golder or TRC geologist was present to log each boring and describe the soil and bedrock in accordance with the Unified Soil Classification System (USCS).

The borings were advanced to depths ranging from approximately 270 to 320 feet-bgs within the uppermost aquifer Dundee Formation (limestone with some dolostone bedrock), the Detroit River Group Formation (limestone and/or dolostone with some sandstone intervals), and in some cases into the top of the underlying Sylvania Sandstone. Saturation was encountered at deeper depths ranging from approximately 115 to 210 feet-bgs at monitoring wells located closer to the quarry bottom. Shallower depths to groundwater (on the order of 22 to 55 feet-bgs were encountered in areas of lower surface topography and/or at monitoring well locations farthest from the quarry bottom where dewatering is occurring down to approximately 300 ft-bgs (on the order of 304 feet relative to the NGVD 88).

3.1.2 Monitoring Well Installation

As stated above, the CCR monitoring wells MW-101 through MW-107 and MW-108A are set as open-hole within the Dundee Formation (generally limestone) uppermost aquifer and the underlying Detroit River Group Formation (limestone, dolostone, some sandstone intervals), and in some cases into the top of the Sylvania Sandstone with total depths ranging from 270 to 320 feet-bgs at eight locations around the SQLF perimeter (**Figure 2**). Monitoring well construction diagrams from the installed monitoring wells accompany the soil boring logs in Appendix A. A summary of monitoring well details are also included in Table 1. Following well installation, the monitoring wells 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 horizontally located each monitoring well utilizing the Michigan State Plane South Zone-2113, North American Datum 1983 (NAD83), International feet. Vertical elevations were measured at the ground surface at each soil boring and monitoring well, and at the top of casing in feet for each monitoring well relative to the NAVD 88. Monitoring well coordinates, elevations, open-hole intervals, and other monitoring well details are included in Table 1.

3.1.4 Detection Monitoring

The SQLF 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. Because the uppermost aquifer is in an area where pumping has been performed continuously before CCR disposal began, and will be continued to be dewatered, a continuous inward hydraulic gradient is maintained. As a result, the uppermost aquifer perimeter monitoring wells cannot have been affected by the SQLF CCR unit operations to date, nor could they be in the future under current pumping conditions. Given that groundwater flow is inward toward the quarry, all of the perimeter monitoring wells in the groundwater monitoring system are located in an up gradient position relative to the landfill; therefore, monitoring of the SQLF CCR unit using inter well statistical methods (upgradient to downgradient) is not possible. Instead, based on these hydrogeologic conditions, intra-well statistical approaches are the appropriate method to evaluate groundwater data statistically. Consequently, intra-well statistical tests 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 Rules.

Section 4
Groundwater Monitoring System Certification

Groundwater Monitoring System Certification per 40 CFR §257.91(f)
Sibley Quarry Landfill
Trenton, 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 SQLF 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

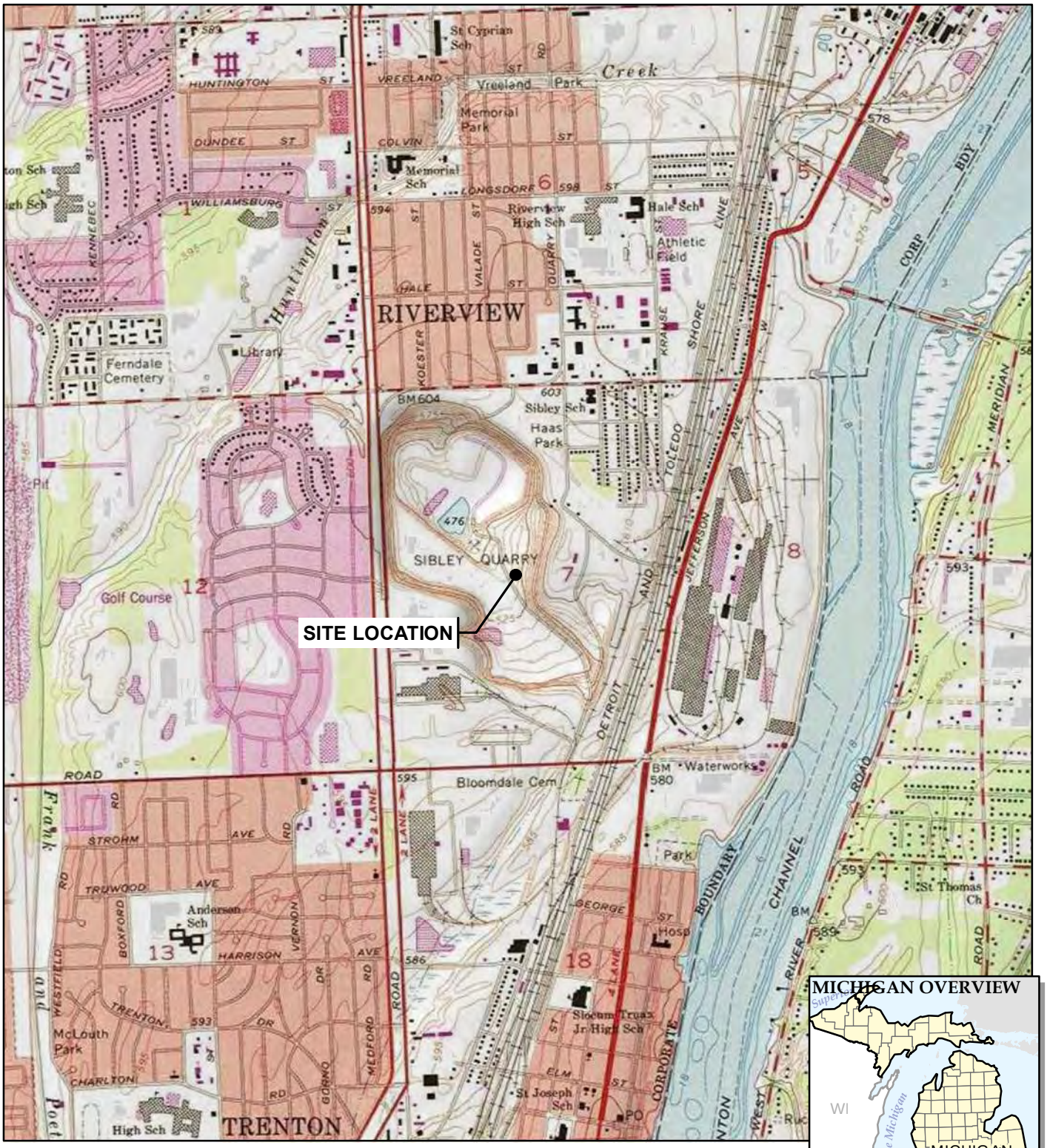
Tables

Table 1
Monitoring Well Information Summary
DTE Electric Company – Sibley Quarry Landfill
Trenton, Michigan

Well Location	Date Installed	Northing	Easting	Ground Surface Elevation (ft AMSL)	TOC Elevation (ft AMSL)	Geologic Unit of Sample Interval	Well Construction	Open Hole Interval Depth (ft BGS)	Dedicated Bladder Pump Inlet Depth (ft BGS)	Dedicated Bladder Pump Elevation (ft AMSL)	Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft AMSL)
Sibley Quarry Landfill												
MW-101	7/14/2015	2832.00	2587.40	615.23	617.67	Limestone bedrock	Open hole bedrock	70.00 to 320.00	260.6	354.7	320.0	295.2
MW-102	7/16/2015	3821.60	2394.30	612.62	615.03	Limestone bedrock	Open hole bedrock	18.00 to 270.00	257.6	355.0	270.0	342.6
MW-103	7/15/2015	4635.40	83.10	604.67	607.23	Limestone bedrock	Open hole bedrock	63.00 to 310.00	249.4	355.2	310.0	294.7
MW-104	7/16/2015	1949.90	221.90	605.98	608.39	Limestone bedrock	Open hole bedrock	55.00 to 310.00	250.6	355.4	310.0	296.0
MW-105	3/30/2016	1469.07	3370.82	590.71	593.28	Limestone bedrock	4.75" Open hole bedrock	20.00 to 300.00	235.4	355.3	300.0	290.7
MW-106	3/28/2016	3343.60	71.70	603.99	606.75	Limestone bedrock	4.75" Open hole bedrock	42.00 to 300.00	249.2	354.8	300.0	304.0
MW-107	4/6/2016	5193.15	1841.68	607.51	610.03	Limestone bedrock	4.75", 4.5", and 3.875" Open hole bedrock	60.00 to 271.00	252.5	355.0	271.0	336.5
MW-108A	1/24/2017	174.84	1821.39	590.52	594.06	Sandstone bedrock	5.625" Open hole bedrock	47.00 to 300.00	235.5	355.1	300.0	290.5
MW-108	3/29/2016	961.12	2446.71	600.22	602.96	Limestone bedrock	4.75" Open hole bedrock	80.00 to 300.00	245.3	355.0	300.0	300.2

Notes:
Coordinate System is Sibley Quarry Coordinate System.
Elevation Datum is U.S.C. & G.S. 1929.
TOC: Top of well casing.
ft AMSL: Feet above mean sea level.
ft BGS: Feet below ground surface.
GRAY text represents decommissioned monitoring well.

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
SIBLEY QUARRY LANDFILL
801 FORT STREET
TRENTON, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0002
FILE:	265996-SLMMB.mxd

FIGURE 1

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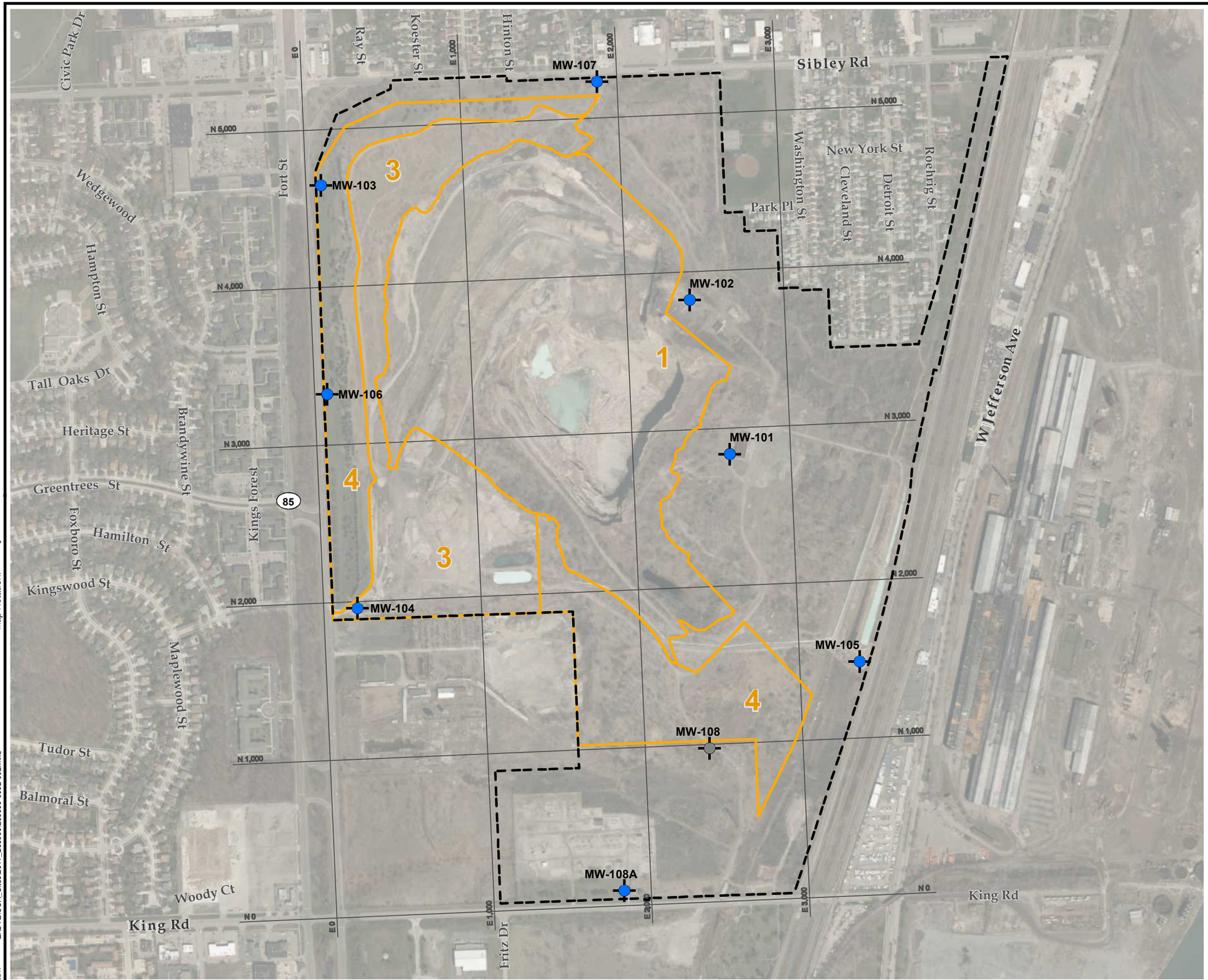

LEGEND

- MONITORING WELLS
- ABANDONED MONITORING WELL
- SIBLEY QUARRY PROPERTY LINE
- SOLID WASTE DISPOSAL AREA BOUNDARY
- 1 FILL AREA DESIGNATION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER, 2011.
2. SITE LAYOUT INFORMATION FROM GEOREFERENCED CAD FILE. FEATURES ARE APPROXIMATE.
3. SURVEY PERFORMED BY THE DTE SURVEY GROUP IN AUGUST 2015, MAY 2016 AND JANUARY 2017.

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
SIBLEY QUARRY LANDFILL
801 FORT STREET
TRENTON, MICHIGAN

TITLE:
MONITORING NETWORK AND SITE PLAN

DRAWN BY:	SUEMNICHT R	PROJ NO.:	254222.0002
CHECKED BY:	S HOLMSTROM		
APPROVED BY:	BUENING V		**FIGURE 2**
DATE:	OCTOBER 2017		

TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

FILE NO.: 265996-0002-002.mxd

Plot Date: 10/12/2017, 09:40:06 AM by BDEEGAN -- LAYOUT: ANSI B (11"x17")
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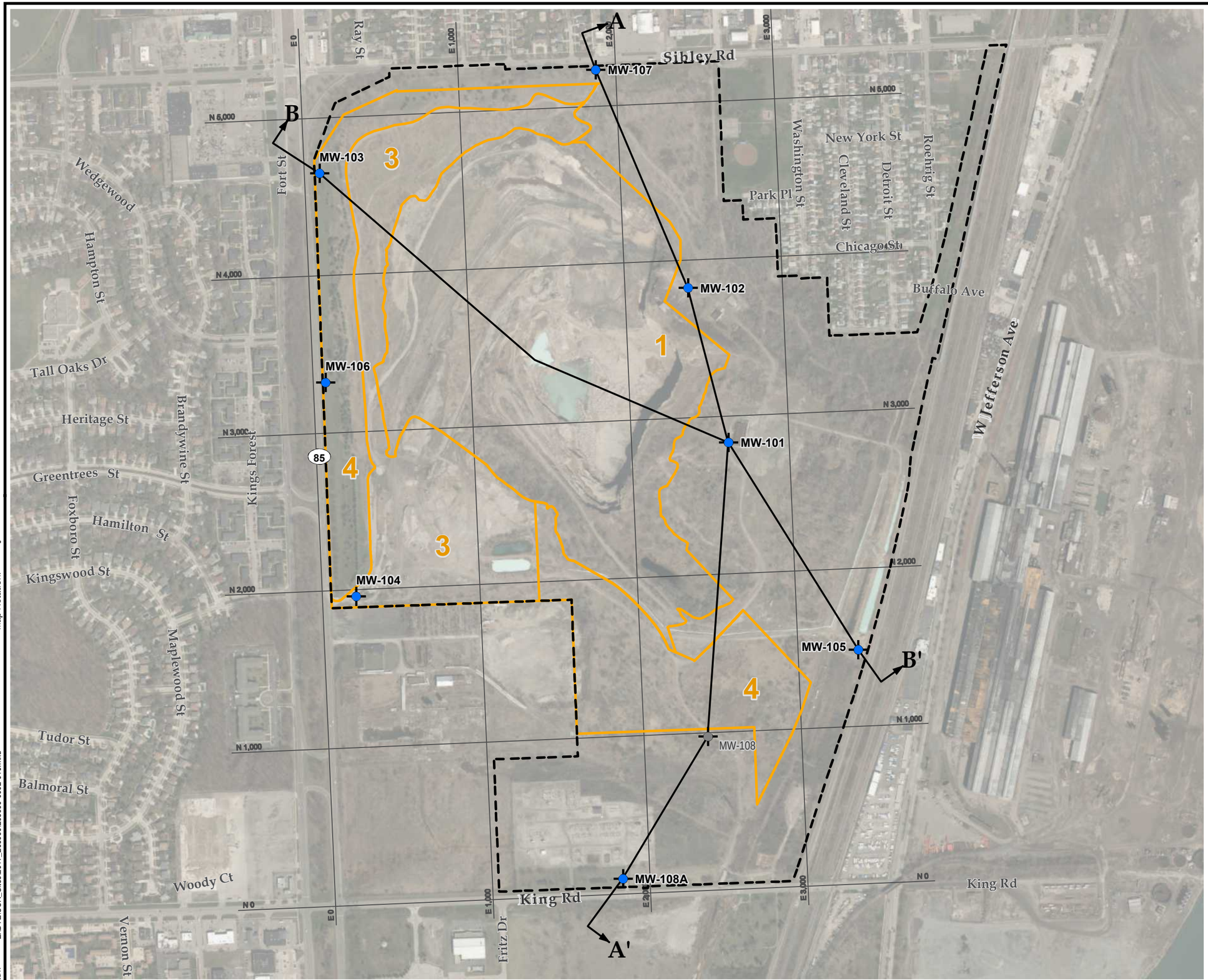
Map Rotation: 0

TRC - GIS



LEGEND

- MONITORING WELLS
- ABANDONED MONITORING WELL
- SIBLEY QUARRY PROPERTY LINE
- SOLID WASTE DISPOSAL AREA BOUNDARY
- 1 FILL AREA DESIGNATION
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER, 2011.
2. SITE LAYOUT INFORMATION FROM GEOREFERENCED CAD FILE. FEATURES ARE APPROXIMATE.
3. SURVEY PERFORMED BY THE DTE SURVEY GROUP IN AUGUST 2015, MAY 2016, AND JANUARY 2017.

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

DTE ELECTRIC COMPANY
SIBLEY QUARRY LANDFILL
801 FORT STREET
TRENTON, MICHIGAN

TITLE:

CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0002
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	OCTOBER 2017		

TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
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FILE NO.: 265996-0002-010.mxd

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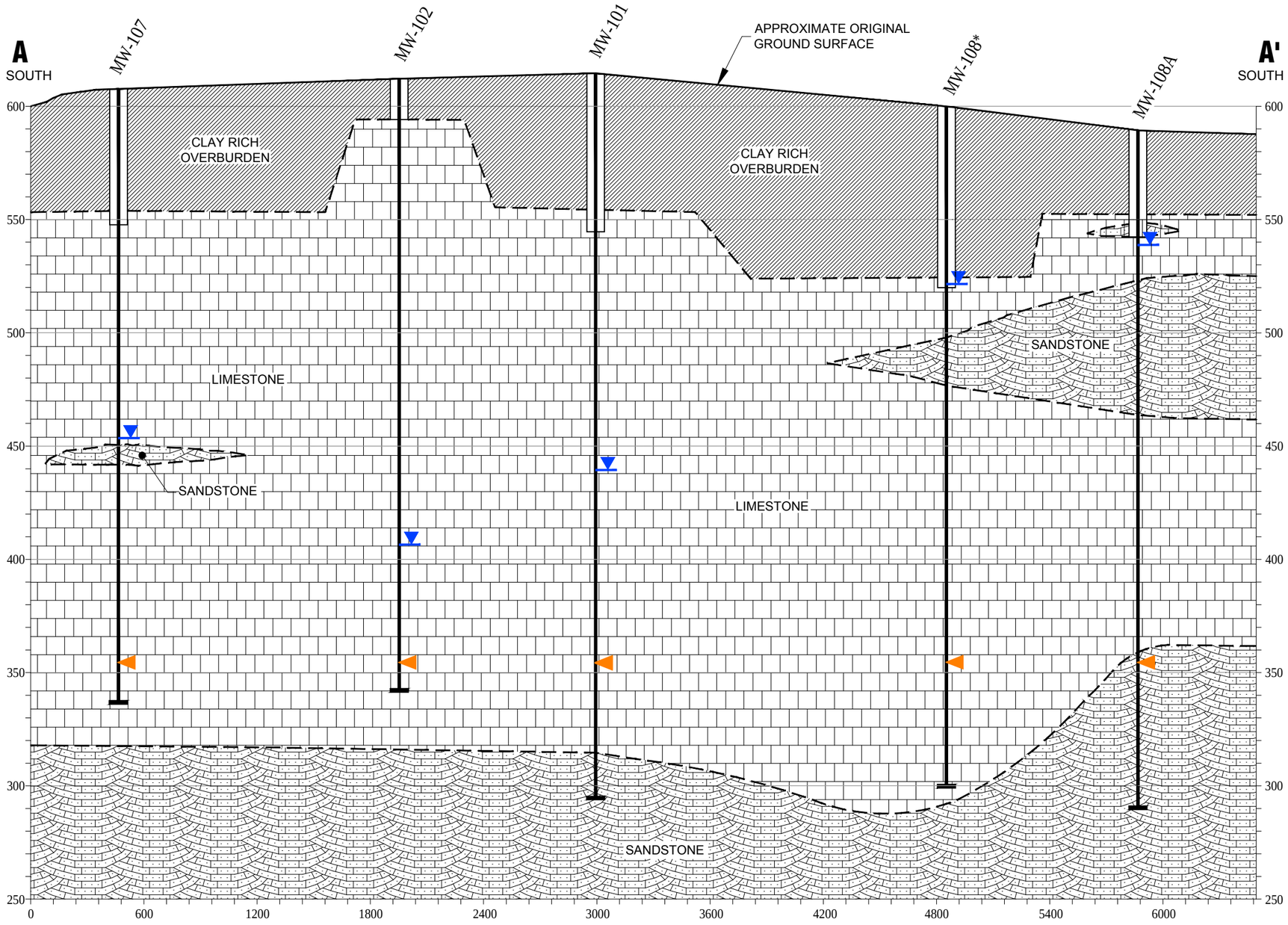
Map Rotation: 0
TRC - GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- SURFACE CASING
- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- SOIL BORING
- GROUNDWATER ELEVATION (COLLECTED 03/08/2017)
- SAMPLE COLLECTION POINT
- END OF BORING

* MW-108 ABANDONED JANUARY 24, 2017

Lithology Key

- CLAY-RICH OVERBURDEN
- LIMESTONE BEDROCK
- SANDSTONE BEDROCK

SCALE IN FEET
VERTICAL 50 0
HORIZONTAL 0 600

PROJECT:	DTE ELECTRIC COMPANY SIBLEY QUARRY LANDFILL TRENTON, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION A-A'
DRAWN BY:	DStehle
CHECKED BY:	S.HOLMSTROM
APPROVED BY:	V.BUENING
DATE:	SEPTEMBER 2017
PROJ NO.:	265996.0002.01
	FIGURE 4

TRC
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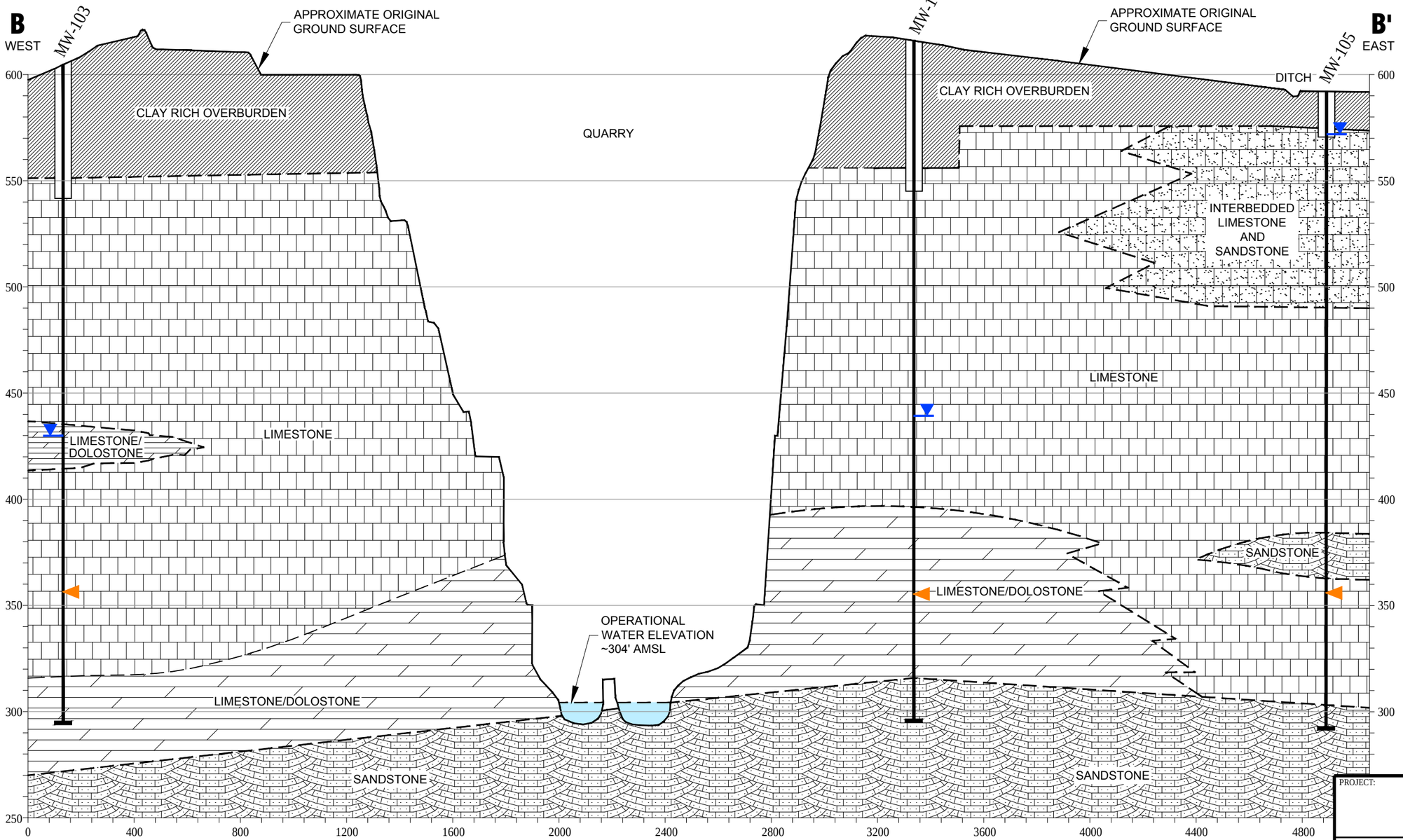
FILE NO.: 265996.0002.01.04-05.dwg

GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- SURFACE CASING
- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- SOIL BORING
- GROUNDWATER ELEVATION (COLLECTED 03/08/2017)
- SAMPLE COLLECTION POINT
- END OF BORING

Lithology Key

- CLAY RICH OVERBURDEN
- LIMESTONE BEDROCK
- INTERBEDDED LIMESTONE AND SANDSTONE
- SANDSTONE BEDROCK
- LIMESTONE / DOLOSTONE BEDROCK

AMSL = ABOVE MEAN SEA LEVEL

SCALE IN FEET
VERTICAL: 50, 0
HORIZONTAL: 0, 400

PROJECT:
DTE ELECTRIC COMPANY
SIBLEY QUARRY LANDFILL
TRENTON, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0002.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	SEPTEMBER 2017		

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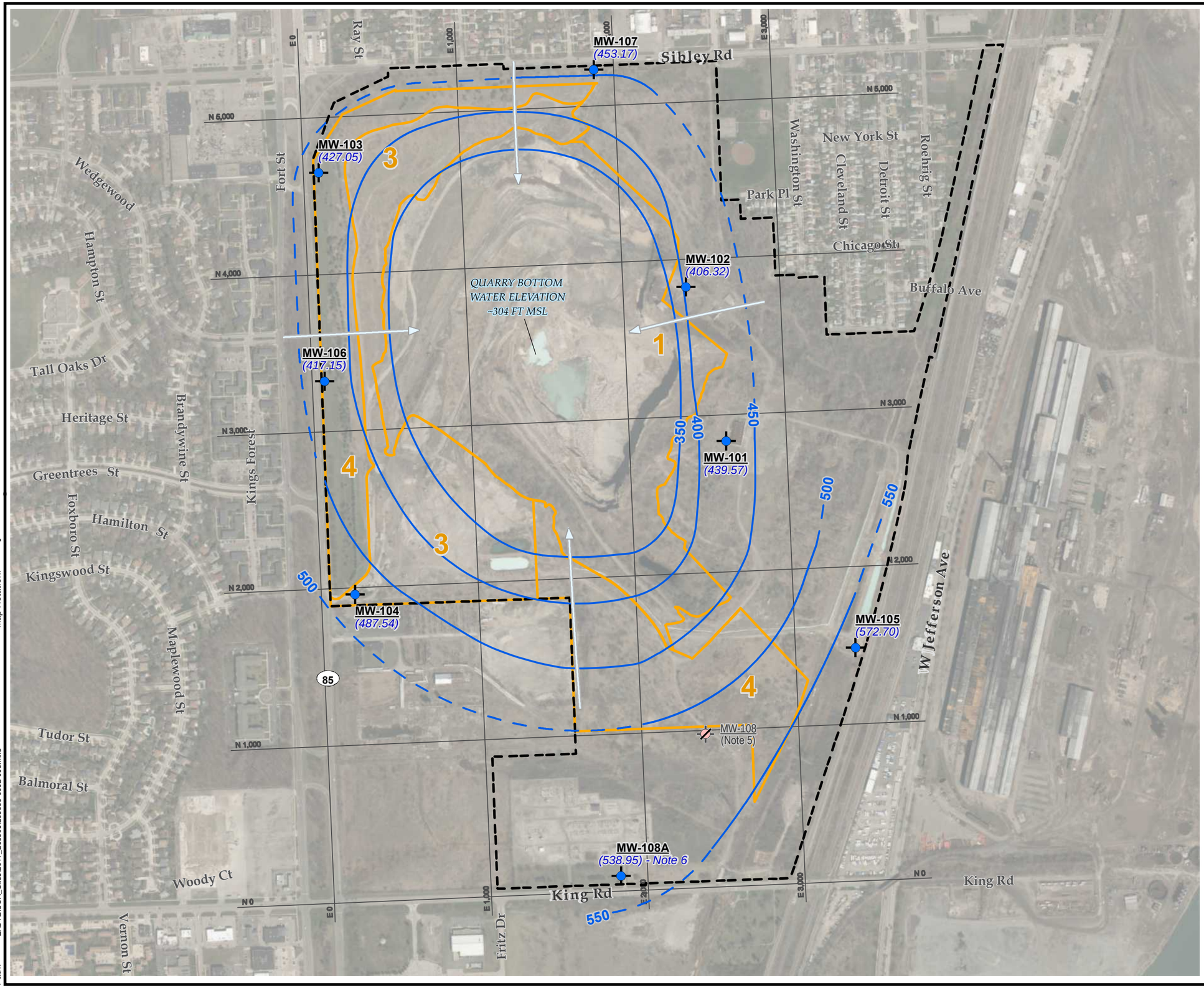
FILE NO.: 265996.0002.01.04-05.dwg



LEGEND

- MONITORING WELLS
- DECOMMISSIONED MONITORING WELL
- SIBLEY QUARRY PROPERTY LINE
- SOLID WASTE DISPOSAL AREA BOUNDARY
- 1 — FILL AREA DESIGNATION
- (439.08) — GROUNDWATER ELEVATION (FT MSL)
- POTENTIOMETRIC SURFACE CONTOUR (50-FT INTERVAL, DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER, 2011.
2. SITE LAYOUT INFORMATION FROM GEOREFERENCED CAD FILE. FEATURES ARE APPROXIMATE.
3. SURVEY PERFORMED BY THE DTE SURVEY GROUP IN AUGUST 2015, MAY 2016 AND JANURARY 2017.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL.
5. MONITORING WELL MW-108 WAS DECOMMISSIONED ON 1/25/2017.
6. MONITORING WELL MW-108A WAS INSTALLED ON 1/24/2017.

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:	DTE ELECTRIC COMPANY SIBLEY QUARRY LANDFILL 801 FORT STREET TRENTON, MICHIGAN
TITLE:	GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 2017
DRAWN BY: J. PAPEZ	PROJ NO.: 265996.0002
CHECKED BY: S. HOLMSTROM	FIGURE 6
APPROVED BY: V. BUENING	
DATE: OCTOBER 2017	

TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

FILE NO.: 265996-0002-008.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 10/12/2017, 09:46:18 AM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0002-008.mxd

Appendix A
Soil Boring and Monitoring Well Installation Logs

PROJECT No.: 1530539 / 0002

RECORD OF MONITORING WELL: MW-101

SHEET 1 OF 7

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 2832.20 E: 2587.40
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

DRILLING DATE: 7/14/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
			Grass/Gravel		615.23												
0	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	**(SC)** CLAYEY SAND, Heterogeneous, sub angular, trace to some GRAVEL, poorly graded (0-10'), well graded (10-58')		0.00												
5																	
10																	
15																	
20																	
25																	5" Black steel casing
30																	
35																	
40																	
45																	
50			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE
1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 2832.20 E: 2587.40
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 2 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)
50	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	**(SC)** CLAYEY SAND, Heterogeneous, sub angular, trace to some GRAVEL, poorly graded (0-10'), well graded (10-58') *(continued)*		
55					557.23
			(CL) SILTY CLAY		58.00
60			LIMESTONE, Homogeneous, angular, calcareous		555.23 / 60.00
65					
70					
75					
80					
85					
90					
95					
100			*CONTINUED NEXT PAGE*		

No.	PENETRATION RATE (m/min)	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	RQD % (80 60 40 20)	FRACT. INDEX PER 0.3 (5 10 15 20)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	DIAMETRAL POINT LOAD INDEX (MPa) (2 4 6)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
												5" Black steel casing
												4.75"

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 2832.20 E: 2587.40

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 3 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015

DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
100			LIMESTONE, Homogeneous, angular, calcareous *(continued)*														
105																	
110																	
115																	
120																	
125	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)															4.75"
130																	
135																	
140																	
145																	
150			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE

1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:

LOGGED: Stephen Tatum

CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 2832.20 E: 2587.40

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 4 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015

DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
150			LIMESTONE, Homogeneous, angular, calcareous *(continued)*														
155																	
160																	
165																	
170																	
175	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)															4.75"
180																	
185																	
190																	
195																	
200			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE

1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:

LOGGED: Stephen Tatum

CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 2832.20 E: 2587.40
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 5 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
200			LIMESTONE, Homogeneous, angular, calcareous *(continued)*														
205																	
210																	
215																	
220					395.23												
			DOLOSTONE, Homogeneous, angular, calcareous		220.00												
225	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)															4.75"
230																	
235																	
240																	
245																	
250			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 2832.20 E: 2587.40
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 6 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
250			DOLOSTONE, Homogeneous, angular, calcareous *(continued)*														
255																	
260																	
265																	
270																	
275	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)															4.75"
280																	
285																	
290																	
295																	
300			*CONTINUED NEXT PAGE*		315.23												

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 2832.20 E: 2587.40
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-101

SHEET 7 OF 7

DATUM: Local

DRILLING DATE: 7/14/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
300	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	SANDSTONE, fine grained, well sorted		300.00												
305																	
310																	4.75"
315																	
320					295.23												
			End of Borehole.		320.00												
325																	
330																	
335																	
340																	
345																	
350																	

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

RECORD OF MONITORING WELL: MW-102

SHEET 1 OF 6

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 3821.60 E: 2394.30
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR / % RETURN	FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
			Ground Surface		612.62													
0	Track Mounted Sonic Drill	Sonic (Casing:4 in. Casing;)	**(CL)** CLAY, Gravely CLAY, brown, coarse gravel, stiff, w<pl, non-plastic.		0.00	1												
5																		
10						2												5" Black steel casing
15																		
					596.12													
			LIMESTONE, fossiliferous, light gray, multiple stylolites.		16.50													
20	Track Mounted Sonic Drill	PQ Coring				3												
						4												
25						5												
30																		
35						6												4.75"
40																		
45						7												
50			*CONTINUED NEXT PAGE*															

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 3821.60 E: 2394.30
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-102

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
50	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, fossiliferous, light gray, multiple stylolites. *(continued)*														
55						8											
					554.12												
			LIMESTONE, brownish gray, many large round fossils		58.50												
60																	
					549.72												
			LIMESTONE, gray, angular bedding														
					63.30												
			LIMESTONE, brownish gray, horizontal bedding														
65						9											
70						10											
					538.42												
			LIMESTONE, brown, thin-very thin horizontal beddding		74.20												4.75"
75						11											
					534.02												
			LIMESTONE, gray, deformed bedding, synclinal folding		78.60												
80																	
					530.42												
			LIMESTONE, gray, brecciated		529.72												
			LIMESTONE, brownish gray, thin horizontal bedding		82.90												
85						12											
90																	
95						13											
					515.92												
			LIMESTONE, light gray, non-laminar bedding		96.70												
					514.82												
			LIMESTONE, gray to brownish gray, horizontal wavy bedding		97.80												
100																	
			CONTINUED NEXT PAGE														

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 3821.60 E: 2394.30

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-102

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
100	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, gray to brownish gray, horizontal wavy bedding *(continued)*		508.52												
105			LIMESTONE, gray, thicker (~0.5") bedding , wavy, non-laminar		104.10 507.32	14											
			LIMESTONE, light gray, thick (0.5-5") bedding		506.42												
			LIMESTONE, thin bedding, brownish gray and black layering		106.60												
			LIMESTONE, thick bedding with cross cutting		503.02												
110			LIMESTONE, brownish gray with thin horizontal layers		109.60 501.92												
			LIMESTONE, large wavy stylolite marks change in color to gray		110.70 500.22												
			LIMESTONE, brownish gray, thin mostly horizontal bedding		112.40 497.72												
115			LIMESTONE, gray, thick bedding		496.82	15											
			LIMESTONE, brown, thinly bedded		115.80 494.02												
			LIMESTONE, sharp contact at 118.6, goes from brown to gray		493.22 119.40												
120			LIMESTONE, light gray, friable, thinly bedded (~1mm)		491.72	16											
			LIMESTONE, brown-brownish gray, fractured, thinly bedded		120.90												
125						17											4.75"
130																	
135			LIMESTONE, gray fragments in a light gray cement. Breccia		477.52 476.82 135.80	18											
			LIMESTONE, brown-brownish gray, fractured, thinly bedded		474.42												
			LIMESTONE, light gray, thin wavy bedding, stylolites		138.20 472.62												
140			LIMESTONE, brown-brownish gray, thin horizontal bedding		140.00 471.12												
			LIMESTONE, gray, thin horizontal bedding		141.50 467.62	19											
145			LIMESTONE, brownish gray, deformed wavy bedding		466.62												
			LIMESTONE, brownish gray, thin horizontal bedding. Broken into many small pieces 148.5-150ft		146.00	20											
150			*CONTINUED NEXT PAGE*		462.62												

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE

1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 3821.60 E: 2394.30

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-102

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
150	Track Mounted Sonic Drill	PQ Coring	deformed wavy bedding, many small voids		461.92 / 150.70												
			thin horizontal bedding, many small voids seam of mostly void spaces in gray Limestone completely crushed, fine sand - large gravel size pieces of Limestone			21											
155																	
						22											
160					452.02												
			LIMESTONE, gray, thinly bedded, small voids with crystals		160.60 / 448.62												
			LIMESTONE, light gray, deformed bedding, many small voids throughout, some filled with crystals		164.00 / 447.22	23											
165			LIMESTONE, gray-dark gray, thin horizontal bedding		165.40 / 443.52												
			LIMESTONE, thick bedding, large voids, many brown crystals		169.50												
170			LIMESTONE, gray-dark gray, thin horizontal bedding														
175					436.42	24											4.75"
			LIMESTONE, gray- dark gray, thin horizontal bedding, many voids, brittle		176.20 / 434.42												
			LIMESTONE, brown, thin horizontal bedding, friable, appears fine grained instead of crystalline.		178.20 / 432.62												
180			LIMESTONE, light brown, fine grain, no bedding, calcite filled vertical fractures graying in color		180.00 / 427.92												
			LIMESTONE, light brown-white, some horizontal cracking		185.20	25											
185			LIMESTONE gray- dark gray, thin slightly deformed horizontal bedding, stylolites		422.62												
			LIMESTONE, gray, thin horizontal bedding, large crystal filled voids, many small voids throughout		190.00												
190																	
195						26											
200			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite; Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite; Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar; Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE

1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 3821.60 E: 2394.30

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-102

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
200	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, gray, thin horizontal bedding, large crystal filled voids, many small voids throughout *(continued)*														
205						27											
210					401.62												
			LIMESTONE, gray-light gray, thicker (up to 0.5") wavy bedding		211.00												
					398.82												
			LIMESTONE, grayish brown, thin horizontal bedding		213.80												
215						28											
220																	
225						29											4.75"
					386.12												
			LIMESTONE, light gray, thick (~0.5") wavy bedding		226.50												
			black seam with fracture at base		384.82												
			LIMESTONE, gray, thin horizontal bedding		227.90												
230					382.62												
			LIMESTONE, light gray, many small black crystals, evidence of bioturbation.		381.92												
			LIMESTONE, gray, thin mostly horizontal bedding		380.92												
			LIMESTONE, no layering, single bed, small black crystals		231.70												
235			LIMESTONE, gray, thin mostly horizontal bedding, many small black crystals			30											
					372.62												
240			LIMESTONE, gray-blue, angular bedding until a stylolite at 240.6 where bedding becomes wavy and deformed		240.00												
			LIMESTONE, gray, thin horizontal bedding		370.72												
			LIMESTONE, gray, deformed bedding		369.72												
			LIMESTONE, gray, thin horizontal bedding		368.62												
245			LIMESTONE, gray, deformed wavy bedding, many stylolites		244.00	31											
			LIMESTONE, gray, thin horizontal bedding, many small voids throughout, some large crystals		367.32												
					245.30												
250					362.62												
			CONTINUED NEXT PAGE														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE

1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 3821.60 E: 2394.30

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-102

SHEET 6 OF 6

DATUM: Local

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
250	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, brownish gray- gray, thick (1-6") deformed bedding, many large crystals that do not react to HCl, harder than 2 on Mohs hardness scale.		250.00												
255						32											
260			many small white crystals easily scratched with fingernail														4.75"
265						33											
270					342.62												
			End of Borehole.		270.00												
275																	
280																	
285																	
290																	
295																	
300																	

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE

1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

SHEET 1 OF 7
DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR / % RETURN	FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
			Grass		604.67													
0	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	**(SC)** CLAYEY SAND, Heterogeneous, sub angular, medium gravels in a FLY ASH SANDY CLAY matrix, well sorted		0.00													
					601.67													
			ASH, Homogeneous, very fine grained, FLY ASH, well sorted		3.00													
5					598.67													
			(SC) CLAYEY SAND, Heterogeneous, sub-angular, medium gravel, poorly sorted		6.00													
					595.67													
			(CL) SILTY CLAY, Heterogeneous, sub-angular, fine to medium to coarse, trace to some FLY ASH (9-15'), poorly sorted		9.00													
10																		
15																		
20																		
25																		5" Black steel casing
30																		
35																		
40																		
45																		
50			*CONTINUED NEXT PAGE*															

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 4635.40 E: 83.10

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 2 OF 7

DATUM: Local

DRILLING DATE: 7/15/2015

DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
50	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	**(CL)** SILTY CLAY, Heterogeneous, sub-angular, fine to medium to coarse, trace to some FLY ASH (9-15'), poorly sorted *(continued)*														
					551.67												
			Homogeneous, angular, coarse grained, calcareous, LIMESTONE, poorly sorted, evidence of fossils (85'), darker grain colors (130-170')		53.00												
55																	5" Black steel casing
60																	
65																	
70																	
75																	
80																	4.75"
85																	
90																	
95																	
100			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE

1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:

LOGGED: Stephen Tatum

CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 3 OF 7

DATUM: Local

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE FEET	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
100	TH-55 Rotary Rig Air and Water Rotary (Casing:5";)	Homogeneous, angular, coarse grained, calcareous, LIMESTONE, poorly sorted, evidence of fossils (85'), darker grain colors (130-170') *(continued)*														
105																
110																
115																
120																
125																4.75"
130																
135																
140																
145																
150		*CONTINUED NEXT PAGE*														

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 4 OF 7

DATUM: Local

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)
150	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	Homogeneous, angular, coarse grained, calcareous, LIMESTONE, poorly sorted, evidence of fossils (85'), darker grain colors (130-170') *(continued)*		
155					
160					
165					
170					434.67 / 170.00
			Homogeneous, angular, medium to coarse, DOLOSTONE		
175					
180					
185					
190					414.67 / 190.00
			Heterogeneous, fine to coarse grained, abundant calcite crystals, LIMESTONE		
195					
200			*CONTINUED NEXT PAGE*		

No.	PENETRATION RATE (m/min)	COLOUR % RETURN	FLUSH	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	RQD % (80 60 40 20)	FRACT. INDEX PER 0.3 (5 10 15 20)	DISCONTINUITY DATA DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	DIAMETRAL POINT LOAD INDEX (MPa) (2 4 6)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
												4.75"

Type
JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape
PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness
PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling
Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE
1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 5 OF 7

DATUM: Local

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
200	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	Heterogeneous, fine to coarse grained, abundant calcite crystals, LIMESTONE *(continued)*														
205																	
210					394.67 / 210.00												
			Homogeneous, angular, fine grained matrix, LIMESTONE														
215																	
220																	
225																	4.75"
230																	
235																	
240																	
245																	
250			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 6 OF 7

DATUM: Local

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
250	TH-55 Rotary Rig	Air and Water Rotary (Casing:5";)	Homogeneous, angular, fine grained matrix, LIMESTONE *(continued)*														
255																	
260																	
265																	
270																	
275																	4.75"
280																	
285																	
290					314.67 / 290.00												
			Homogeneous, angular, DOLOSTONE														
295																	
300			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 4635.40 E: 83.10
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-103

SHEET 7 OF 7
DATUM: Local

DRILLING DATE: 7/15/2015
DRILLING CONTRACTOR: Pearson Drilling Co.

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
300	TH-55 Rotary Rig Air and Water Rotary (Casing:5";)	Homogeneous, angular, DOLOSTONE *(continued)*														
305																4.75"
310				294.67												
		End of Borehole.		310.00												
315																
320																
325																
330																
335																
340																
345																
350																

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Stephen Tatum
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 1949.90 E: 221.90
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0			Ground Surface		605.98													
			Topsoil		604.98													
			CLAY with gravel, brown-dark brown, firm, w<pl, dry, becomes stiff at 3ft		1.00	1												
5					600.98													
			Gravelly CLAY, dark brown-dark gray, friable, noncohesive, non-plastic, dry		5.00													
					598.98													
			Gravelly CLAY, dark brown-gray, cohesive, w>pl, small to large gravel		7.00													
10						2												
15			6" seam of small angular gravel with clay at 15ft															
20						3												
25	Track Mounted Sonic Drill	Sonic (Casing:4 in. Casing:)																5" Black steel casing
30						4												
35																		
40						5												
45																		
					556.98	6												
50					49.00													
			CONTINUED NEXT PAGE															

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 1949.90 E: 221.90
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
50	Track Mounted Sonic Drill	Sonic	LIMESTONE, gray-dark gray, crystalline, some shell fragments, thin horizontal bedding *(continued)*		6												5" Black steel casing
55					7												
60			abundant white shells		8												
65					9												
70			antiform folded bedding 68-69ft														
				534.38													
			LIMESTONE, thick horizontal bedding, weathered, many small voids, reacts strongly to HCl Highly reactive to HCL.	71.60													
				532.28													
			LIMESTONE, brownish gray-gray, thin horizontal bedding, many fractures along bedding plane, mild reaction to HCl Medium reaction to HCL.	73.70	10												
75	Track Mounted Sonic Drill	PQ Coring		529.58													
			No recovery. Driller reported that interval felt like void	76.40													4.75"
				527.58													
			LIMESTONE, gray-brown, thin angular bedding, reacts well to HCl Highly reactive to HCL.	78.40													
80																	
				522.48													
			SANDSTONE, brown, fine grain, massive layering, porous, very slight reaction to HCl Low to no reaction to HCL.	83.50													
85				520.38	11												
			SANDSTONE, light brown-gray, fine grain, thin bedding, very porous, slight to no reaction to HCl Low to no reaction to HCL.	85.60													
90																	
95					12												
				507.33													
			LIMESTONE, gray, thin horizontal bed, stylolites	98.65													
100			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 1949.90 E: 221.90

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

SHEET 3 OF 7

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
100	Track Mounted Sonic Drill	PQ Coring			505.08												
			Interbedded layers of brown SANDSTONE and gray LIMESTONE, 1-5mm thick horizontal layers, many fractures		100.90												
105					499.38	13											
			LIMESTONE, gray-light brown, thin horizontal layers brecciated limestone from 107.9-108.1 ft		106.60												
110					494.98												
			LIMESTONE, gray, thick bedding, wavy stylolites		111.00												
			LIMESTONE, gray-light brown, thin horizontal bedding		493.28 112.70												
115					490.68	14											
			LIMESTONE, gray-brown, very porous, many voids, large crystals		115.30												
					487.78												
			Interbedded SANDSTONE and LIMESTONE		118.20												
120					485.68												
			LIMESTONE, gray-brown, thin horizontal bedding		120.30												
			SANDSTONE, brown, porous, thick bedding, weathered, little to no reaction to HCl Low to no reaction to HCL.		484.18 121.80												
					481.73												
			BRECCIA, limestone fragments		480.88												
125			Interbedded SANDSTONE and LIMESTONE, brown-gray, porous, angled bedding to 127.2ft horizontal to 130ft		125.10	15											4.75"
					475.98												
130			LIMESTONE, light brown, fine grain, porous, thick bedding, reacts to HCl Medium reaction to HCL.		130.00												
135						16											
140																	
					462.88												
			BRECCIA, limestone, brittle		143.10												
					461.38												
145			LIMESTONE, light brown-gray, thin bedding, many sinuous stylolites		144.60 459.98	17											
			LIMESTONE, crystalline, light gray, thick bedding, reacts well to HCl Highly reactive to HCL.		146.00												
150					455.98												
			CONTINUED NEXT PAGE														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture; BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite; Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite; Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar; Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE

1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 1949.90 E: 221.90
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
150	Track Mounted Sonic Drill	PQ Coring	DOLOSTONE, light gray-whitish, thin horizontal-wavy bedding, reacts to HCl when scratched Low to no reaction to HCL.		150.00												
155					450.58	18											
			LIMESTONE, dark gray, very weathered/crumbly, many voids and fractures, abundant mineralization		449.88												
			LIMESTONE, gray-light brown, thin horizontal bedding		156.10												
160																	
					442.58												
			DOLOSTONE, light gray with light brown and black swirling, reacts to HCl when scratched Low to no reaction to HCL.		163.40												
165						19											
170					435.58												
			LIMESTONE, light gray, thin horizontal - wavy bedding, weathered, voids		170.40												
					430.88												
175			LIMESTONE, brownish gray, thin horizontal bedding, some small voids, reacts to HCl Highly reactive to HCL.		175.10	20											4.75"
180																	
185						21											
					416.98												
			LIMESTONE, gray, crystalline, thin horizontal bedding, many stylolites becomes more fine grain than crystalline		189.00												
190																	
195						22											
200			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE
PROJECT: Sibley Quarry Closure
LOCATION: Sibley Quarry
N: 1949.90 E: 221.90
Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015
DRILLING CONTRACTOR: Cascade Drilling

SHEET 5 OF 7
DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
200	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, gray, crystalline, thin horizontal bedding, many stylolites *(continued)* weak to no reaction to HCl Low to no reaction to HCL. fractured zone, many broken/crushed pieces		403.48 / 202.50												
205			LIMESTONE, light gray, thin-thick bedding, some stylolites, reacts to HCl Highly reactive to HCL.			23											
210			LIMESTONE, crystalline, light gray-blue layered, thin horizontal bedding		395.08 / 394.28 / 211.70												
			LIMESTONE, dark gray-brown, thick-thin wavy deformed bedding, reacts when scratched. Low to no reaction to HCL.		391.28 / 214.70	24											
215			LIMESTONE, light gray-gray, thin horizontal bedding, many small thin voids, likely crystals that were dissolved.														
220						25											
					381.58												
225			LIMESTONE, thin wavy bedding, thickening with depth		224.40 / 380.08												4.75"
			LIMESTONE, brecciated														
			LIMESTONE, solid gray layer		226.50												
			Stylolite ~0.5" thick with fractures on either side			26											
230			LIMESTONE, light gray-gray, thin-thick horizontal-wavy bedding														
235						27											
240																	
245					360.38	28											
			LIMESTONE, fine grain, light brown, thin horizontal bedding, porous, many voids, abundant white non reactive crystals		245.60												
250			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage
Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular
Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough
Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE
1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:
LOGGED: Brian Eustice
CHECKED: B. Johnson

Golder Associates

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 1949.90 E: 221.90

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

SHEET 6 OF 7

DATUM: Local

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
250	Track Mounted Sonic Drill	PQ Coring	LIMESTONE, fine grain, light brown, thin horizontal bedding, porous, many voids, abundant white non reactive crystals *(continued)*														
255						29											
260						30											
265																	
270						31											4.75"
275																	
280						32											
285																	
290						33											
295																	
300			*CONTINUED NEXT PAGE*														

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Si-Silt, Su-Sulphide, Oth-Other, Qfsp-Quartz Feldspar

DEPTH SCALE

1 in to 6 ft

Golder Associates

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

PROJECT No.: 1530539 / 0002

CLIENT: DTE

PROJECT: Sibley Quarry Closure

LOCATION: Sibley Quarry

N: 1949.90 E: 221.90

Survey Provided by: DTE Energy's Surveying Service, Dated 8/26/2015

RECORD OF MONITORING WELL: MW-104

DRILLING DATE: 7/16/2015

DRILLING CONTRACTOR: Cascade Drilling

DATUM: Local

INCLINATION: -90°

DEPTH SCALE FEET	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	No.	PENETRATION RATE (m/min)	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	RQD %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
300	Track Mounted Sonic Drill / PQ Coring	LIMESTONE, fine grain, light brown, thin horizontal bedding, porous, many voids, abundant white non reactive crystals *(continued)*														
305					34											4.75"
310				295.98												
		End of Borehole.		310.00												
315																
320																
325																
330																
335																
340																
345																
350																

Type: JN-Joint, FLT-Fault, SH-Shear, VN-Vein, FR-Fracture, BD-Bedding, FO-Foliation, CO-Contact, OR-Orthogonal, CL-Cleavage

Shape: PL-Planar, CU-Curved, UN-Undulating, ST-Stepped, IR-Irregular

Roughness: PO-Polished, K-Slickensided, SM-Smooth, Ro-Rough, VR-Very Rough

Infilling: Br-Brocken Rock, Bt-Biotite, Cl-Clay, Ch-Chlorite, Ca-Calcite, Ep-Epidote, Fe-Iron, Go-Gouge, Gr-Gravel, He-Hematite, Py-Pyrite, Qz-Quartz, Sa-Sand, Se-Sericite, Qfsp-Quartz Feldspar, Si-Silt, Su-Sulphide, Oth-Other

DEPTH SCALE

1 in to 6 ft

SOIL CLASSIFICATION SYSTEM:

LOGGED: Brian Eustice

CHECKED: B. Johnson

Golder Associates

WELL CONSTRUCTION LOG

WELL NO. MW-105

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Sibley Quarry CCR	3/22/16	3/30/16	231828.0002.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Mud/Water Rotary	590.71	593.28	300.0	8"/4.75"

Boring Location: Near pump house, E of quarry.	Personnel	Drilling Equipment:
N: 1469.07 E: 3370.82	Logged By - C. Scieszka Driller - J. Bacome	CME 750X

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Trenton	Wayne	MI	While Drilling: Date/Time After Drilling: Date/Time 4/19/16 18:45 ▼ Depth (ft bgs) 23.20

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 AU			0	**GRAVEL** mostly coarse gravel, trace to few sand, trace clay, gray (10YR 5/1), no odor, dry, loose.				
				SILTY CLAY WITH SAND mostly clay, little to some silt, little medium to coarse sand, trace to few fine to coarse gravel, brown (10YR 4/3), mottled with black (10YR 2/1), no odor, moist, stiff.	CL-ML			
2 AU			10	**LIMESTONE** gray to white, high reaction to HCL.				
3 AU			20 ▼					Surface casing set at 20 feet below ground surface.
4 AU				**SANDSTONE** coarse grained, brown, brittle, high reaction to HCL.				
5 AU			30					
			40	**LIMESTONE** dark gray to gray, trace to few black fragments present, medium reaction to HCL.				
6 AU				**SANDSTONE** coarse grained, brown, brittle, high reaction to HCL.				
			50	**LIMESTONE** dark gray to gray, trace to few black fragments present, slight reaction to HCL.				
7 AU				**SANDSTONE** fine grained, brown, brittle, very slight reaction to HCL.				
			60					
8 AU				**LIMESTONE** gray, little calcite crystals, medium to high reaction to HCL.				
			70	**SANDSTONE** fine grained, brown, brittle, slight reaction to HCL.				
9 AU				**LIMESTONE** gray to dark gray, no calcite crystals, medium to high reaction to HCL.				
			80	**SANDSTONE** fine grained, brown, brittle, medium reaction to HCL.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 5/23/16

Signature: _____ Checked By: R. Pulliam

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

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
10 AU			90	Change to trace to few limestone cuttings mixed with sandstone cuttings, slight reaction to HCL at 85 feet.				
11 AU			100	Change to no limestone cuttings at 92 feet.				
12 AU			110	**LIMESTONE** grayish brown to bluish gray, flat angular cuttings, medium reaction to HCL.				
13 AU			120	Change to grayish brown, slight reaction to HCL at 112 feet.				
14 AU			130					
15 AU			140					
16 AU			150	Change to medium reaction to HCL at 142 feet.				
17 AU			160					
18 AU			170					
19 AU			180	**FRACTURE** 170 to 171 feet. **LIMESTONE** grayish brown, slight reaction to HCL.				
20 AU			190	Change to high reaction to HCL at 182 feet.				
21				Change to gray at 190 feet. Change to medium reaction to HCL at 192 feet.				

WELL CONSTRUCTION LOG

WELL NO. MW-105

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
AU			200	Change to few to little black fragments present, slight to medium reaction to HCL at 202 feet.				
22 AU				**SANDSTONE** brown to yellowish brown, fine grained, calcite crystals present, slight to medium reaction to HCL.				
			210	Change to dark brown to black at 212 feet.				
23 AU			220					
24 AU				**LIMESTONE** dark gray to dark grayish brown, angular cuttings, trace to few crystals, slight to medium reaction to HCL.				
			230					
25 AU			240					
26 AU			250					
27 AU			260					
28 AU			270					
29 AU			280					
30 AU			290	**SANDSTONE** white, fine grained.				No recovery from 290 to 300 feet. Cuttings in mud-pan likely sandstone too fine for sieve.
31 AU			300	End of boring at 300 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 5/23/16

WELL CONSTRUCTION LOG

WELL NO. MW-106

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Sibley Quarry CCR	3/23/16	3/28/16	231828.0002.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Mud/Water Rotary	603.99	606.75	300.0	8"/4.75"

Boring Location: W of quarry, approximately 50 feet E of Fort Street.	Personnel	Drilling Equipment:
N: 3343.60 E: 71.70	Logged By - C. Scieszka Driller - J. Bacome	CME 750X

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
Trenton	Wayne	MI	While Drilling: Date/Time		Depth (ft bgs)
			After Drilling: Date/Time	4/19/16 10:50	Depth (ft bgs) 189.37

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 AU			0	**TOPSOIL** dark brown (10YR 3/3), no odor, moist, dense.	CL-ML			
				SILTY CLAY mostly clay, little to some silt, low plasticity, dark grayish brown (10YR 4/2), no odor, moist, very stiff.				
				COAL ASH WITH COAL mostly coal ash, little coal fragments, black (10YR 2/1), white flecks, soft.				
			10	Change to no coal fragments at 5.0 feet.				
2 AU				**SILTY CLAY** mostly clay, little to some silt, low plasticity, brown (10YR 4/3), no odor, very stiff.				
			20					
3 AU				Change to trace to few medium to coarse sand at 25 feet.	CL-ML			
			30					
4 AU								
				LIMESTONE gray, low reaction to HCL.				
5 AU			40					Surface casing set at 42 feet.
6 AU								
			50					
7 AU				Change to dark gray, medium reaction to HCL at 55 feet.				
			60					
8 AU				Change to evidence of fossils present at 65 feet.				
			70					
9 AU				Change to gray, high reaction to HCL, no evidence of fossils at 77 feet.				
			80					

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 6/3/16

Signature:

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

734.971.7080
Fax 734.971.9022

Checked By: R. Pulliam

WELL CONSTRUCTION LOG

WELL NO. MW-106

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
10 AU			90	**LIMESTONE** gray, high reaction to HCL.				
11 AU			100	Change to grayish brown, low to medium reaction to HCL at 95 feet.				
12 AU			110					
13 AU			120					
14 AU			130	Change to trace to few calcite crystals present, medium to strong reaction to HCL at 122 feet.				
15 AU			140	Change to no calcite crystals, brown, no to low reaction to HCL at 132 feet.				
16 AU			150					
17 AU			160					
18 AU			170	**DOLOSTONE** dark gray, no reaction to HCL.				
19 AU			180					
20 AU			190	**LIMESTONE** little to some calcite crystals, gray to white, low reaction to HCL. ▼				
21								

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 6/3/16

WELL CONSTRUCTION LOG

WELL NO. MW-106

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
AU			200	**LIMESTONE** little to some calcite crystals, gray to white, low reaction to HCL. Change to few calcite crystals at 202 feet.				
22 AU			210					
23 AU			220					
24 AU			230					
25 AU			240					
26 AU			250					
27 AU			260					
28 AU			270					
29 AU			280					
30 AU			290					
31 AU			300	End of boring at 300 feet below ground surface.				

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-107

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Sibley Quarry CCR	3/23/16	4/6/16	231828.0002.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Mud/Water Rotary	607.51	610.03	270.0	8"/4.75"/3.875"

Boring Location: Near Sibley Road gate, N of quarry.	Personnel	Drilling Equipment:
N: 5193.15 E: 1841.68	Logged By - C. Scieszka Driller - J. Bacome	CME 750X

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
Trenton	Wayne	MI	While Drilling:	Date/Time	Depth (ft bgs)
			After Drilling:	Date/Time 4/19/16 07:51 ▼	Depth (ft bgs) 153.12

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 AU			0	**TOPSOIL** very dark grayish brown (10YR 3/2), no odor, dry, dense.				
				SILTY CLAY mostly clay, some silt, trace medium to coarse sand, medium plasticity, brown (10YR 4/3), no odor, dry, very stiff.	CL-ML			
2 AU			10	Change to few medium to coarse sand, few fine to coarse gravel at 5 feet.				
				SILTY CLAY WITH SAND AND GRAVEL mostly clay, little to some silt, little medium to coarse sand, little fine to coarse gravel, low to medium plasticity, brown (10YR 5/3), no odor, stiff.	CL-ML			
3 AU			20					
				SANDY CLAY mostly clay, little to some medium to coarse sand, dark grayish brown (10YR 4/2), no odor, stiff.				
4 AU			30					
					CL			
5 AU			40					
6 AU			50					
				LIMESTONE grayish brown to white, medium to high reaction to HCL.				
7 AU			60					Surface casing set at 60 feet.
8 AU								
			70	Change to brown at 72 feet.				
9 AU								
			80	Change to slight to medium reaction to HCL at 82 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 6/3/16

Signature: [signature]

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

Checked By: R. Pulliam

WELL CONSTRUCTION LOG

WELL NO. MW-107

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
10 AU			90	**LIMESTONE** brown, slight to medium reaction to HCL.				
				Change to gray, high reaction to HCL at 92 feet.				
11 AU			100					
12 AU			110					Fractured zone at 105 feet, lost return.
13 AU			120					
14 AU								
15 AU			130	Change to grayish brown, medium to high reaction to HCL at 125 feet.				Advanced 4.5 inch casing to 127 feet, to case off fractured zone.
16 AU								
17 AU			140	Change to dark gray to gray, styolites present, low to medium reaction to HCL. Change to no styolites at 137.5 feet.				Advanced 4.5 inch casing to 135 feet, to case off fractured zone. Continue drilling with 3 7/8" tri-cone drill bit at 135 feet.
18 AU			150	Change to slight reaction to HCL at 142 feet.				
19 AU			160	▼ Change to slight to medium reaction to HCL at 152 feet. **SANDSTONE** fine grained, grayish brown, low reaction to HCL.				
20 AU			170	**DOLOSTONE** gray to dark gray to grayish brown, no reaction to HCL.				
21 AU			180	**LIMESTONE** dark gray, little to some calcite crystals present, low to medium reaction to HCL. Change to gray to grayish brown, trace to few calcite crystals present at 177 feet. Change to no calcite crystals present at 181 feet.				
22 AU			190					Temporarily lost return, likely smaller fractured zone at approximately 187 feet.
23 AU								

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 6/3/16

WELL CONSTRUCTION LOG

WELL NO. MW-107

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			200	**LIMESTONE** gray to grayish brown, low to medium reaction to HCL.				
24 AU								
			210	Change to mostly gray to grayish brown, some dark gray, medium reaction to HCL.				
25 AU								
			220	Change to gray to grayish brown at 221 feet.				
26 AU				**SANDSTONE** fine grained, grayish brown. **LIMESTONE** gray to brownish gray, slight reaction to HCL.				
			230					
27 AU								
			240					
28 AU				Change to gray to brown slight reaction to HCL at 243.5 feet. Change to gray to grayish brown, very slight reaction to HCL.				
			250					
29 AU								
			260	**FRACTURE** 258 to 259 feet. **LIMESTONE** brown to dark brown, very slight reaction to HCL. Change to medium reaction to HCL at 265 feet.				
30 AU			270	End of boring at 271.0 feet below ground surface.				Ended boring due to smaller diameter tooling locking up.
			280					
			290					
			300					

WELL CONSTRUCTION LOG

WELL NO. MW-108

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Sibley Quarry CCR	3/21/16	3/29/16	231828.0002.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Mud/Water Rotary	600.22	602.96	300.0	8"/4.75"

Boring Location: S of quarry.	Personnel	Drilling Equipment:
N: 961.12 E: 2446.71	Logged By - C. Scieszka Driller - J. Bacome	CME 750X

Civil Town/City/or Village:	County:	State:	Water Level Observations:
Trenton	Wayne	MI	While Drilling: Date/Time After Drilling: Date/Time 4/19/16 13:16 ▼ Depth (ft bgs) 82.15

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 AU			0	**GRAVEL** mostly fine to coarse gravel, trace to few silt, gray (10YR 4/1), no odor, moist, loose.				
				SAND FILL mostly fine to coarse sand, trace to few slag, trace to few cinders, black (10YR 2/1), moist, no odor, loose.	SW			
2 AU			10	**SAND** mostly fine to coarse sand, trace silt, very dark gray (10YR 3/1), mothball odor, loose, some wood fragments present.				
				CLAYEY SAND mostly fine to coarse sand, little to some clay, trace to few fine gravel, dark grayish brown (10YR 4/2), no odor, loose.				
3 AU			20	Change to brown (10YR 4/3) at 15 feet.	SC			
4 AU			30	**SANDY CLAY WITH SILT** mostly clay, little to some fine to coarse sand, few to little silt, medium plasticity, brown (10YR 4/3), no odor, soft.	CL-ML			
5 AU			40	**SILTY CLAY** mostly clay, little to some silt, low plasticity, brown (10YR 4/3), no odor, stiff.				
6 AU			50		CL-ML			
7 AU			60					
8 AU			70					
				LIMESTONE gray to dark gray, 1 foot thick soft interval from 76 to 77 feet.				
9 AU			80	▼ Change to dark gray , low to medium HCL reaction, darker grained fragments present.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 6/3/16

Signature: _____

Checked By: R. Pulliam

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

WELL CONSTRUCTION LOG

WELL NO. MW-108

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
10 AU			90	Change to dark gray to grayish brown, no dark grained fragments present, high HCL reaction.				
11 AU			100					
12 AU			110					
13 AU			120	**SANDSTONE** fine grained, brown, very slight HCL reaction.				
14 AU			130	**LIMESTONE** dark gray to grayish brown, no dark grained fragments present, high HCL reaction.				
15 AU			140	**DOLOSTONE** dark gray, no HCL reaction.				
16 AU			150	**LIMESTONE** gray to grayish brown, slight HCL reaction.				
17 AU			160	Change to brown at 152 feet.				
18 AU			170	Change to gray, medium reaction to HCL at 162 feet.				
19 AU			180	Change to slight reaction to HCL at 172 feet.				
20 AU			190	Change to medium reaction to HCL at 182 feet.				
21				Change to slight reaction to HCL at 192 feet.				

WELL CONSTRUCTION LOG

WELL NO. MW-108

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
AU			200	**LIMESTONE** gray, slight reaction to HCL.				
22 AU			210	Change to medium reaction to HCL at 212 feet.				
23 AU			220					
24 AU			230					
25 AU			240					
26 AU			250	Change to high HCL reaction at 252 feet.				
27 AU			260	Change to dark gray to gray, few dark grained fragments, medium reaction to HCL at 262 feet.				
28 AU			270	Change to slight reaction to HCL at 272 feet.				
29 AU			280					
30 AU			290					
31 AU			300	End of boring at 300.0 feet below ground surface.				

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-108A

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE: Sibley Quarry CCR	1/23/17	1/24/17	265513.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Pearson Drilling	Mud/Air Rotary	590.5	594.06	300.0	10.625"/5.625"

Boring Location: N of King Road Approximatley 20 feet W of E access drive to substation, 10 feet S of substation fence.
N: 174.17 E: 1821.55

Personnel
Logged By - J. Krenz
Driller - B. Pearson

Drilling Equipment: GEFCO 30K

Civil Town/City/or Village:	County:	State:
Trenton	Wayne	MI

Water Level Observations:
While Drilling: Date/Time 1/24/17 00:00 ▽ Depth (ft bgs) 50.00
After Drilling: Date/Time 1/25/17 10:00 ▼ Depth (ft bgs) 49.16

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	100			**CLAY** mostly clay, trace to few sand, medium to high plasticity, brown (10YR 5/3), no odor. Change to few fine to coarse sand at 2.5 feet.				
			10	Change to few fine to medium sand, trace gravel, low to med plasticity, stiff at 6.5 feet. Change to gray (10YR 5/1) at 10.0 feet.	CL			
2 CS	100			**CLAY WITH SAND** mostly clay, little medium to coarse sand, low plasticity, gray (10YR 5/1), no odor, soft.				
			20	Change to trace fine gravel at 20.0 feet.	CL			
3 CS	100		30	**CLAY** mostly clay, trace to few fine to medium sand, gray (10YR 5/1), medium to high plasticity, no odor, low density.	CL			
				LIMESTONE gray to white, low reaction to HCl.				
			40	Change to medium reaction to HCl at 40.0 feet.				
				SANDSTONE medium grained, grayish brown (10YR 5/2), no reaction to HCl.				
4 CS	100		50	**LIMESTONE** dark gray (10YR 4/1), low reaction with HCl.				Suface cesing set at 47.0 feet below ground surface. Open hole beneath surface cesing.
			60	Change to light gray (10YR 7/2) at 60.0 feet.				
5 CS	100			**SANDSTONE** fine to medium grained, light brownish gray (10YR 6/2), no reaction to HCl.				
			70					

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 265513.0000.0000 4/14/17

Signature: 4-13-17 Firm: TRC Environmental Fax

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-108A

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			80	**SANDSTONE**				
6 CS	100		90	Change to gray (10YR 5/1) at 88.0 feet.				
				Change to grayish brown (10YR 5/2) at 95.0 feet.				
7 CS	100		100	Change to medium grained, pale brown (10YR 6/3), no reaction to HCl at 100.0 feet.				
			110					
				Change to grayish brown (10YR 5/2) at 166.0 feet.				
8 CS	100		120					
				DOLOSTONE gray (10YR 5/1), no reaction to HCl.				
			130					
			140					
				LIMESTONE grayish brown (10YR 5/2), slight reaction to HCl.				
9 CS	100			Change to light gray (10YR 7/1), no reaction to HCl at 146.0 feet.				
			150					
				Change to gray (10YR 6/1) at 156.0 feet.				
			160					
10 CS	100							

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-108A

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			170	**SANDSTONE** fine to medium grained, pale brown (10YR 6/3), no reaction to HCl.				
11 CS	100		180	**LIMESTONE** gray (10YR 5/1), slight reaction to HCl.				
			190					
12 CS	100		200	**SANDSTONE** medium grained, brown (10 YR 5/3), no reaction to HCl.				
			210					
13 CS	100		220	**DOLOSTONE** brown (10YR 4/3), slight reaction to HCl.				
			230					
14 CS	100		240	**SANDSTONE** fine grained, light gray (10YR 7/1), no reaction to HCl.				
			250					
			260					

SOIL BORING WELL CONSTRUCTION LOG 231828.0002.GPJ TRC_CORP.GDT 265513.0000.0000 4/14/17

TRC

WELL CONSTRUCTION LOG

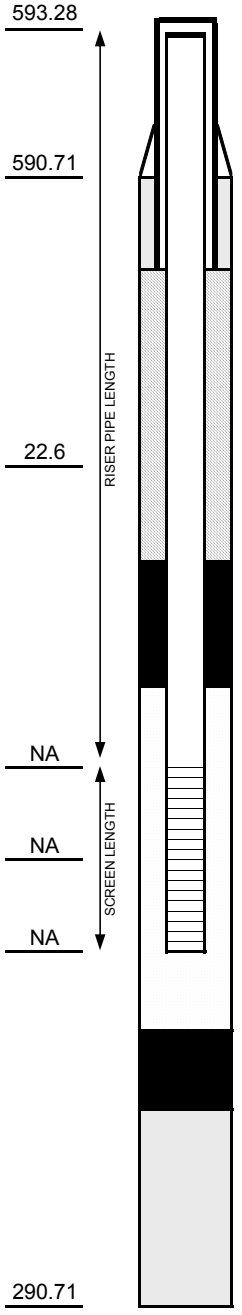
WELL NO. MW-108A

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
15 CS	100		270	**SANDSTONE** Change to medium grained, gray (10YR 5/1) at 273.0 feet.				
16 CS	100		280 290					
17 CS	100		300	End of Boring at 300.0 feet below ground surface.				
			310 320 330 340 350					

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: Sibley Quarry CCR MW Installation		WELL ID:	**MW-105**
PROJ. NO: 231828.0002	DATE INSTALLED: 3/30/2016 INSTALLED BY: C. Scieszka	CHECKED BY:	R. Pulliam

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
593.28	2.6	TOP OF CASING
590.71	0.0	GROUND SURFACE
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: CEMENT SLURRY
		GROUT/BACKFILL METHOD: TREMIE
22.6		RISER PIPE LENGTH
	20.0	CEMENT
		BENTONITE SEAL MATERIAL: NA
	NA	BENTONITE SEAL
NA	NA	TOP OF SCREEN
		FILTER PACK MATERIAL: NA
NA		SCREEN LENGTH
NA	NA	BOTTOM OF SCREEN
	NA	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NA
290.71	300.0	HOLE BOTTOM



NOTES:
OPEN HOLE MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 5-INCH BLACK STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: WELDED

SCREEN TYPE: OPEN HOLE BEDROCK

SCR. SLOT SIZE: NA

BOREHOLE DIAMETER: 8 IN. FROM 0 TO 20 FT.
4.75 IN. FROM 20 TO 300 FT.

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

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3 HOURS

WATER REMOVED: 7,000 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN

CLARITY AFTER: SLIGHTLY TURBID

COLOR AFTER: BLACK

ODOR (IF PRESENT): STRONG SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	>300	TOC	4/19/2016	13:00
DTB AFTER DEVELOPING:	>300	TOC	4/19/2016	18:45
SWL BEFORE DEVELOPING:	29.27	TOC	4/19/2016	13:00
SWL AFTER DEVELOPING:	26.00	TOC	4/19/2016	18:45
OTHER SWL:		TOC		
OTHER SWL:		TOC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

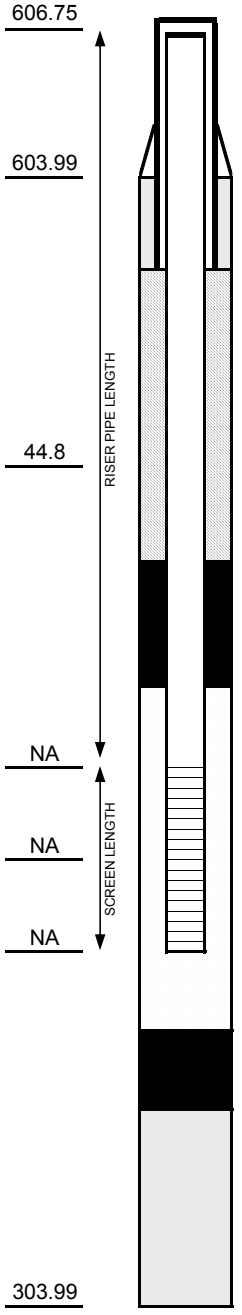
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: Sibley Quarry CCR MW Installation		WELL ID:	**MW-106**
PROJ. NO: 231828.0002	DATE INSTALLED: 3/28/2016 INSTALLED BY: C. Scieszka	CHECKED BY:	R. Pulliam

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
606.75	2.8	TOP OF CASING
603.99	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: CEMENT SLURRY
		GROUT/BACKFILL METHOD: TREMIE
44.8		RISER PIPE LENGTH
	42.0	CEMENT
		BENTONITE SEAL MATERIAL: NA
	NA	BENTONITE SEAL
NA	NA	TOP OF SCREEN
		SCREEN LENGTH
		FILTER PACK MATERIAL: NA
NA		
NA	NA	BOTTOM OF SCREEN
	NA	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NA
303.99	300.0	HOLE BOTTOM



NOTES:
OPEN HOLE MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 5-INCH BLACK STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: WELDED

SCREEN TYPE: OPEN HOLE BEDROCK

SCR. SLOT SIZE: NA

BOREHOLE DIAMETER: 8 IN. FROM 0 TO 42 FT.
4.75 IN. FROM 42 TO 300 FT.

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

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3.75 HOURS

WATER REMOVED: 900 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: VERY DARK GRAY

CLARITY AFTER: CLOUDY

COLOR AFTER: DARK GRAY

ODOR (IF PRESENT): STRONG SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	>300	GS	4/7/2016	13:30
DTB AFTER DEVELOPING:	>300	TOC	4/19/2016	10:50
SWL BEFORE DEVELOPING:	186.00	GS	4/7/2016	13:30
SWL AFTER DEVELOPING:	192.17	TOC	4/19/2016	10:50
OTHER SWL:		TOC		
OTHER SWL:		TOC		

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: Sibley Quarry CCR MW Installation			WELL ID: **MW-107**
PROJ. NO: 231828.0002	DATE INSTALLED: 3/28/2016	INSTALLED BY: C. Scieszka	CHECKED BY: R. Pulliam

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
610.03	2.5	TOP OF CASING
607.51	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: CEMENT SLURRY
		GROUT/BACKFILL METHOD: TREMIE
62.5		RISER PIPE LENGTH
	60.0	CEMENT
		BENTONITE SEAL MATERIAL: NA
	NA	BENTONITE SEAL
NA	NA	TOP OF SCREEN
		SCREEN LENGTH
		FILTER PACK MATERIAL: NA
NA	NA	BOTTOM OF SCREEN
	NA	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NA
336.51	271.0	HOLE BOTTOM

NOTES:
OPEN HOLE MONITORING WELL
AIR LIFTED FOR 2.5 HOURS WITHOUT RETURN, DEVELOPMENT
WATER LIKELY WENT INTO FRACTURES FROM 125-135 FT-BGS

CASING AND SCREEN DETAILS

TYPE OF RISER: 5-INCH BLACK STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: WELDED

SCREEN TYPE: OPEN HOLE BEDROCK

SCR. SLOT SIZE: NA

BOREHOLE DIAMETER:
- 8 IN. FROM 0 TO 60 FT.
- 4.75 IN. FROM 60 TO 300 FT.
- 4.5 IN. ROM 125 TO 135 FT.
- 3.88 IN. FROM 135 TO 271 FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 2.5 HOURS

WATER REMOVED: 0 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	271.40	GS	4/7/2016	7:15
DTB AFTER DEVELOPING:	--	TOC	--	--
SWL BEFORE DEVELOPING:	151.80	GS	4/7/2016	7:15
SWL AFTER DEVELOPING:	155.62	TOC	4/19/2016	7:51
OTHER SWL:		TOC		
OTHER SWL:		TOC		

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: Sibley Quarry CCR MW Installation		WELL ID:	**MW-108**
PROJ. NO: 231828.0002	DATE INSTALLED: 3/29/2016 INSTALLED BY: C. Scieszka	CHECKED BY:	R. Pulliam

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
602.96	2.7	TOP OF CASING
600.22	0.0	GROUND SURFACE
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: CEMENT SLURRY
		GROUT/BACKFILL METHOD: TREMIE
82.8	80.0	CEMENT
		BENTONITE SEAL MATERIAL: NA
	NA	BENTONITE SEAL
NA	NA	TOP OF SCREEN
		FILTER PACK MATERIAL: NA
NA	NA	BOTTOM OF SCREEN
	NA	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NA
300.22	300.0	HOLE BOTTOM

RISER PIPE LENGTH: 82.8

SCREEN LENGTH: NA

NOTES:
OPEN HOLE MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 5-INCH BLACK STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: WELDED

SCREEN TYPE: OPEN HOLE BEDROCK

SCR. SLOT SIZE: NA

BOREHOLE DIAMETER: 8 IN. FROM 0 TO 80 FT.
4.75 IN. FROM 80 TO 300 FT.

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

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 1.5 HOURS

WATER REMOVED: 2,275 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: LIGHT BROWN TO BROWNISH GRAY

CLARITY AFTER: SLIGHTLY CLOUDY

COLOR AFTER: LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	>300	GS	4/7/2016	7:50
DTB AFTER DEVELOPING:	>300	TOC	4/19/2016	10:05
SWL BEFORE DEVELOPING:	71.00	GS	4/7/2016	7:50
SWL AFTER DEVELOPING:	84.85	TOC	4/19/2016	10:05
OTHER SWL:		TOC		
OTHER SWL:		TOC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

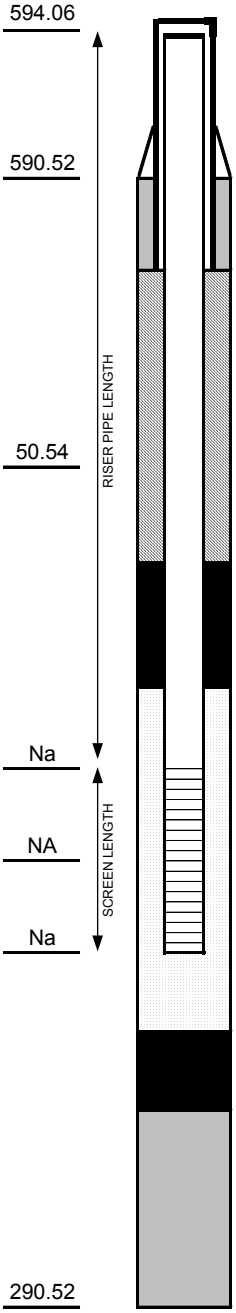
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE EC CCR: Sibley Well Install/Abandonment	WELL ID:	**MW-108A**
PROJ. NO:	265513.0000	DATE INSTALLED: 1/24/2017 INSTALLED BY: Jacob Krenz	CHECKED BY: Chris Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)



594.06	3.54 TOP OF CASING
590.52	0.0 GROUND SURFACE
	CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: CEMENT SLURRY
	GROUT/BACKFILL METHOD: TREMIE
50.54	47.0 Cement
	BENTONITE SEAL MATERIAL: NA
	NA BENTONITE SEAL
Na	NA TOP OF SCREEN
	FILTER PACK MATERIAL: NA
NA	
Na	NA BOTTOM OF SCREEN
	NA BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NA
290.52	300.0 HOLE BOTTOM

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 6-INCH STAINLESS STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED

SOLVENT USED? NO

SCREEN TYPE: OPEN HOLE BEDROCK

SCR. SLOT SIZE: NA

BOREHOLE DIAMETER:	10-5/8	IN. FROM	0	TO	47	FT.
	5-5/8	IN. FROM	47	TO	300	FT.
SURF. CASING DIAMETER:	6	IN. FROM	0	TO	47	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 2 HOURS

WATER REMOVED: 8400 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: Very Turbid (2157 AU)

COLOR BEFORE: Dark Gray to Blackish

CLARITY AFTER: Very Turbid (748 AU)

COLOR AFTER: Dark Gray to Blackish

ODOR (IF PRESENT): Sulfur

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	>300	T/PVC		
DTB AFTER DEVELOPING:	>300	T/PVC		
SWE BEFORE DEVELOPING:	NM	T/PVC		
SWE AFTER DEVELOPING:	NM	T/PVC		
OTHER SWE:	52.72	T/PVC	1/25/2017	1000
OTHER SWE:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120