Location Restrictions Demonstrations

DTE Electric Company
Range Road Coal Combustion Residual Landfill

3600 Range Road
China Township, Michigan

October 2018

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Prepared For
DTE Electric Company

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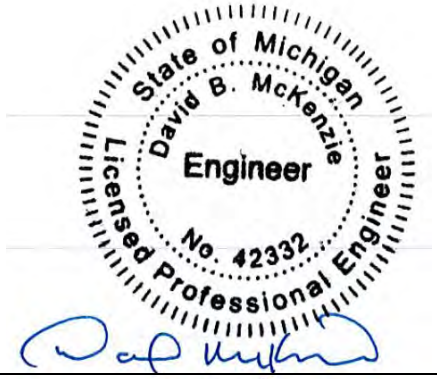
Certification

I, the undersigned Michigan Professional Engineer, hereby certify that I am familiar with the technical requirements of Title 40 Code of Federal Regulations Part 257 Subpart D (§257). I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of §257.60 through §257.64.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Michigan Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.



Seal/Date 10/15/18

David B McKenzie, P.E.

License No: 6201042332

Section 1
Background

The purpose of this document is to determine whether the Coal Combustion Residual (CCR) landfill at the Range Road Landfill (RRLF) is in compliance with the location restrictions outlined in the Environmental Protection Agency's (EPA) final CCR rule [Title 40 Code of Federal Regulations (CFR) Parts 257 and 261] Subpart D – "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" (§257.60 through §257.64, federal rule). The RRLF is considered an existing CCR landfill according to the federal rule (§257.53).

This document includes information from a desktop study and well installation activities to demonstrate that the landfill is in compliance with locational criteria as defined in §257.60 through §257.64 of the federal rule.

Supporting documents are provided in appendices to this demonstration.

1.1 Facility and CCR Unit Information

The RRLF is located in Section 12, Township 4 North, Range 16 East, 3600 Range Road, China Township in St. Clair County, Michigan. The site is located approximately one-half mile west of the St. Clair River and one mile north of the Belle River Power Plant. The RRLF property was previously used as farmland prior to being used continuously as a coal ash landfill since Detroit Edison Company (now DTE Electric) began coal ash landfilling operations at the RRLF in the 1950s. The RRLF is constructed over a natural confining, low permeability clay-rich soil base that serves as an underlying soil barrier. The RRLF property consists of approximately 514 acres of which 402 acres are designated for landfill development. CCR currently occupies approximately 200 acres of the RRLF, and the landfill is estimated to have several decades of capacity remaining.

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

1.2 Site Setting

The RRLF CCR unit is located approximately one-half mile west of the St. Clair River. Soil and Materials Engineers, Inc., advanced 66 soil borings at the RRLF in 1995 as part of a geotechnical

subsurface investigation (SME, 1996), and as part of the installation of the CCR groundwater monitoring network nine deep soil borings/wells were advanced in 2016 (TRC, October 2017); representative soil boring logs are included in Appendix A. In general, the RRLF is initially underlain by 86 feet to as much as 188 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits, although on the eastern portion and northwest corner of RRLF some thin partially saturated silty sand near-surface deposits are present. These deposits are not laterally contiguous, are not in communication with the deeper uppermost aquifer, do not yield a useable quantity of groundwater, and thus are not considered an aquifer per the CCR Rule. On a significant portion of the RRLF, there is a bedrock valley that trends from the northeast corner to the south-central area of the site. The valley is incised in the Bedford and/or Antrim Shale bedrock and filled with unconsolidated glacial deposits consisting of clay, silt, sand and/or gravel. Based on historical oil well logs from the RRLF area, the bedrock valley extends to depths of up to 303 feet below ground surface (ft bgs). Along the western portion of the RRLF, clay-rich till is present continuously to the top of the underlying Bedford or Antrim Shale bedrock in the area of SB-16-01 and SB-16-02 (Figure 1), creating a no flow boundary.

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

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

Section 2
Location Restrictions

The location restrictions designated in the federal CCR rule are presented below with a corresponding demonstration to show compliance with each restriction. The location restrictions include placement above the uppermost aquifer, within wetlands, near fault areas, within seismic impact zones, and in unstable areas based on geologic and geomorphologic information. Supporting information for the demonstrations is included in the appendices to this report.

2.1 §257.60 – Placement above the Uppermost Aquifer

Per §257.60(a), the requirements of §257.60 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.60 do not apply to the RRLF.

2.2 §257.61 – Wetlands

Per §257.61(a), the requirements of §257.61 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.61 do not apply.

2.3 §257.62 – Fault areas

Per §257.61(a), the requirements of §257.62 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.62 do not apply.

2.4 §257.63 – Seismic Impact Zones

Per §257.61(a), the requirements of §257.63 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.63 do not apply to the RRLF.

2.5 §257.64 – Unstable Areas

The federal CCR rule requires that CCR units not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity

of the structural components of the CCR unit will not be disrupted. Factors associated with soil conditions resulting in significant differential settlement, geologic or geomorphologic features, and human-made features or events must be evaluated to determine compliance. This demonstration was performed reviewing geotechnical data, local geology, topography, and evaluating human-made features at the RRLF.

As described in Section 1.2 of this report, the RRLF is generally underlain by a hard to soft low permeability clay. This clay is noted to be medium stiff to hard nearer the surface (top 10 to 15 feet) and softens with depth as the moisture content increases. The clay soils overlie the silty sand to gravel aquifer which overtops the hard shale bedrock. Topography in the vicinity of the site is generally flat with no areas of significant elevation change. These observations suggest that there are no unstable soil or bedrock or unstable side slope conditions proximal to the RRLF that could impact the ongoing operations at the RRLF. Additionally, periodic facility inspections are performed to assess the ongoing condition of constructed landfill berms, caps, and drainage features.

Evidence of unstable areas due to soil conditions resulting in significant differential settling, geologic or geomorphologic features, or human-made features or events is not supported by this determination; therefore, the RRLF is not located in an unstable area. The landfill is in compliance with the requirements of §257.64.

Section 3
Conclusions

Based on the evaluation provided in this demonstration, the RRLF are in compliance with the location restrictions provided in §257.60 through §257.64 of the CCR rule. No additional action, justification, or demonstration is required to document compliance with the location restrictions provided in the CCR rule after this demonstration has been placed into the operating record, posted to the publicly-accessible website, and government notifications provided.

Section 4
References

Soil and Materials Engineers, Inc. (SME) 1996. Geotechnical Investigation—Verification of Natural Soil Barrier Range Road Fly Ash Landfill Site.

TRC. October 2017. Groundwater Monitoring System Summary Report – DTE Electric Company Range Road Coal Combustion Residual Landfill.

TRC. January 2018. Annual Groundwater Monitoring Report – DTE Electric Company Range Road Coal Combustion Residual Landfill.

Appendix A
Soil Boring Logs

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	1/5/16	1/13/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	592.70	595.35	220.0	6

Boring Location: 157' NW of water filling station, 10' SW of main drive.	Personnel: Logged By - C. Scieszka; Driller - A. Goldsmith	Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations: While Drilling: Date/Time; After Drilling: Date/Time 2/3/16 16:16 ▼ Depth (ft bgs) 12.94
East China	St. Clair	MI	

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		0	**SILTY SAND** mostly fine to medium sand, some silt, dark brown (10YR 3/3), moist, dense, roots present.	SM			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			5	**SILTY CLAY** mostly clay, some silt, low to medium plasticity, dark grayish brown (10YR 4/2), mottled with yellowish brown (10YR 5/6), dry, very stiff, roots present.	CL-ML			
2 CS	75		10	**CLAY** mostly clay, trace silt, medium to high plasticity, gray (10YR 5/1) mottled with yellowish brown (10YR 5/6), dry, very stiff. Change to trace medium to coarse sand at 10.5 feet. ▼				
			15	Change to high plasticity, gray (10YR 5/1), moist, very soft at 15.5 feet.				
3 CS	90		20					
			25		CL			
4 CS	50		30	Change to no sand at 30.0 feet.				
			35					
5			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Checked By: M. Powers

Firm: TRC Environmental Corporation
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734.971.7080
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WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	50			**CLAY** mostly clay, trace silt, high plasticity, gray (10YR 5/1), moist, very soft.				
6 ST	100		50					
7 CS	80		55					
8 CS	60		60					
9 CS	100		65					
			70					
			75	Change to trace coarse gravel, trace coarse sand, soft at 75.0 feet.	CL			
10 CS	100		80					
			85	Change to trace fine to coarse gravel, trace coarse sand, medium stiff at 85.0 feet.				
11 CS	70		90	Change to stiff at 90.0 feet.				
			95					
			100					

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	70		105	**CLAY** mostly clay, trace coarse gravel, trace coarse sand, trace silt, high plasticity, gray (10YR 5/1), moist, stiff.				
			110					
13 CS	100		115					
			120		CL			
			125					
14 CS	50		130					4-inch sample rods sank under weight of casing due to soft clay from 130 feet to 142 feet when cased off to 130 feet with 6-inch casing rods.
			135					
			140	Change to few fine to coarse sand, trace fine to coarse gravel at 140.0 feet.				
15 CS	100		145	**SILT** mostly silt, non-plastic, dark gray (10YR 4/1), moist, medium stiff to stiff.	ML			
16 CS	100			**SAND** mostly fine sand, trace silt, dark gray (10YR 4/1), moist, medium dense to dense.	SP			
			150	**CLAY** mostly clay, trace fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.				
17 CS	100		155		CL			
			160	Change to few fine to coarse gravel at 160.0 feet.				

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
18 CS	100		165	**CLAY** mostly clay, few fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.				
			170					
19 CS	100		175		CL			
			180					
20 CS	100							
			185					
21 CS	50			**CLAY WITH SAND AND GRAVEL** mostly clay, few to little fine to coarse gravel, few to little fine to coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
			190	**SAND WITH GRAVEL** mostly fine to coarse sand, little fine to coarse gravel, few silt, dark grayish brown (10YR 4/2), moist to saturated, loose.	SW CL			
22 CS	100		195	**CLAY WITH SAND AND GRAVEL** mostly clay, few to little fine to coarse gravel, few to little fine to coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard. **SILTY SAND** mostly fine to coarse sand, little to some silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose. Change to trace cobbles at 200.0 feet.	SM			
			200					
23 CS	80		205	**SAND WITH SILT** mostly fine to coarse sand, few to little silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose.	SW-SM			
			210	**SILTY SAND** mostly fine to medium sand, some silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose.	SM			
24 CS	90		215	**CLAY** mostly clay, trace fine to coarse sand, trace to few fine to coarse gravel, trace cobbles, low plasticity, dark grayish brown (10YR 4/2), dry to moist, hard.	CL			
			220	End of boring at 220.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	1/14/16	1/20/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	595.33	598.44	220.0	6

Boring Location: 375' N of SG-07, 10' W of drive, S of Range Rd. gate.	Personnel: Logged By - C. Scieszka; Driller - A. Goldsmith	Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations: While Drilling: Date/Time; After Drilling: Date/Time 2/8/16 13:24 ▼ Depth (ft bgs) 17.53
East China	St. Clair	MI	

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	60		5	**CLAYEY SAND** mostly fine to medium sand, some clay, few silt, trace fine to coarse gravel, brown (10YR 4/3), moist, dense.	SC			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				SILTY CLAY WITH SAND mostly clay, some silt, few to little fine to medium sand, low plasticity, gray (10YR 5/1), moist, very stiff.	CL-ML			Original soil boring abandoned due to broken rods lost in boring at approximately 210 feet below ground surface. Redrilled and installed well at survey location noted above, lithology from 0 to 160 feet taken from original boring approximately 20 feet south of MW-16-02.
2 CS	60		10	**SAND** mostly fine to medium sand, few silt, yellowish brown (10YR 5/6), moist, loose. Change to dark gray (10YR 4/1) at 9.0 feet.	SP			
			15	**CLAY** mostly clay, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard. ▼				
3 CS	80		20	Change to trace fine gravel, no sand, moist, very soft at 20.0 feet.				
			25					
4 CS	100		30	Change to no gravel at 30.0 feet.	CL			
			35					
5 CS	100		40	1-inch thick sand seam, mostly fine to coarse sand, trace coarse gravel, very dark gray (10YR 3/1), saturated, loose at 39.5 feet.				
			45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

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Checked By: M. Powers

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
6 ST	100							
7 CS	100		55					
			60					
8 CS	100		65		CL			
			70					
9 CS	90		75					
			80	Change to trace fine gravel, trace fine to coarse sand, medium plastic, medium stiff at 78.5 feet.				
10 CS	80		85					
			90	**SILT** mostly silt, trace clay, trace to few fine sand, non-plastic, dark gray (10YR 4/1), dry, hard.	ML			
11 CS	90		95	**SILTY SAND** mostly fine sand, few medium sand, little to some silt, dark grayish brown (10YR 4/2), moist, dense.	SM			
			100	**CLAY** mostly clay, trace to few fine to coarse sand, trace fine to coarse gravel, trace silt, medium to high plasticity, dark gray (10YR 4/1), moist, stiff.	CL			
12			105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	40		110	**CLAY** mostly clay, trace to few fine to coarse sand, trace fine to coarse gravel, trace silt, medium to high plasticity, dark gray (10YR 4/1), moist, soft.	CL			4-inch sample rods sank under weight of casing due to soft clay from 110 feet to 118 feet when cased off to 110 feet with 6-inch casing rods.
			115					
13 CS	0		120					118 to 120 feet sample likely fell out of rods during retrieval.
14 CS	100		125	**SILT** mostly silt, few fine sand, non plastic, dark gray (10YR 4/1), moist, medium stiff.	ML			
			130	**SILTY SAND** mostly fine sand, little silt, trace cobbles, trace fine to coarse gravel, dark gray (10YR 4/1), saturated, dense.	SM			
15 CS	100		135	**CLAY** mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
16 CS	70		140					
			145					
17 CS	80		150					
			155					
18 CS	100		160					
			165					
			170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
19 CS	100		175	**CLAY** mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
			180	**SAND WITH SILT** mostly fine to coarse sand, few to little silt, dark grayish brown (10YR 4/2), saturated, medium dense.	SW-SM			
20 CS	60		185	**CLAY** mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
			190					
21 CS	100		195	**SILTY SAND WITH GRAVEL** mostly fine to coarse sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.	SM			
				SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	SM			
22 CS	100		200	**SAND** mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.	SW			
				SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	SM			
			205	**SAND** mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.	SW			
				SILTY SAND WITH GRAVEL mostly fine sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.	SM			
23 CS	100		210	**SILTY SAND** mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	ML			
				SILT WITH GRAVEL AND SAND mostly silt, few to little fine to coarse gravel, few to little fine to coarse sand, non-plastic, dark gray (10YR 4/1), saturated, hard.	GW-GM			
			215	**GRAVEL WITH SILT AND SAND** mostly fine to coarse gravel, few to little fine to coarse sand, few to little silt, dark gray (10YR 4/1), saturated, loose.	SW			
				SAND WITH GRAVEL mostly fine to coarse sand, little fine to coarse gravel, trace to few silt, dark gray (10YR 4/1), saturated, loose.	SP			
			220	**SAND** mostly medium to coarse sand, trace to few silt, trace fine to coarse gravel, dark gray (10YR 4/1), saturated, loose. Change to mostly fine sand, no gravel, dark grayish brown (10YR 4/2) at 217.0 feet. Change to mostly medium to coarse sand, few to little fine to coarse gravel, dark gray (10YR 4/1) at 218 feet.				
			225	End of boring at 220.0 feet below ground surface.				
			230					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	1/28/16	2/1/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	595.07	597.69	180.0	6/4

Boring Location:	Personnel	Drilling Equipment:
32' W of E fence, 420' N of PZ-2, N of Range Rd. gate.	Logged By - C. Scieszka Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
East China	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time 2/8/16 13:34 ▼ Depth (ft bgs) 17.08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90		0–5	**CLAY** mostly clay, high plasticity, brown (10YR 4/3) mottled with yellowish brown (10YR 5/6) and gray (10YR 5/1), dry to moist, very stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sand sized coal fragments, trace fine gravel sized slag fragments.	CL			
			5	**CLAY WITH SAND** mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL			
				SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose. Change to brown (10YR 4/3) at 8.0 feet.	SP			
2 CS	90		10–20	**CLAY** mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard. ▼ (17.08 ft)				
3 CS	100		20–30	Change to soft at 21.0 feet. Change to very soft at 25.0 feet.	CL			
4 CS	100		30–40					

Signature: [signature]

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Checked By: M. Powers

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			45	**CLAY** mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, very soft.				
5 CS	100		50					
6 CS	80		55	Change to hard at 57.5 feet.				
7 ST	100		60	2-inch thick sand seam - mostly coarse sand, few fine to medium sand, trace silt, very dark gray (10YR 3/1), saturated, loose at 58.0 feet.				
8 CS	100		65	Change to no sand, no gravel, dark grayish brown (10YR 4/2) at 62.0 feet.	CL			
9 CS	100		70	Change to dark gray (10YR 4/1) at 70.0 feet.				
10 CS	100		75					
			80	Change to trace fine to coarse gravel at 82.0 feet.				
			85					
			90					

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	80		95	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), dry to moist, very soft. Change to soft at 95.0 feet.				
			100					
12 CS	100		105	Change to stiff at 102.0 feet.				
			110					
13 CS	70		115		CL			
			120					
14 CS	100		125					
			130					
15 CS	80		135					
			140	**SILT** mostly silt, trace to few fine to coarse sand, non-plastic, dark gray (10YR 4/1), moist to saturated, medium stiff.	ML			
16 CS	100		145	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), saturated, very soft.	CL			

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			150	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), saturated, very soft.	CL			
17 CS	100		155	**SILTY GRAVEL WITH SAND** mostly fine to coarse gravel, little to some silt, few to little fine to coarse sand, trace cobbles, dark gray (10YR 4/1), saturated, dense to very dense.	GM			
			160	**CLAY** mostly clay, trace to few silt, few fine to coarse gravel, few fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.	CL			
18 CS	100		165	**SILTY GRAVEL WITH SAND** mostly fine to coarse gravel, little silt, few to little fine to coarse sand, trace cobbles, dark gray (10YR 4/1), saturated, loose to dense.	GM			
			170					
19 CS	100		175	**SILTY SAND WITH GRAVEL** mostly fine sand, little to some silt, little fine to coarse gravel, trace cobbles, dark gray (10YR 4/1), saturated, dense. Change to mostly fine to coarse sand, few to little silt, saturated at 177.0 feet.	SM			
			180	End of boring at 180.0 feet below ground surface.				
			185					
			190					
			195					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/18/16	5/24/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	596.87	594.07	210.0	6

Boring Location: NE of landfill, inside perimeter fence, near railroad crossing on Bree Rd.
N: 480291.59 E: 13625442.43

Personnel
Logged By - C. DoVono/J. Reed
Driller - A. Goldsmith

Drilling Equipment:
TSi 150cc

Civil Town/City/or Village:	County:	State:
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 5/25/16 09:15 ▼ Depth (ft bgs) 19.11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	65		5	**SILTY SAND** mostly sand, little to some silt, brown (10YR 4/3), moist, medium dense.	SM			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	**SAND** mostly fine to medium sand, brown (10YR 4/3), moist, loose.	SP			
2 CS	70		15	**CLAY** mostly clay, few silt, medium plasticity, dark gray (10YR 4/1), moist, stiff.				
			20	▼				
3 CS	0		25					
			30	Change to high plasticity at 30.0 feet.	CL			
4 CS	100		35	Change to soft at 34.5 feet.				
			40					
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, few silt, high plasticity, dark gray (10YR 4/1), moist, soft.	CL			
6 CS	100		55					
			60					
7 CS	100		65					
			70					
8 CS	65		75					
			80					
9 CS	100		85					
			90					
10 CS	85		95	Change to medium stiff at 94.5 feet.				
			100					
11 CS	100		105	Change to stiff at 103.0 feet.				

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110	**CLAY** mostly clay, few silt, trace sand, high plasticity, dark gray, moist, stiff.				
12 CS	90		115					
			120		CL			
13 CS	55		125	Change to very soft at 123.0 feet.				
			130					
14 CS	100		135	**SILTY CLAY** mostly clay, some silt, little gravel, dry, hard, hardpan.				
			140		CL-ML			
15 CS	100		145					
			150	**SAND** mostly fine to medium sand, gray (10YR 5/1), moist.	SP			
				SILTY SAND WITH GRAVEL little gravel, gray (10YR 5/1), moist, very dense, hardpan.				
16 CS	100		155		SM			
			160	**SILT** mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), moist.				
17 CS	80		165		ML			
			170	Change to dry to moist at 170.0 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
18 CS	100		175	**SILT** mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), dry to moist.	ML			
			180	**SILTY SAND** mostly fine to medium sand, little silt, gray (10YR 5/1), moist to saturated, loose to medium dense. Change to few to little silt at 182.0 feet.	SM			
19 CS	100		185	**SILT** mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), moist, medium dense to dense.				
			190	Change to dry at 190.5 feet. Change to trace sand at 191.0 feet.	ML			
20 CS	100		195	Change to few to little sand, moist at 198.0 feet. Change to few sand at 199.0 feet.				
			200	**SANDY SILT** mostly silt, little to some sand, gray (10YR 5/1), moist, loose to medium dense.	ML			
21 CS	100		205	**SILT** mostly slit, trace sand, trace gravel, dark gray (10YR 4/1), dry to moist, very dense, hardpan.	ML			
			210	End of boring at 210.0 feet below ground surface.				
			215					
			220					
			225					
			230					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/12/16	5/13/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	601.97	599.62	140.0	6

Boring Location: SW of landfill, near Puttygut Rd. gate closest to King Rd.	Personnel	Drilling Equipment:
N: 474831.30 E: 13622242.19	Logged By - C. DoVono Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
East China	St. Clair	MI	While Drilling: Date/Time		Depth (ft bgs)
			After Drilling: Date/Time	5/18/16 11:40	Depth (ft bgs) 25.67

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		5	**SILTY CLAY** mostly clay, little to some silt, brown (10YR 4/3), moist, stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	70		10	**CLAY** mostly clay, dark gray (10YR 4/1), moist, stiff.				
3 CS	70		15					
			20	Change to medium to high plasticity, soft at 20.0 feet.				
				Change to stiff at 22.0 feet.				
			25 ▼		CL			
4 CS	70		30	Change to soft at 30.0 feet.				
			35					
			40	Change to dark grayish brown (10YR 4/2) at 40.0 feet.				
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

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

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Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.	CL			
				SILTY SAND mostly sand, little to some silt, trace gravel.	SM			
				CLAY mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.				
6 CS	70		55					
			60					
7 CS	100		65					
			70	Change to very dark gray (10YR 3/1) at 70.0 feet.				
8 CS	90		75					
			80	Change to dark gray (10YR 4/1), wet at 80.0 feet.	CL			
9 CS	80		85	Change to stiff at 87.0 feet.				
			90	Change to moist, high plasticity at 90.0 feet.				
10 CS	80		95					
			100	Change to medium plasticity at 100.0 feet.				
11 CS	100		105					

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110	**CLAY** mostly clay, medium plasticity, dark gray (10YR 4/1), moist, stiff. Change to very soft, high plasticity at 110.0 feet.	CL			
12 CS	100		115					
			120	**GRAVEL WITH SAND** mostly fine to coarse gravel, little medium to coarse sand, trace cobble, brown (10YR 4/3), saturated.	GW			
13 CS	100		125					
			130					
14 CS	100		135					
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					
			160					
			165					
			170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/2/16	5/10/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	598.00	600.68	140.0	6

Boring Location: N of landfill, approximately 20 feet S of N fence, approximately 100 feet E of jog in N fence.
N: 479837.91 E: 13623393.48

Personnel
Logged By - J. Reed/C. Scieszka
Driller - A. Goldsmith

Drilling Equipment:
TSi 150cc

Civil Town/City/or Village:	County:	State:
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 6/9/16 14:22 ▼ Depth (ft bgs) 21.14

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	100		5	**SILTY CLAY** mostly clay, little to some silt, trace to few fine to medium sand, low plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	10		10					
			15					
			20 ▼					
3 CS	100		25					
			30					
4 CS	100		35					
			40	Change to trace fine to medium sand at 40.0 feet				
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**SILTY CLAY** mostly clay, some silt, trace fine to medium sand, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
6 CS	100		55					
			60					
7 CS	100		65					
			70					
8 CS	100		75					
			80	**SILT** mostly silt, trace fine sand, non plastic, dark gray (10YR 4/1), moist, stiff.	ML			
9 CS	100		85	**SAND** mostly fine sand, trace to few silt, dark gray (10YR 4/1), saturated, medium dense. Change to no silt at 87.0 feet. Change to mostly medium sand at 89.0 feet.	SP			
			90	Change to mostly medium to coarse sand, trace fine gravel at 91.0 feet. Change to mostly coarse sand, few fine to medium sand, few fine to coarse gravel at 93.0 feet.				
10 CS	100		95	Change to mostly fine sand, no gravel at 97.0 feet.				
			100	Change to trace silt at 99.5 feet. Change to mostly medium to coarse sand, few fine to coarse gravel at 100.0 feet.				
11 CS	60		105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		110	**SAND** mostly medium to coarse sand, few fine to coarse gravel, trace silt, dark gray (10YR 4/1), saturated, medium dense.	SP			
			115	Change to mostly fine to medium sand, no gravel, trace silt at 112.5 feet.				
13 CS	100		120					
			125					
14 CS	100		130	**SHALE** dark gray (10YR 4/1), dry, brittle.				
			135					
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					
			160					
			165					
			170					

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/11/16	5/12/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.40	589.34	140.0	6

Boring Location: S of landfill, near former weather station.	Personnel	Drilling Equipment:
N: 474892.80 E: 13623511.65	Logged By - C. DoVono Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
East China	St. Clair	MI	While Drilling:	Date/Time	Depth (ft bgs)
			After Drilling:	Date/Time 5/18/16 09:30 ▼	Depth (ft bgs) 18.05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	40		0	**CLAY** mostly clay, dark grayish brown (10YR 4/2) with brown and gray mottling, moist, stiff.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			5	Change to dark gray (10YR 4/1), soft at 5.0 feet.				
			10					
			15					
			20	▼ Change to wet at 20.0 feet.				
2 CS	100		25		CL			
			30					
3 CS	100		35					
			40	Change to very dark gray (10YR 3/1), moist at 39.0 feet.				
4 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

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

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Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, very dark gray (10YR 3/1), moist, soft.	CL			
5 CS	75		55					
			60					
6 CS	100		65					
			70					
7 CS	100		75	Change to stiff at 76.0 feet.				
			80					
8 CS	100		85					
			90					
				SILTY SAND mostly sand, little to some silt, dark gray (10YR 4/2), moist to saturated.	SM			
9 CS	100		95	**SAND** mostly fine to medium sand, dark gray (10YR 4/1), saturated.				
			100	Change to mostly fine sand, gray (10YR 5/1) at 100.0 feet.	SP			
10 CS	90		105					

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110	**SAND** mostly fine sand, gray (10YR 5/1), moist to saturated.	SP			
11 CS	100		115	**SAND WITH GRAVEL** mostly medium sand, little fine to coarse gravel, gray (10YR 5/1), moist to saturated.	SP			
				SAND mostly fine sand, gray (10YR 5/1), moist to saturated.	SP			
12 CS	100		120	**SAND WITH GRAVEL** mostly fine sand, little gravel, moist to saturated.	SP			
					SM			
				SILTY SAND mostly sand, little to some silt, dark gray (10YR 4/1), moist to saturated.	SP-SM			
			125	**SAND WITH SILT** mostly sand, few silt, dark gray (10YR 4/1), moist to saturated.				
				SAND WITH GRAVEL mostly medium to coarse sand, some gravel, moist to saturated.	SP			
13 CS	100		130	**GRAVEL WITH SAND** mostly gravel, little coarse sand, saturated.	GW			
			135	**SAND WITH SILT** mostly sand, few silt, dark gray (10YR 4/1), moist to saturated.	SP-SM			
				GRAVEL WITH SAND mostly gravel, some sand, saturated.	GW			
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					
			160					
			165					
			170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

BORING NO. SB-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	2/2/16	2/3/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	593.98	---	168.0	6

Boring Location:	Personnel	Drilling Equipment:
30' E of W fence, 85' S of N fence, on W side of landfill near King Rd. gate.	Logged By - C. Scieszka Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:	
East China	St. Clair	MI	While Drilling: Date/Time	Depth (ft bgs)
			After Drilling: Date/Time	Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			0	**TOPSOIL** dark brown (10YR 3/3), moist, loose, roots.			
1 CS	50		5	**CLAY** mostly clay, trace fine to coarse gravel, trace fine to coarse sand, medium to high plasticity, dark gray (10YR 4/1) with brown mottles (10YR 4/3), dry, hard, roots. Change to no roots at 5.0 feet. Change to dark gray (10YR 4/1) at 7.5 feet.	CL		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	40		10	Change to no sand, no gravel, high plasticity, gray (10YR 5/1), moist at 10.0 feet. Change to soft at 15.0 feet.			
3 CS	100		20	Change to very soft at 20.0 feet.			
4 CS	100		25 30 35				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: _____

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

Checked By: M. Powers

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			40	**CLAY** mostly clay, high plasticity, gray (10YR 5/1), moist, very soft.	CL		
5 CS	90		45				
6 ST	100		50				
7 CS	80		55				
			60				
8 CS	100		65				
			70	Change to dark gray (10YR 4/1) at 70.0 feet.			
9 CS	100		75				
			80				
10 CS	100		85				

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
				CLAY mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.			
				Change to stiff at 89.0 feet.			
			90				
				Change to trace to few fine to coarse sand, trace to few fine to coarse gravel at 92.0 feet.			
11 CS	100		95	Change to hard at 95.0 feet.			
			100	Change to no sand, no gravel, stiff at 100.0 feet			
12 CS	60		105				
			110		CL		
13 CS	70		115				
			120				
14 CS	100		125				
			130	Change to trace to few fine to coarse sand at 130.0 feet.			

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
15 CS	100		135	**CLAY** mostly clay, trace to few fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, stiff.	CL		
			140				
16 CS	100		145	Change to few fine to coarse sand, few fine to coarse gravel, hard at 147.5 feet.			
			150	**SHALE** dark gray (10YR 4/1), layered, brittle, weathered.			
17 CS	100		155				
			160				
18 CS	100		165				
				End of boring at 168.0 feet below ground surface.			
			170				
			175				
			180				

SOIL BORING LOG

TRC

BORING NO. SB-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	2/5/16	2/9/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	593.55	---	140.0	6

Boring Location: 30' E of W fence, 35' S of N fence, in NW corner of landfill.	Personnel: Logged By - C. Scieszka; Driller - A. Goldsmith	Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations: While Drilling: Date/Time / Depth (ft bgs); After Drilling: Date/Time / Depth (ft bgs)
East China	St. Clair	MI	

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
1 CS	50		5	**SILTY SAND** mostly fine to medium sand, little to some silt, dark yellowish brown (10YR 4/4), moist, medium dense, roots. Change to no roots at 2.5 feet. Change to dense, brown (10YR 4/3) mottled with yellowish brown (10YR 5/8) at 7.0 feet.	SM		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	**SAND** mostly fine sand, trace to few silt, trace fine gravel, brown (10YR 4/3), saturated, medium dense.	SP		
2 CS	100		15	**CLAY** mostly clay, trace fine to coarse sand, trace fine to coarse gravel, medium plasticity, gray (10YR 5/1), moist, hard. Change to high plasticity, stiff at 15.0 feet.	CL		
3 CS	60		20 25	Change to very soft at 20.0 feet.			
4 CS	100		30 35				
			40				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

734.971.7080
Fax 734.971.9022

Checked By: M. Powers

SOIL BORING LOG

BORING NO. SB-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
5 CS	100		45	**CLAY** mostly clay, trace fine to coarse sand, trace fine to coarse gravel, high plasticity, gray (10YR 5/1), moist, very soft.			
				Cobble present at 48.0 feet.			
			50	Change to no sand, no gravel at 50.0 feet.			
6 CS	100		55				
			60		CL		
7 CS	100		65				
			70				
8 CS	100		75				
				Change to trace fine to coarse sand at 77.5 feet.			
				SILT mostly silt, trace to few fine sand, non-plastic, dark gray (10YR 4/1), moist to saturated, stiff.	ML		
			80	**SILTY SAND** mostly fine to medium sand, few to little silt, dark gray (10YR 4/1), saturated, dense.	SM		
9 CS	100		85	**CLAY** mostly clay, trace fine to coarse sand, high plasticity, gray (10YR 5/1), moist, very soft.	CL		
				SILT WITH SAND mostly silt, few to little fine to coarse sand, trace fine to coarse gravel, non-plastic, dark gray (10YR 4/1), moist, very stiff.	ML		
			90	**CLAY** mostly clay, trace to few fine to coarse gravel, trace to few fine to coarse sand, low to medium plasticity, dark gray (10YR 4/1), dry, hard.	CL		
10 CS	100		95				

SOIL BORING LOG

BORING NO. SB-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			100	**SILTY SAND WITH GRAVEL** mostly fine to medium sand, little to some silt, few to little fine to coarse gravel, dark gray (10YR 4/1), moist to saturated, dense.	SM		
				CLAY mostly clay, trace to few fine to coarse gravel, trace to few fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, stiff.			
			105	Change to soft at 106.0 feet.			
11 CS	70		110				4-inch sample rods sank under weight of casing due to soft clay from 110 feet to 120 feet when cased off to 110 feet with 6-inch casing rods.
			115		CL		
12 CS	100		120				
			125				
			130				
13 CS	100		135				
				SHALE dark gray (10YR 4/1), dry, hard, weathered, not brittle.			
			140	Change to competent, layered at 139.5 feet.			
				End of boring at 140.0 feet below ground surface.			
			145				
			150				