REVISED
MONITORING WELL INSTALLATION REPORT

INACTIVE BOTTOM ASH IMPOUNDMENT
DTE Monroe Plant
Monroe, Michigan

Prepared for:

DTE Energy
One Energy Plaza
Detroit, MI 48226

April 2019, Revised April 2020

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1.0 INTRODUCTION

At the request of DTE Electric Company (DTE), AECOM Technical Services, Inc. (AECOM) has prepared this revised Well Installation Report so that the documentation of the installation of monitoring wells at the DTE Energy Monroe Power Plant located in Monroe, Michigan (**Figure 1**) better addresses the requirements of new Michigan rules (cited below).

Monitoring wells were installed in the vicinity of the inactive Bottom Ash Impoundment in order to establish a groundwater monitoring system as required by the United States Environmental Protection Agency (USEPA) Final Rule 40 Code of Federal Regulations (CFR), Part 257 (Rule), Section 257.91 Sub-Part (a). The CCR Rule was established to regulate the disposal of Coal Combustion Residuals (CCR) produced by electric generating facilities (USEPA, 2015).

On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018, to amend Part 115 of the Natural Resources and Environmental Protection Act of PA 451 of 1994, as amended (Part 115). The Michigan Public Act was established to provide the State of Michigan oversight of CCR impoundments and landfills and to better align existing state solid waste management rules and statutes with the CCR Rule (EGLE, 2018). After passage of Public Act, the design and installation of the groundwater monitoring system was reviewed and found to be in compliance with its requirements.

1.1 Site Location

The DTE Monroe Plant (Monroe Plant) is located in Monroe County Michigan approximately 2 miles east of the city of Monroe. The Monroe Plant was built in the early 1970s and occupies a parcel of land approximately 440 acres in size. The plant buildings, coal pile, and appurtenances associated with power generation reside on the northern (approximately 274 acres) portion of the 440-acre land parcel. The southern portion of the land parcel consists of the inactive Bottom Ash Impoundment area plus the Process Pond area which, together cover approximately 166 acres.

The Monroe Plant is bounded to the east and south by the shoreline of Lake Erie; to the west by neighboring industrial facilities and the plant discharge canal; and to the north by mixed residential/commercial properties as well as Plum Creek, as shown on **Figure 1**. Topography at the Bottom Ash Impoundment area is relatively flat with elevations ranging from 580 down to 572 feet mean sea level (msl), which is close to the mean elevation of Lake Erie.

1.2 Description of the CCR Unit

The Inactive Bottom Ash Impoundment is located to the south of the main Monroe Plant area and encompasses an area approximately 86.4 acres in size (**Figure 1**). The Inactive CCR Impoundment area was constructed in the late 1960s by building a perimeter dike to surround a low area of the adjacent Lake Erie; the area south of the plant was removed from the Waters of the United States by an Act of Congress prior to plant construction. CCR materials have been placed and allowed to drain into the pond from the north end of the pond; these materials currently form a delta that extends about 1/3 of the way into the pond. For purposes of the CCR groundwater study, the Inactive Bottom Ash Impoundment is considered a single CCR unit.

2.0 HYDROGEOLOGY

The following section presents information regarding the site-specific geologic and hydrogeologic conditions based on the findings from field investigation activities.

2.1 Geologic Setting

The Monroe Plant site is located on the eastern side of the Michigan Basin, which is a regional geologic structure in which the bedrock layers have warped downward towards a low spot in west-central Michigan. Accordingly, bedrock layers in the site vicinity are inclined (dip) at a very shallow angle to the west. The bedrock underlying the site is comprised of late Silurian age sedimentary rocks (predominantly dolomites and shales) from the Bass Island Group. The uppermost bedrock in the area tends to be highly weathered and is comprised of a tan, argillaceous dolomite with interbedded dark gray, firm to soft shales. The Bass Island Group is underlain by the middle to late Silurian age Salina Group, which is also comprised of alternating dolomite and shale units as well as anhydrite beds.

The bedrock in the site vicinity is overlain by approximately 40 to 50 feet of unconsolidated deposits of glacial origin. The deposits are comprised of two distinct units: a hard glacial till immediately overlying bedrock and lacustrine (lake bed or lake shore) deposits which overlay the till unit. Various thicknesses of surficial fill materials are present across the entire Monroe Plant and ash impoundment areas.

2.2 Local Hydrogeology

A series of cross-sections was prepared by NTH Consultants, LTD as part of a sitewide study completed in 2014. The locations of these sections are illustrated on **Figure 2**. These sections illustrate the sequence of geologic materials present under the Plant, Bottom Ash Impoundment, and Process Pond areas based on an assemblage of available boring logs. The lowermost unit identified in these areas is the glacial till. The till is comprised of overconsolidated (highly compacted) gray silty to sandy clay with some cobbles and boulders, and ranges from approximately 20 to 50 feet in thickness (**Figures 2a and 2b**). The overlying lacustrine deposits are composed of 10 to 30 feet of fine-grained sand and silt with some soft clay except where there is a thin, discontinuous coarse sand unit at the base of the lacustrine sequence (**Figure 2b**).

Under parts of the Plant, the Inactive Bottom Ash Impoundment, and Process Pond areas, this sand unit ranges in thickness from 5 to 20 feet and yields groundwater. The sand unit thins progressively to the west, having a thickness of approximately 12 feet on the east side of the discharge canal and thinning to less than a few feet within 150 feet to the west of the discharge canal. Further to the west the sand unit is not evident in soil borings for monitoring wells drilled in 2016 around the Fly Ash Basin. This is consistent with the expectation that lake-deposited materials will decrease in thickness with distance away from Lake Erie. Accordingly, it appears that this sand unit is a localized lakeshore beach deposit formed by westward aggradation with rising lake level and subsequently blanketed by finer lacustrine deposits. Groundwater in the sand unit is under semi-confined conditions with groundwater elevations ranging between approximately 572.6 and 575.6 feet above mean sea level (msl).

Lithologic information for each Inactive Bottom Ash Impoundment monitoring well is provided on the monitoring well construction logs included in **Appendix A**. Geologic Cross-sections are presented in **Figures 2a and 2b.**

2.2.1 Uppermost Aquifer System

The following section presents the expectations under the CCR Rule and Part 115 R 299.4101 and R 299.4105 for identifying the uppermost aquifer subject to groundwater monitoring and describes the lithologic unit identified as the uppermost aquifer in the vicinity of the combined footprint of the Inactive Bottom Ash Impoundment at the Monroe Plant.

As described in Part 115 R 299.4906:

> *"A landfill groundwater monitoring system shall be installed and shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer…" …"*

Applicable definitions from Part 115 of PA 451 of 1994, as amended regarding the definition of an aquifer and the uppermost aquifer include the following:

> *"Aquifer means a geologic formation, group of formations, or portion of a formation that is capable of yielding significant quantities of groundwater to wells or springs."*

> *"Uppermost aquifer means the geologic formation which is nearest to the natural ground surface and which is an aquifer and includes lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary..."*

Based on the hydrogeologic investigation findings, the uppermost aquifer zone occurs in the lower portion of a sequence of lacustrine deposits that is dominated by silty materials near the ground surface or under fill materials, which transitions at depth to a fine-grained sand. The shallow water-bearing zone is semi-confined by the overlying silts, with water levels generally higher than the top of the lacustrine unit. This water-bearing zone overlies a thick, hard glacial till. The glacial till unit acts as an aquitard between the unconsolidated deposits and the deeper, underlying bedrock.

2.2.2 Groundwater Flow and Hydraulic Conductivity

Water level data collected during the baseline groundwater monitoring program were used to construct potentiometric surface maps for the shallow groundwater zone. The data suggest that the direction of groundwater flow within the upper water-bearing zone is generally to the southeast and southwest towards Lake Erie, with an average gradient along the flow direction of approximately 0.00044 foot/foot (roughly 0.45 foot per 1000 feet). These values are within the expected range for the type of aquifer and the hydraulic setting. Potentiometric surface maps from the March 2018 and September 2018 sampling events are included in **Figures 4a and 4b**. As noted above, the aquifer unit thins to the west and the north such that there is no aquifer under areas north of the Inactive Bottom Ash Impoundment. Consequently, there is no representative upgradient or background monitoring position available for the unit. This directly affects the approach to the evaluation of compliance for the monitoring system as noted in the Statistical Methods Certification for this unit.

Hydraulic Conductivity

Aquifer testing (via drawdown and recovery tests using a submersible pump) was completed at monitoring wells MW-1S, MW-3S, MW-7S, and MW-8S. Testing data were evaluated on a well-by-well basis to assist in selecting the appropriate solution via the Aqtesolv™ software platform. Some key assumptions included the following: confined or leaky confined, presence of wellbore storage, and whether individual wells were considered fully or partially penetrating. The test pumping rates were low enough that the potential boundary conditions represented by the physical aquifer limits (to the north and west) were not expected to be detected in the drawdown or recovery data.

The shallow water-bearing zone wells yield groundwater at a relatively high rate. Where the zone has a component of gravel in the fine sand, the wells (MW-1S and MW-7S) produced significantly more water than monitoring wells screened in fine sand with silt (wells MW-3S and MW-8S). Calculated hydraulic conductivity values for the uppermost aquifer are summarized below:

Well ID	Transmissivity (cm^2/sec)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (m/day)	Hydraulic Conductivity (ft/day)
MW-1S	10.16	0.0423	36.5	119.8
MW-3S	0.68	0.0035	3.02	9.90
MW-7S	42.03	0.1274	110	360.9
MW-8S	0.57	0.0024	3.07	10.07

cm2/sec – centimeters squared per second
cm/sec – centimeters per second
m/day – meters per day
ft/day – feet per day

Horizontal Time of Travel

The horizontal time of travel for the Inactive Bottom Ash Impoundment area was calculated using Darcy Flux calculations and the following input values:

- Hydraulic Gradient (foot/foot) – based on average of dry and wet season potentiometric contours
- Hydraulic Conductivity (feet/day) – based on a median value estimated for the shallow aquifer system
- Effective Porosity (unit less) – based on published values for silty sands

Assuming an effective porosity of 30 percent for silty sand with some gravel, a gradient value of 0.00044 foot/foot (average gradient value of MW-14 to MW-7and MW-14 to MW-3) with a median conductivity value of 119 feet/day, the horizontal time of travel is estimated to be 0.174 feet/day (or 260 feet/year).

3.0 GROUNDWATER MONITORING SYSTEM INSTALLATION

The CCR groundwater monitoring system well network was installed in two phases. The first phase of activities, conducted between September 19 and October 4, 2016, included the installation of seven (7) shallow and four (4) exploratory, deep (bedrock) monitoring wells in the vicinity of the inactive Bottom Ash Impoundment. Groundwater monitoring was performed over an 8-month period to evaluate the hydrogeology and groundwater chemistry in the vicinity of the inactive Bottom Ash Impoundment. Findings were used to select the location of seven (7) additional monitoring wells to establish the CCR groundwater monitoring system well network. The additional monitoring wells were installed between September 20 and September 26, 2017.

3.1 Borehole Advancement and Well Installation

Each monitoring well was installed by a State of Michigan licensed well driller as directly observed by an AECOM Geologist. Borings were advanced using a rotosonic drill rig and soil cores were collected in continuous sections for examination and lithologic description by the on-site geologist to the terminating depth of each borehole. Photographs of each soil core were collected. In total, 14 boreholes were advanced into the upper water-bearing zone in unconsolidated materials. Upon reaching the target depth, a monitoring well was installed in each borehole. Four (4) separate boreholes were advanced into a water-bearing zone of the bedrock that underlies the unconsolidated materials, but these wells are not included in the monitoring system because there is a strong upward hydraulic gradient between the bedrock and shallow groundwater systems that prevents downward migration of contaminants.

3.2 Well Construction

Each monitoring well was constructed using 2-inch inside diameter polyvinyl chloride (PVC) casing with a 10-foot section of 0.010-inch slotted PVC screen. The annular space (between the borehole wall and well

screen/casing) was backfilled with a clean silica sand pack extending at least 2 feet above the top of the screen. A minimum 2-foot thick bentonite seal was placed on top of the sand pack and each seal was allowed to hydrate for at least 1 hour per manufacturer's specifications. After hydrating the seal, the remaining annular space was filled with a cement/bentonite grout emplaced via tremie method to within approximately 12 inches of the ground surface.

3.3 Well Development

Each monitoring well was developed no sooner than 24-hours after grout emplacement to enhance hydraulic connection between the well and the aquifer and to remove potable water introduced to the subsurface during drilling activities. A submersible pump was used to remove at least five (5) well volumes or until the water was visibly clear of sediments, turbidity was less than 10 nephalometric turbidity units (NTUs), and water quality measurements [temperature, pH, conductivity, and oxidation-reduction potential (ORP)] were stable over at least three (3) well volumes.

3.4 Well Survey

Each monitoring well was surveyed for horizontal location (North American Datum of 1983 or NAD 83) and elevation data (North American Vertical Datum of 1988 or NAVD 88). by a surveyor licensed in the State of Michigan. Top-of-casing and ground surface elevations were recorded to the nearest 0.01 foot.

4.0 CCR GROUNDWATER MONITORING SYSTEM DESCRIPTION

Based on site-specific hydrogeologic information and groundwater flow, 11 shallow monitoring wells were selected as the groundwater monitoring system for the inactive Bottom Ash Impoundment. The number, spacing, and depth of monitoring wells was based on a thorough characterization of the hydrogeologic factors included in Part 115 R 299.4906. As noted in Section 3.1 above, each well was installed into the uppermost water-bearing zone underlying the site. It was determined that, although MW-8S was installed in the fine sand with silt in the uppermost water-bearing zone (similar to MW-3S), potentiometric data and discharge canal dredging information indicates that there is no hydraulic connection between MW-8S and the CCR unit. Groundwater flow potential in the vicinity of MW-8S is generally east toward the CCR unit and, given that the historical dredging depth went below the clay unit and intercepted the uppermost water-bearing zone, there is a vertical flow pathway between the uppermost water-bearing zone and the discharge canal (detail provided in Appendix B). The zone is comprised primarily of sand with varying amounts of silt present between approximately 25 to 35 feet below ground surface (bgs) on site. Each well is equipped with a dedicated bladder pump system and tubing installed for sampling purposes.

Monitoring well locations are shown on **Figure 3**. **Table 1** contains information regarding well locations and construction details. Well lithologic and construction logs are included as **Attachment A**.

5.0 CCR GROUNDWATER MONITORING SYSTEM CERTIFICATION

AECOM ("Consultant") has been retained by DTE Energy to provide certification of the groundwater monitoring system as required under Part 115 R 299.4906(7)(b) and 40 CFR § 257.91(f) of the HAZARDOUS AND SOLID WASTE MANAGEMENT SYSTEM; DISPOSAL OF COAL COMBUSTION RESIDUALS FROM ELECTRIC UTILITIES; FINAL RULE, 80 Fed. Reg. 21302 (Apr. 17, 2015) ("CCR Rule") for the inactive CCR unit identified by DTE Energy at their Monroe Plant located in Monroe, Michigan.

Requirements

Pursuant to Part 115 the owner or operator of an inactive CCR unit must install a groundwater monitoring system that meets the requirements of Part 115 R 299.4906 The groundwater monitoring system must meet the Part 115 performance standard, which requires the system to consist of a sufficient number of

wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of:

(1) background groundwater that has not been affected by leakage from a CCR unit; and

(2) groundwater passing the waste boundary of the CCR unit and monitoring all potential contaminant pathways.

The CCR unit identified at the site is the Inactive Bottom Ash Impoundment. The groundwater monitoring system requirement is addressed by a single system consisting of 11 monitoring wells. Information regarding the groundwater monitoring system design and construction has been provided to the qualified professional engineer as required by Part 115 R 299.4906(7)(b) and .

Limitations

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

6.0 CERTIFICATION

I, Scott Hutsell, being a Registered Professional Engineer, in accordance with the State of Michigan Professional Engineer's Registration program, possessing the technical knowledge and experience to make the specific technical certifications required under Part 115 and 40 Code of Federal Regulations (CFR) Part 257, Subpart D, Standards for the Disposal of Coal Combustion Residuals (CCRs) in Landfills and Surface Impoundments, and being licensed in the state where the CCR unit(s) is located, do hereby certify to the best of my knowledge, information, and belief, that the groundwater monitoring system that is the subject of this certification has been designed and constructed to meet the requirements of R 299.4906 and 40 CFR § 257.91.

Signature: _____

Date: 04/27/20

License #: MI-43961

License Renewal Date: 10/31/21

TABLE

TABLE 1
DTE ENERGY
MONROE POWER PLANT
MONITORING WELL CONSTRUCTION SUMMARY

Well ID	Easting	Northing	Well Installation Date	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Total Depth (ft BTOC)	Bottom Elevation (ft MSL)	Screen Length (feet)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation (ft MSL)	Pump Depth (ft BTOC)	Well Casing Material	Well Screen Material and Slot Size	Groundwater Flow Location	Program Use
MW-1S	13401951.05	140176.14	9/19/2016	582.62	579.80	43.82	538.80	10	548.80	538.80	40.74	2-inch Schedule 40 PVC	2-inch Schedule 40 PVC and 0.01-inch slot	Downgradient	Detection
MW-2S	13401077.48	139070.06	9/19/2016	578.85	579.20	49.65	529.20	10	548.20	538.20	37.34				
MW-3S	13399871.43	139417.18	9/20/2016	577.58	578.10	39.48	538.10	10	548.10	538.10	35.00				
MW-7S	13399510.36	141102.76	9/28/2016	576.20	576.60	33.60	542.60	10	552.60	542.60	29.70			Downgradient	
MW-9	13399606.60	140623.10	9/19/2017	579.05	576.37	37.73	541.32	10	551.37	541.37	33.00			Downgradient	
MW-10	13399724.80	140207.50	9/20/2017	577.46	577.79	36.58	540.88	10	550.79	540.79	31.50				
MW-11	13399991.4	138811.7	9/20/2017	580.58	577.84	41.90	538.68	10	547.84	537.84	36.00				
MW-12	13400748.3	138911.9	9/21/2017	582.49	579.90	44.79	537.70	10	547.90	537.90	39.00				
MW-13	13401644.6	139800.4	9/21/2017	580.97	578.25	38.08	542.89	10	553.25	543.25	33.00				
MW-14	13401772.2	141406.5	9/22/2017	580.76	577.87	42.67	538.09	10	547.87	537.87	37.50				
MW-15	13399419.6	141789.1	9/26/2017	580.80	578.11	40.88	539.92	10	549.61	539.61	36.00				
MW-4S	13401614.14	141163.06	9/26/2016	580.67	578.10	42.57	538.10	10	551.10	541.10	35.84			N/A	Potentiometry*
MW-5S	13401176.41	142564.92	10/4/2016	584.50	581.70	72.80	511.70	10	568.70	558.70	20.96				
MW-8S	13397828.28	140560.53	9/30/2016	586.59	583.70	45.89	540.70	10	550.70	540.70	42.57				
MW-1D	13401952.04	140178.92	9/19/2016	582.82	579.40	83.42	499.40	10	509.40	499.40	N/A				
MW-3D	13399871.16	139422.09	9/20/2016	577.42	578.00	79.42	498.00	10	509.00	499.00	N/A				
MW-7D	13399510.92	141099.21	9/28/2016	576.17	576.70	69.47	506.70	10	517.70	507.70	N/A				
MW-8D	13397828.00	140561.00	9/30/2016	586.45	583.70	72.75	513.70	10	527.20	517.20	N/A				

TOC - Top of Casing
ft MSL - feet above Mean Sea Level
ft BTOC - feet below top of casing
PVC - Polyvinyl Chloride
* Monitoring wells used for potentiomeric evaluation only

FIGURES

DTE Monroe Plant

Discharge Canal

Conveyance Lines to Fly Ash Basin

Separation Berm

Inactive Bottom Ash Impoundment

Lake Erie

Aerial Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community and Google Earth 2016 Aerial Imagery

LEGEND:

- Unit Separation Berm
- Approximate Plant Boundary
- Revised Approximate Boundary of Inactive Bottom Ash Impoundment

N

0 750 1,500 Feet

DTE Energy

Monroe Power Plant

FIGURE 1
SITE VICINITY MAP

DATE: 7/22/2016	SCALE 1 inch = 720 feet
CREATED BY: KLP	
JOB NO. 60489524	

Document Path: J:\GIS\Projects\DTE\Monroe Plant\Fig1_Site Location Map (7-22-2016).mxd

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\DTE\DTE-Monroe Plant\Data-Tech\GIS\DTE_Monroe_Fig2_Cross-Section_Location_Map.mxd

Discharge Canal

E
264
265
266
800
MW-5S
267
752
737
736
443
C
738
739
SB-3
Conveyance Lines to Fly Ash Basin
MW-15
740
444
MW-14
741
742
743
744
746
745
MW-7S
MW-8S
MW-7D
459
MW-4S
445
C'
755
764
761
MW-9
MW-1D
MW-8D
454
D
MW-10
SB-6
MW-1S
Separation Berm
455
759
E'
456
MW-13
457
D'
MW-3S
MW-3D
MW-2S
MW-11
MW-12
Lake Erie

Aerial and Google Earth 2016 Aerial Imagery

LEGEND:

- CCR Program Monitoring Well
- Investigation Monitoring Well (Potentiometry Only)

Soil Borings (NTH)

- Soil Boring pre-1971
- Soil Boring 1971 and later
- Soil Boring 1971 and later with ash fill
- Soil Boring in 2015 by NTH with ash fill

- Unit Separation Berm
- Cross Section Location
- Conveyance Line Boring Corridor (No Basal Sand)
- Approximate Plant Boundary
- Revised Approximate Boundary of Inactive Bottom Ash Impoundment

N

0 700 1,400 Feet

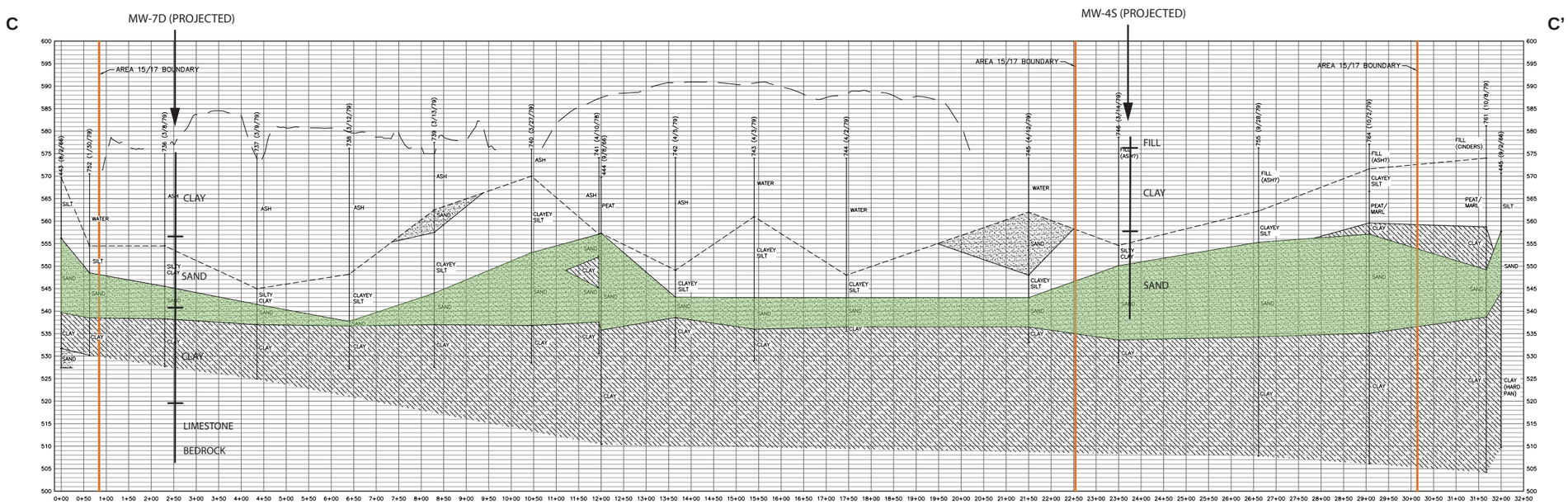
DTE Energy

Monroe Power Plant

FIGURE 2
GEOLOGIC CROSS-SECTION LOCATION MAP

DATE: 3/21/2019	SCALE 1 inch = 700 feet
JOB NO. 60516675	

NORTHWEST **SOUTHEAST**



LEGEND

ASH
CLAY
SAND
UPPERMOST AQUIFER

PRELIMINARY
NOT FOR CONSTRUCTION

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
For the location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:
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Yellow – GAS, OIL, CATV
Red – ELECTRIC
Blue – WATER
Green – SEWER, DRAIN
Orange – SEWER
Pink – SURVEYING
IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG.

THIS IS A CAD PRODUCED DRAWING. ANY CHANGES OR REVISIONS TO THIS DRAWING MUST BE COMPLETED USING THE CAD SYSTEM.

C	PROJ.ENG.	PROJ.MGR.
	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

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	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

A	PROJ.ENG.	PROJ.MGR.
	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

DETROIT EDISON APPROVALS	DATE
FOS GEN TECH ORG	
FOS GEN PLANT ENG	
DIST OPR	
PROJECT ENG	
ENG COMP	

OTHER DISCIPLINE APPROVALS	DATE
ARCH	
CIVIL	
MECH	
ELEC	
I&C	

DESIGNED BY	DATE
ACE	7/13/2015
DRAWN BY	DATE
CWS	7/13/2015
CHECKED BY	DATE
DRL	7/13/2015
APPROVED BY	DATE
PROJECT ENGINEER	DATE
PROJECT MANAGER	DATE

2

LATEST REVISION "0"

PMP NUMBER: 11107
GL/WBS2 NUMBER: I-000022-0211
PO NUMBER: 4700855696

NO.	DATE	ISSUED FOR	PROJ ENG	RESP ENG
6				
5				
4				
3				
2				
1				

PROJECT ENGINEER: APPROVALS
PRECONSTRUCTION REVISION BLOCK – REV.

Vendor:

NTH Consultants, Ltd.
Infrastructure Engineering & Environmental Services
Northville, Michigan

NTH PROJECT NO. 62-150239-00

The Detroit Edison Co. Engineering

TITLE

AREA 15-17 CLOSURE
CROSS SECTIONS A,B,C

LOCATION NAME	UNIT NUMBER
MONROE POWER PLANT	1-6
ORIGINATING SOURCE: NTH CONSULTANTS, LTD.	SCALE: AS SHOWN / USE DIMENSIONS ONLY, DO NOT SCALE

DRAWING NUMBER 2

DESIGN FILE:
DATE ISSUED:
DATE PLOTTED:
OPERATOR:

DTE Energy

Monroe Power Plant

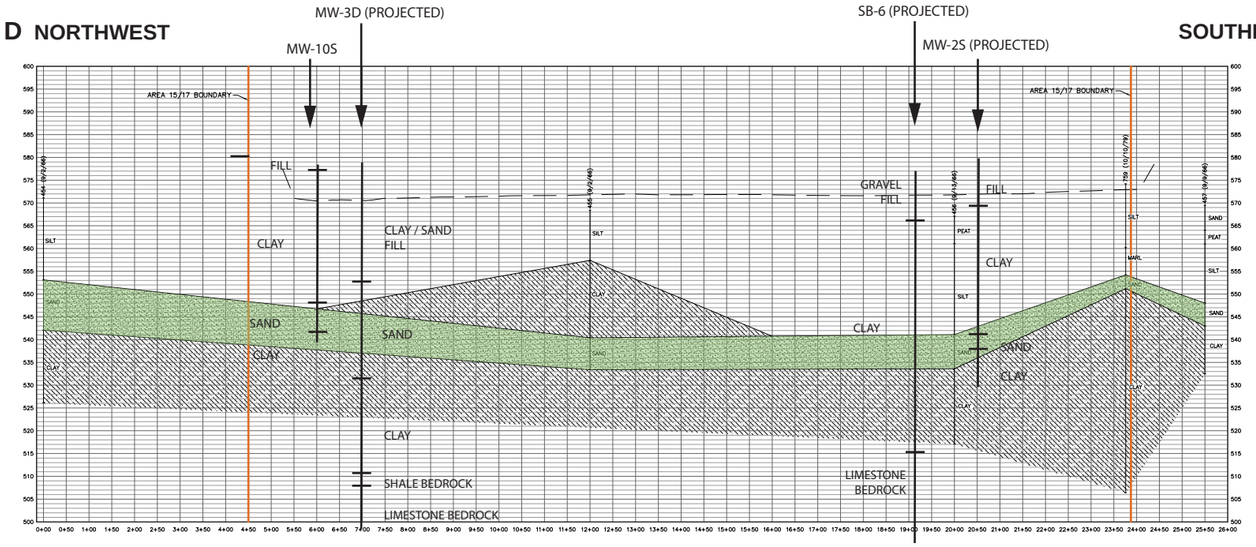
FIGURE 2a
NTH CONSULTANTS, LTD - GEOLOGIC CROSS-SECTION C - C'

DATE	REV NO.	DWG. BY	CHKD. BY
03/20/19	1	JMA	WBL

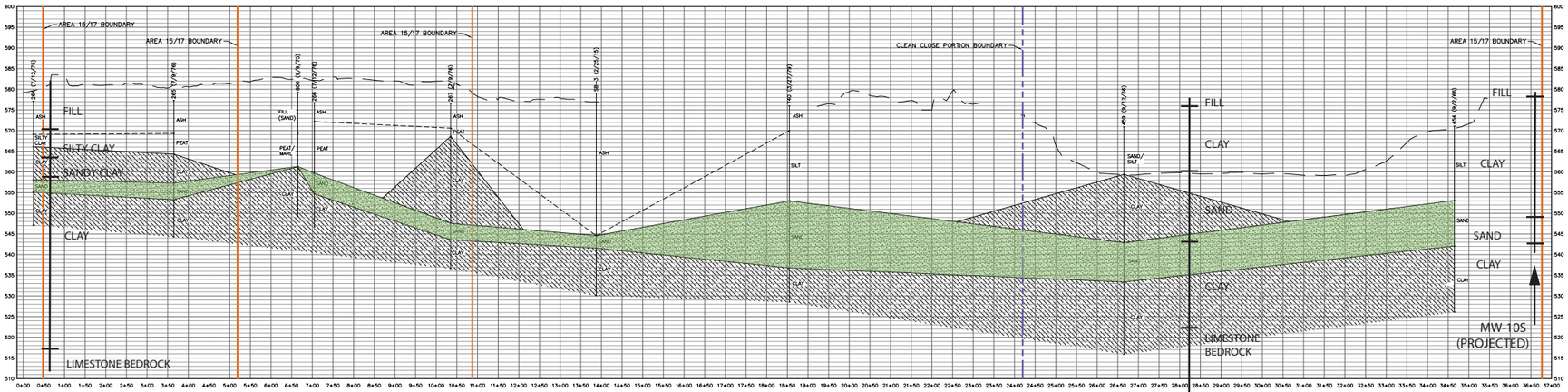
JOB NO. 60516675 AECOM

J:\Project\D\DTE\DTE-Monroe Plant\Deliverables\Draft\Aquifer Memo\Fig2a_Geo-Xsection_CC.AI

D NORTHWEST — SOUTHEAST D'



NORTHEAST E — E' SOUTHWEST



LEGEND

ASH
CLAY
SAND
UPPERMOST AQUIFER

PRELIMINARY
NOT FOR CONSTRUCTION

3

LATEST REVISION "O"

PMP NUMBER: 11107
GL/WBS2 NUMBER: I-000022-0211
PO NUMBER: 4700855696

NO.	DATE	ISSUED FOR	PROJ ENG	RESP ENG
6				
5				
4				
3				
2				
1				

PROJECT ENGINEER: APPROVALS
PRECONSTRUCTION REVISION BLOCK – REV.

Vendor:

NTH Consultants, Ltd.
Infrastructure Engineering & Environmental Services
Farmington, Michigan

NTH PROJECT NO. 60-150239-00

The Detroit Edison Co. Engineering

TITLE
AREA 15-17 CLOSURE
CROSS SECTIONS D,E

LOCATION NAME: MONROE POWER PLANT		UNIT NUMBER: 1-4	
ORIGINATING SOURCE: NTH CONSULTANTS, LTD.		SCALE: AS SHOWN	USE DIMENSIONS DO NOT SCALE
DRAWING NUMBER: 3			

DESIGN FILE:
DATE ISSUED:
DATE PLOTTED:
OPERATOR:

	DESIGNED BY	DATE
DETROIT EDISON APPROVALS	ACE	7/13/2015
FOS GEN TECH ENG	DRAWN BY	DATE
FOS GEN PLANT ENG	CWS	7/13/2015
DIST OPS	CHECKED BY	DATE
PROJECT ENG	CRL	7/13/2015
ENG CONT	APPROVED BY	DATE
OTHER DISCIPLINE APPROVALS	PROJECT ENGINEER	DATE
ARCH	PROJECT MANAGER	DATE
CIVIL		
MECH		
ELEC		
I&C		

THIS IS A CAD PRODUCED DRAWING. ANY CHANGES OR REVISIONS TO THIS DRAWING MUST BE COMPLETED USING THE CAD SYSTEM.

C	PRELIM'S	PRELIM'SR.			
MADE BY	DATE	I&C	ELECT.		
CHK'K BY	DATE	MECH.	APPROVED BY		

B	PRELIM'S	PRELIM'SR.			
MADE BY	DATE	I&C	ELECT.		
CHK'K BY	DATE	MECH.	APPROVED BY		

A	PRELIM'S	PRELIM'SR.			
MADE BY	DATE	I&C	ELECT.		
CHK'K BY	DATE	MECH.	APPROVED BY		

Monroe Power Plant

FIGURE 2b
NTH CONSULTANTS, LTD
GEOLOGIC CROSS-SECTIONS D - D' AND E - E'

DATE	REV NO.	DWG. BY	CHKD. BY
03/20/19	1	JMA	WBL

JOB NO. 60489524 — AECOM

J:\Project\D\DTE\DTE-Monroe Plant\Deliverables\Draft\Aquifer Memo\Fig2b_Geo-XsectionS_DD_EE.AI

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\D\DTE\DTE-Monroe Plant\Data-Tech\GIS\DTE_Monroe_Fig2_WellLocationMap_WithDeepWells_2018_20190114.mxd

Discharge Canal

MW-5S

MW-15

Conveyance Lines to Fly Ash Basin

MW-14

MW-4S

MW-7S

MW-8S

MW-7D

MW-9

MW-1D

MW-1S

MW-8D

MW-10

Separation Berm

MW-13

MW-3S

MW-3D

MW-2S

MW-11

MW-12

Lake Erie

Aerial and Google Earth 2016 Aerial Imagery

LEGEND:

- CCR Program Monitoring Well
- Investigation Monitoring Well (Potentiometry Only)
- Unit Separation Berm
- Approximate Plant Boundary
- Revised Approximate Boundary of Inactive Bottom Ash Impoundment

N

0 700 1,400 Feet

DTE Energy

Monroe Power Plant

FIGURE 3
INACTIVE BOTTOM ASH IMPOUNDMENT
WELL LOCATION MAP
2018

DATE: 3/20/2019	SCALE 1 inch = 720 feet
JOB NO. 60516675	

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\DTE\DTE-Monroe Plant\Data-Tech\GIS\DTE_Monroe_Event3_NO_MW5S_20180312.mxd

Discharge Canal

MW-15
573.81

Conveyance Lines to
Fly Ash Basin

MW-14
575.42

MW-8S
573.96

MW-7S
574.22

MW-9
574.35

MW-4S
575.23

MW-1S
573.70

Separation Berm

MW-13
573.75

MW-10
574.40

MW-3S
573.86

MW-2S
573.87

MW-12
573.91

MW-11
573.80

Lake Erie

574
575
576

Aerial and Google Earth 2016 Aerial Imagery

LEGEND:

- Monitoring Well
- Investigation Monitoring Well (Potentiometry Only)
- Groundwater Contour (Dashed where inferred)
- Unit Separation Berm
- Approximate Plant Boundary
- Revised Approximate Boundary of Inactive Bottom Ash Impoundment

N

0 700 1,400 Feet

Monroe County, Michigan

DTE Energy

Monroe Power Plant

FIGURE 4a
EVENT 3 (NO MW-5S)
GROUNDWATER CONTOUR MAP
3/12/2018

DATE: 3/20/2019	SCALE 1 inch = 720 feet
JOB NO. 60516675	

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\DTE\DTE-Monroe Plant\Data-Tech\GIS\DTE_Monroe_Event6_NO_MW5S_20190226.mxd

Discharge Canal

575

576

574

MW-15
574.08

Conveyance Lines to
Fly Ash Basin

MW-14
575.23

MW-4S
575.04

MW-7S
574.33

MW-8S
574.31

MW-9
574.25

MW-1S
573.88

MW-10
574.58

MW-13
574.14

Separation Berm

MW-3S
574.72

MW-2S
574.93

MW-11
574.93

MW-12
574.92

Lake Erie

Aerial and Google Earth 2016 Aerial Imagery

LEGEND:

- Monitoring Well
- Investigation Monitoring Well (Potentiometry Only)
- Goundwater Contour (Dashed where inferred)
- Unit Separation Berm
- Approximate Plant Boundary
- Revised Approximate Boundary of Inactive Bottom Ash Impoundment

0 700 1,400 Feet

N

Monroe County, Michigan

DTE Energy

Monroe Power Plant

FIGURE 4b
EVENT 6 (NO MW-5S)
GROUNDWATER CONTOUR MAP
9/24/2018

DATE: 3/20/2019	SCALE 1 inch = 720 feet
JOB NO. 60516675	

APPENDIX A

Monitoring Well Construction Logs

Project: DTE Monroe Plant Project Location: Monroe, Michigan Project Number: 60489524	Log of MW-1D Sheet 1 of 3

Date(s) Drilled	9/15/16 to 9/19/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	80.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	579.7 ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	582.60 ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)	Artesian (flowing) [Measurement after development]		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Dark gray, well graded SAND (SW); loose; some gravel, trace silt and clay; fill materials		Steel Pro-Casing
						Black, poorly graded SAND (SP); trace gravel, little silt and clay, moist (Ash)		
575	5	10	8.5	85		Black CLAY (CH); high plasticity; little sand, trace gravel, moist		
						Gray CLAY (CL); hard; moist; little gravel		Bentonite Grout
570	10					Dark gray SAND (SW); well graded; trace gravel;wet		2" ID schedule 40 PVC riser
						Dark brown CLAY (CH); high organic/peat content; moist		
565	15	10	10	100		Grades with peat, small shells		
560	20					Gray SILT (ML); some fine sand increasing with depth; wet		
555	25	10	8.0	80				
550	30							

Report: DTE_MONROE; File J:\RESOURCE\DISC\PLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:06 PM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1D

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						
						Dark gray fine SAND (SP-SM); poorly graded; some silt; wet	
545	35	10	8.5	85			
						same as above; decayed wood present	
						Gray GRAVEL (GW); rounded; well graded; trace clay; wet	Bentonite Grout
540	40						2" ID schedule 40 PVC riser
						Gray CLAY (CL); glacial till; hard; trace fine sand; moist	
535	45	10	10	100			
530	50						
		5	5.0	100			
						Highly weathered LIMESTONE-SHALE (large bedrock inclusion in till)	
525	55						
		5	5.0	100		Gray CLAY (CL); glacial till; very hard; trace medium sand; dry	
520	60						
		5	0.5	10			
515	65						

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1D

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
		5	2.75	55			Bentonite Grout 2" ID schedule 40 PVC riser Bentonite Seal
510	70						
		5	4.0	80		LIMESTONE-SHALE (bedrock); gray, highly weathered; wet; some intact 2"-3"	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
505	75						Clean silica sand
		5	5.0	100		LIMESTONE (bedrock); gray, slightly weathered; breaks apart with hammer blows; moist to wet	
500	80						End of boring
495	85						
490	90						
485	95						
480	100						

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1S

Sheet 1 of 2

Date(s) Drilled	**9/15/16 to 9/19/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**41.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**579.8 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**582.62 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**9.42' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Dark gray well graded SAND (SW); loose; some ash; fill materials		Steel Pro-Casing
575	5	10	8.5	85				
						Black CLAY (CH); high plastiscity; moist		
								Bentonite Grout
						Gray CLAY (CL); hard; moist; little gravel		
570	10					Dark gray SAND (SW); well graded; trace gravel;wet		2" ID schedule 40 PVC riser
						Dark brown CLAY (CH); high organic-peat content; moist		
565	15	10	10	100				
560	20					Gray SILT (ML); some fine sand; wet		
555	25	10	8.0	80				Bentonite Seal
								Clean silica sand
550	30							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1S

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						2" ID schedule 40 PVC riser
							SCH 40 PVC 2" Diameter 0.01" Slotted Screen
						Dark gray fine SAND (SP-SM); poorly graded; some silt; wet	
545	35	10	8.5	85			Clean silica sand
						same as above; decayed wood present	
						Gray GRAVEL (GW); rounded; well graded; trace clay; wet	
540	40						End of boring
535	45	10	10	100			
530	50						
525	55						
520	60						
515	65						

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-2S

Sheet 1 of 2

Date(s) Drilled	**9/19/16 to 9/19/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**50.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**579.2 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**578.85 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**4.91' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT Gray SAND (SW-SM); well graded; with silt; some gravel		
575	5	10	1.0	10				
								Bentonite Grout
570	10					Dark gray CLAY (CH); high plasticity; trace silt; wood debris-organic materials; moist		2" ID schedule 40 PVC riser
565	15	10	7.5	75				
560	20							
						Brown CLAY (CH); high plasticiity; some mottling; little gravel; moist; hard @ 26'		
555	25	10	6.0	60				
								Bentonite Seal
550	30							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-2S

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30					Dark gray CLAY (CL); trace coarse sand; little gravel; very hard; dry-moist	2" ID schedule 40 PVC riser
545							SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	35	10	8.5	85			Clean silica sand
540						Dark gray SAND (SP-SM); poorly graded; fine grained; some silt; wet	
	40					Dark gray SAND (SP); poorly graded; wet	
						Dark Gray CLAY (CL); glacial till; very hard, trace gravel and sand; moist	Bentonite Seal
535							
	45	10	8.0	80			
530							
	50						End of boring
525							
	55						
520							
	60						
515							
	65						

Project: DTE Monroe Plant	Log of MW-3D
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 3

Date(s) Drilled	9/20/16 to 9/20/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	80.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	578.0 ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	577.42 ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)	Artesian (flowing) [Measurement after development]		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT-GRAVEL		
						Brown SAND (SW); well graded; some gravel		
575								
	5	10	2.75	27.5		Dark yellow-brown CLAY (CL); very stiff; little gravel; moist		
570								Bentonite Grout
	10					Dark gray CLAY (CH); high plasticity; some organic materials; stiffer with depth; moist to wet		2" ID schedule 40 PVC riser
565								
	15	10	10	100				
						Dark gray-brown CLAY (CL); hard; gray mottling; little gravel		
560								
	20							
555								
	25	10	10	100		Dark gray SAND (SP-SM); poorly graded with silt; medium dense; trace gravel		
						Dark gray SAND (SP); poorly graded; fine grained; medium dense; moist		
550								
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:25 PM

AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3D

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						
545						Dark gray SAND (SP-SM); poorly graded with silt; fine grained; higher silt content at depth; wet	
	35	10	9.5	95			
540						Gray SILT (ML); soft; little fine sand; wet	Bentonite Grout
	40					Dark gray CLAY (CL); glacial till; hard; trace gravel and sand; moist	2" ID schedule 40 PVC riser
535							
	45	10	5.5	55			
530							
	50						
525							
	55	10	5.5	55			
520							
	60						
		10	3.0	30		Gray highly weathered LIMESTONE (bedrock inclusion in till); some granite pebbles	
515							
	65					Dark gray CLAY (CL); glacial till; hard; trace gravel; moist	Bentonite Seal

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3D

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
510	70	10	3.0	30		Light gray SH (bedrock); highly weathered; broken from drilling process; moist to wet		Bentonite Seal 2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen
505	75	10	4.0	40		Gray LIMESTONE (bedrock); weathered; some intact sections (< 3" long); moist to wet		Clean silica sand
500	80					Pale brown LIMESTONE (bedrock); highly weathered 1-2" long pieces		End of boring
495	85							
490	90							
485	95							
480	100							

Project: DTE Monroe Plant	Log of MW-3S
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/20/16 to 9/20/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	40.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	578.1 ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	577.58 ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)	3.76' BTOC [Measurement after development]		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT-GRAVEL		
						Brown SAND (SW); well graded; some gravel		
575								
	5	10	2.75	27.5		Dark yellow-brown CLAY (CL); very stiff; little gravel; moist		
570								Bentonite Grout
	10					Dark gray CLAY (CH); high plasticity; some organic materials; stiffer with depth; moist to wet		2" ID schedule 40 PVC riser
565								
	15	10	10	100				
						Dark gray-brown CLAY (CL); hard; gray mottling; little gravel		
560								
	20							
555								
	25	10	10	100		Dark gray SAND (SP-SM); poorly graded with silt; medium dense; trace gravel		Bentonite Seal
						Dark gray SAND (SP); poorly graded; fine grained; medium dense; moist		
550								Clean silica sand
	30							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3S

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						SCH 40 PVC 2" Diameter 0.01" Slotted Screen
545						Dark gray SAND (SP-SM); poorly graded with silt; fine grained; higher silt content at depth; wet	2" ID schedule 40 PVC riser
	35	10	9.5	95			Clean silica sand
540						Gray SILT (ML); soft; little fine sand; wet	
	40						End of boring
535							
	45	10	5.5	55			
530							
	50						
525							
	55						
520							
	60						
515							
	65						

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AECOM

Project: DTE Monroe Plant Project Location: Monroe, Michigan Project Number: 60489524	Log of MW-4S Sheet 1 of 2

Date(s) Drilled	9/26/16 to 9/26/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	40.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	578.1 ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	580.67 ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)	5.82' BTOC [Measurement after development]		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Brown SAND (SW); well graded with gravel		Steel Pro-Casing
575						Dark gray SAND (SW); well graded; moist		
	5	10	5.5	55				
						Brown CLAY (CH); high plasticity; trace gravel and coarse sand; moist		
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
						Dark gray CLAY (CH); high plasticity; some organic material-peat		
565								
	15	10	5.0	50				
560								
	20					Gray SILT (ML) with fine sand; wet		
								Bentonite Seal
555								
	25	10	7.5	75				Clean silica sand
								SCH 40 PVC 2" Diameter 0.01" Slotted Screen
550						Dark gray SAND (SW); well graded; loose; trace gravel; wet		
	30							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-4S

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	30							2" ID schedule 40 PVC riser
545								SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	35	10	7.5	75		Dark gray SILT (ML) with fine sand; wet		Clean silica sand
						Gray CLAY (CL); glacial till; hard'; trace gravel and coarse sand		Bentonite Seal
540								
	40							End of boring
535								
	45							
530								
	50							
525								
	55							
520								
	60							
515								
	65							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:37 PM

AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S

Sheet 1 of 3

Date(s) Drilled	**10/4/16 to 10/4/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**70.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**581.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**584.50 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**5.81' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Black SAND (SW); well graded; little gravel; moist (FILL)		Steel Pro-Casing; Bentonite Seal
580		5	0	0		Gray fine SAND (SP-SM) with silt and gravel; moist		
	5							2" ID schedule 40 PVC riser
575		5	4.0	40				
	10					Gray silty CLAY (CL); low plasticity; soft; little organic material; moist		
570						Dark brown CLAY (CL); high plasticity; some organic material; small shells; moist		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	15	10	7.0	70				
565								Clean silica sand
	20					Gray CLAY (CL) with fine sand and silt; soft; trace organic material; sand-silt decrease with depth; wet		
560								
						Gray CLAY (CH); brown mottling; high plasticity; little gravel; moist		Bentonite Chip
	25	10	8.5	85		Gray CLAY (CL); brown mottling; hard; low plasticity; moist; very hard starting at 34 feet		
555								
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:42 PM

AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S

Sheet 2 of 3

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						
550							
	35	10	7.5	75			
545							
	40						Bentonite Chip
540						Gray CLAY (CH); brown mottling; high plasticity; little gravel; moist	
	45	10	8.5	85		Gray CLAY (CL); glacial till; very hard; moist to dry	
535							
	50						
530							
	55	10	5.5	55			
525							
	60						
520		5	4.0	80			
	65						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:43 PM

AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S

Sheet 3 of 3

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
515		5	4.0	80		Gray LIMESTONE (bedrock); higly weathered; dry from drilling methods but zone produces water		Bentonite Chip
	70							End of boring
510								
	75							
505								
	80							
500								
	85							
495								
	90							
490								
	95							
485								
	100							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:44 PM

AECOM

Project: DTE Monroe Plant	Log of MW-7D
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 3

Date(s) Drilled	9/28/16 to 9/28/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	70.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	576.7 ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	576.17 ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)	Artesian (flowing) [Measurement after development]		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Gray gravel FILL		
575						Brown CLAY (CH); high plasticity; some organic materials and shells; moist		
	5	10	5.5	55				
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
565								
	15	10	8.5	85				
560						Gray CLAY(CH); high plasticity; trace fine sand; moist		
						Gray SAND (SP-SM) with silt; trace organic fragments; wet		
	20							
555								
						Gray fine SAND (SP); some silt; wet		
	25	10	8.5	85		Gray SAND (SW); well graded; little gravel; wet		
550								
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:50 PM

AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7D

Sheet 2 of 3

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
545	30					Gray GRAVEL (GW); well graded with sand; wet	
						Gray SAND (SW); well graded; little gravel; wet	
	35	10	8.5	85		Dark gray CLAY (CL); glacial till; hard; trace gravel and coarse sand; moist	
540							Bentonite Grout
	40						2" ID schedule 40 PVC riser
535							
	45	10	9.5	95			
530							
	50						
525							
	55	10	10	100		Light gray LIMESTONE (bedrock); highly weathered; some larger pieces; wet	Bentonite Seal
520							
	60					Light gray LIMESTONE (bedrock); highly weathered; some intact pieces; poor recovery overall; wet	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
515		10	2.5	25			
	65						Clean silica sand

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7D

Sheet 3 of 3

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
510	70	10	2.5	25				2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen Clean silica sand Collapse End of boring
505	75							
500	80							
495	85							
490	90							
485	95							
480	100							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7S

Sheet 1 of 2

Date(s) Drilled	**9/28/16 to 9/28/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**34.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**576.6 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**576.20 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**2.74' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Gray gravel FILL		
575						Brown CLAY (CH); high plasticity; some organic materials and shells; moist		
	5	10	5.5	55				
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
565								
	15	10	8.5	85				
560						Gray CLAY(CH); high plasticity; trace fine sand; moist		
						Gray SAND (SP-SM) with silt; trace organic fragments; wet		
	20							Bentonite Seal
555								
						Gray fine SAND (SP); some silt; wet		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	25	10	8.5	85		Gray SAND (SW); well graded; little gravel; wet		
550								
	30							Clean silica sand

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7S

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	30							2" ID schedule 40 PVC riser
545		4	3.4	85		Gray GRAVEL (GW); well graded with sand; wet		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
						Gray SAND (SW); well graded; little gravel; wet		Clean silica sand
								End of boring
	35							
540								
	40							
535								
	45							
530								
	50							
525								
	55							
520								
	60							
515								
	65							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/27/2016 4:25:57 PM

AECOM

Project: DTE Monroe Plant	Log of MW-8D
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 3

Date(s) Drilled	9/29/16 to 9/30/2016	Logged By	Ron Friend	Checked By	M Hawrylak
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	70.0 ft
Drill Rig Type	Mini Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Fly Ash Basin	Groundwater Level(s)	Artesian (flowing) [Measurement after development]		

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0					Brown SAND (SW); well graded; trace gravel and silt; moist		Steel Pro-Casing
5	10	5.5	55		Gray SILT (ML) with fine sand; trace organic material; some thin black colored layers; wet		Bentonite Grout
10							2" ID schedule 40 PVC riser
15	10	5.5	55				
					Dark gray CLAY (CH); high plasticity; trace organic material; small shells		
20					Brown CLAY(CH); high plasticity; little coarse sand and gravel; gray mottling; moist		
25	10	10	100		Gray CLAY (CL); hard; low plasticity; trace coarse sand and gravel; moist		
30							

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8D

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30	5	5	100			
35	5	2.5	50		Gray fine SAND (SP-SM) with silt; thin silt seams (<1" thick); wet	Bentonite Grout
40	10	8.0	80		Gray CLAY (CL); hard; glacial till; med-low plasticity; little gravel and coarse sand; moist	2" ID schedule 40 PVC riser
45						
50	10	8.0	80		Light gray LIMESTONE (bedrock); highly weathered; soft; wet	Bentonite Seal
55						
60	10	2.0	20		Brown LIMESTONE (bedrock); weathered; wet	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
65						Clean silica sand

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8D

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	10	2.0	20				2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen Clean silica sand
70							End of boring
75							
80							
85							
90							
95							
100							

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8S

Sheet 1 of 2

Date(s) Drilled	**9/29/16 to 9/30/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**43.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**583.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**586.59 ft msl**
Boring Location	**Fly Ash Basin**	Groundwater Level(s)	**11.86' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0							Steel Pro-Casing
580						Brown SAND (SW); well graded; trace gravel and silt; moist		
	5	10	5.5	55		Gray SILT (ML) with fine sand; trace organic material; some thin black colored layers; wet		
575								Bentonite Grout
	10							2" ID schedule 40 PVC riser
570								
	15	10	5.5	55				
565						Dark gray CLAY (CH); high plasticity; trace organic material; small shells		
	20					Brown CLAY(CH); high plasticity; little coarse sand and gravel; gray mottling; moist		
560								
	25	10	10	100		Gray CLAY (CL); hard; low plasticity; trace coarse sand and gravel; moist		
555								Bentonite seal
	30							

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Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8S

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30	5	5	100			Bentonite seal 2" ID schedule 40 PVC riser
550							SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	35	5	2.5	50		Gray fine SAND (SP-SM) with silt; thin silt seams (<1" thick); wet	Clean silica sand
545							
	40	3	2.4	80			End of boring
540							
	45						
535							
	50						
530							
	55						
525							
	60						
520							
	65						

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-9

Sheet 1 of 2

Date(s) Drilled	**9/19/17 to 9/19/2017**	Logged By	**Ron Friend**	Checked By	**B Finnigan**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**40.0 ft**
Drill Rig Type	**Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0					Gravelly FILL, dry		
	2	1.5	50%				
5					Very dark gray high plasticity CLAY with some organics and shell fragments, soft, moist		
	5	5	100%		grades with fine sand		Bentonite Grout
10					grades with some organic material		2" ID schedule 40 PVC riser
15	10	8	80%		grades with more organics		
					Dark brown clayey PEAT, soft		
20					Gray high plasticity CLAY, soft, moist		Bentonite Seal
					Gray sandy SILT, soft, wet		
					grades with less sand with depth		
25	10	9	90%		Gray fine SAND with silt, loose, wet		
					grades with less silt with depth		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
					Gray poorly graded SAND with trace fines, loose, wet		
30					Gray poorly graded GRAVEL with sand, loose, wet		

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-9

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30					Gray fine grained SAND with trace fines, wet	Clean silica sand
35	10	10	100%		Gray low plasticity CLAY with little gravel, hard, moist [TILL]	Natural Collapse
40					Terminate boring at 40 feet BGS.	End of boring
45						
50						
55						
60						
65						

Project: DTE Monroe Plant	Log of MW-10
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/20/17 to 9/20/2017	Logged By	Ron Friend	Checked By	B Finnigan
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	40.0 ft
Drill Rig Type	Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0	5	3	60%		Grey poorly graded GRAVEL with clay and sand, dry		
					Dark yellowish brown low plasticity CLAY with sand, moist		
5	5	3	60%		grades with gravel grades with less gravel with depth		
					Very dark grey high plasticity CLAY with trace shell fragments, moist		Bentonite Grout
10	10	9.5	95%		grades with fine sand		2" ID schedule 40 PVC riser
15					grades with small sand seams, fine sand, 1-2 inches apart grades with little organic material		
20	10	9.5	95%				Bentonite Seal
25					Grey silty CLAY with fine sand, very soft, wet		
					Grey high plasticity CLAY, moist		
30							

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-10

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30					Dark grey poorly graded SAND with gravel, wet	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
					Dark grey well graded SAND, with little silt, fine grained sand, wet	
35	10	9.5	95%		grades with increasing silt with depth	
					Grey SILT with little gravel, hard, moist	Natural Collapse
					Grey CLAY with little gravel, hard, moist	
40					Terminate boring at 40 feet BGS.	End of boring
45						
50						
55						
60						
65						

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-11

Sheet 1 of 2

Date(s) Drilled	**9/20/17 to 9/20/2017**	Logged By	**Ron Friend**	Checked By	**B Finnigan**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**45.0 ft**
Drill Rig Type	**Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0	5	2	40%		Pale brown poorly graded SAND (fill), loose, dry		
5	5	4	80%		grades with gravel		
					Dark brown high plasticity CLAY with grey mottling, very stiff, moist		**Bentonite Grout**
10	5	5	100%		Very dark grey high plasticity CLAY with little organics and trace shell fragments, soft, moist		**2" ID schedule 40 PVC riser**
15	5	5	100%		Grey low plasticity CLAY with brown mottling, little coarse sand and gravel, hard, moist grades to brown		
20	5	5	100%		grades to grey		
					Grey CLAYwith little gravel and coarse sand, hard, moist-dry		
25	5	5	100%				**Bentonite Seal**
					Grey SILT with fine sand, stiff, moist - wet, slow dilatancy		
30							

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Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-11

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30						
35	10	10	100%			SCH 40 PVC 2" Diameter 0.01" Slotted Screen
40						Natural Collapse
	5	5	100%		Grey CLAY (till) with little gravel and coarse sand, hard, friable, moist - dry	
45					Terminate boring at 45 feet BGS.	End of boring
50						
55						
60						
65						

Project: DTE Monroe Plant	Log of MW-12
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/21/17 to 9/21/2017	Logged By	Ron Friend	Checked By	B Finnigan
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	50.0 ft
Drill Rig Type	Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0	5	2	40%		Pale brown well graded SAND with fined grained sand and trace gravel, dry		
					moist		
5	5	3	60%		grades with trace shell fragments		
					Dark grey SAND with silt, moist		Bentonite Grout
10					wet		
	10	8	80%		Very dark grey high plasticity CLAY with little organics and trace shell fragments, soft, moist		2" ID schedule 40 PVC riser
15							
					Gray high plasticity CLAY with trace coarse sand and gravel, stiff, moist		
20							
	10	10	100%		grades with color change to brown, hard, some grey mottling		
25							
					Very dark grey low plasticity CLAY		Bentonite Seal
30							

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-12

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30					Dark grey fine SILT with sand, stiff, wet-moist	
35	10	9	90%		Dark grey fine SAND with silt, stiff, wet-moist	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
40						Natural Collapse
45	10	10	100%		Dark grey low plasticity CLAY (till) with little gravel and coarse sand, hard, moist	
50						End of boring
55						
60						
65						

Project: DTE Monroe Plant	Log of MW-13
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/21/17 to 9/21/2017	Logged By	Ron Friend	Checked By	B Finnigan
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	43.5 ft
Drill Rig Type	Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0	5	4	80%		Brown poorly graded SAND with gravel, dry moist		
5	5	4.5	90%		wet woody debris		
					Black high plasticity CLAY with little organics, soft, moist		Bentonite Grout
10					Dark grey fine SAND with silt, wet, silt increasing with depth Dark grey SILT with fine sand, wet		
					Black high plasticity CLAY with little organic material, soft, moist		2" ID schedule 40 PVC riser
15	10	6	60%				
20					Dark grey low plasticity CLAY with silt and little fine sand, very soft, wet		Bentonite Seal
25	15	11	73%				
					Dark grey fine SILT with sand, very soft, wet, sand increasing with depth woody debris		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
30							

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AECOM

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-13

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30	15	11	73%		Dark grey fine SAND with silt, wet	
					Dark grey low plasticity CLAYwith little gravel and coarse sand, hard, moist	
35						Natural Collapse
	8.5	8.5	100%			
40					Terminate boring at 43.5 feet BGS.	End of boring
45						
50						
55						
60						
65						

Project: DTE Monroe Plant	Log of MW-14
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/22/17 to 9/22/2017	Logged By	Ron Friend	Checked By	B Finnigan
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	40.0 ft
Drill Rig Type	Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0	5	4	80%		Black coal ash FILL with gravel and coal, loose, dry		
5	5	4.5	90%		Black coal ash FILL, coarse, sand-gravel sized, moist		
10	10	6	60%		Very dark grey high plasticity CLAY, soft, moist		Bentonite Grout
15					grades to coarse sand and gravel, wet		2" ID schedule 40 PVC riser
20	10	0	0%		Very dark grey fine SAND with silt and clay, wet No recovery		Bentonite Seal
25							
30							

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-14

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
30					Dark grey CLAY with sand, fine-medium grained sand. wet		
					Dark grey poorly graded SAND with gravel,coarse grained sand, wet		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
35	10	9	90%				
					Dark grey CLAY (till) with little coarse sand and gravel, hard, moist		
40					Terminate boring at 40 feet BGS.		End of boring
45							
50							
55							
60							
65							

Project: DTE Monroe Plant	Log of MW-15
Project Location: Monroe, Michigan	
Project Number: 60489524	Sheet 1 of 2

Date(s) Drilled	9/26/17 to 9/26/2017	Logged By	Ron Friend	Checked By	B Finnigan
Drilling Method	Sonic	Drill Bit Size/Type	Sonic 6"	Total Depth of Borehole	45.0 ft
Drill Rig Type	Sonic	Drilling Contractor	Cascade Drilling	Surface Elevation	ft msl
Borehole Backfill	Monitoring Well	Sampling Method(s)	Sonic Core Barrel - 4"	Top of Casing Elevation	ft msl
Boring Location	Inactive Bottom Ash Basin	Groundwater Level(s)			

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0					Greyish brown gravelly FILL with silt and clay, dry		
	4	4	100%		moist		
					Dark grey medium plasticity CLAY with little shell fragments, soft, moist		
5	5	4.5	90%				Bentonite Grout
10					grades with little organic material		2" ID schedule 40 PVC riser
15	10	9	90%		grades with color change to very dark organic brown		
20					Grey high plasticity CLAY with trace coarse sand, soft, moist-wet		
25	10	8.5	85%				Bentonite Seal
					Grey low plasticity CLAY with little silt, soft, moist-wet, silt increasing with depth		
					Grey SILT with fine sand, wet		
30					Grey SAND with silt, wet		

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-15

Sheet 2 of 2

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
30					Grey well graded SAND, fine to coarse grained, wet		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
35	10	10	100%		grades with gravel		
					Grey well graded GRAVEL with coarse sand, wet		
					Grey well graded SAND with gravel, wet		
					Grey low plasticity CLAY (till) with little coarse sand and gravel, hard, moist		Natural Collapse
40							End of boring
45					Terminate boring at 45 feet BGS.		
50							
55							
60							
65							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENV\GINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 10/16/2017 8:30:12 AM

AECOM

APPENDIX B

MW-8S Hydraulic Isolation Alternative Source Demonstration

1540 Eisenhower Pl.
Ann Arbor, MI 48108
T 734.971.7080
TRCcompanies.com

Technical Memorandum

Date: October 14, 2019

To: Christopher P. Scieszka
DTE Electric Company

From: Graham Crockford, TRC
David McKenzie, TRC

Project No.: 320511.0006.0000 Phase 001, Task 001

Subject: Alternate Source Demonstration: 2019 Initial Detection Monitoring Sampling Event Monroe Power Plant Bottom Ash Impoundment Inactive Coal Combustion Residual Unit

Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Monroe Power Plant (MONPP) Bottom Ash Impoundment (BAI) Inactive CCR unit. On August 5, 2016, the USEPA published the CCR Rule companion *Extension of Compliance Deadlines for Certain Inactive Surface Impoundments*, which established the compliance deadlines for CCR units that were inactive prior to October 15, 2015.

TRC prepared the 2019 *Annual Groundwater Monitoring Report* (Annual Report) for the MONPP BAI Inactive CCR unit on behalf of DTE Electric in accordance with the requirements of §257.90(e) (TRC, July 2019). The Annual Report included the results of the May 2019 semiannual groundwater monitoring event for the MONPP BAI Inactive CCR unit and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the MONPP BAI Inactive CCR unit. This event was the initial detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *Groundwater Monitoring Work Plan Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Basin DTE Monroe Plant* (Work Plan) (AECOM, September 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels. The statistical analysis was performed pursuant to §257.93(f) and (g), and in accordance with the

Groundwater Statistical Evaluation Plan Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Impoundment DTE Monroe Plant (Stats Plan) (AECOM, April 2019, Revised August 2019).

The statistical evaluation of the May 2019 Appendix III indicator parameters showed potential SSIs over background for:

- Boron at MW-8S;
- Sulfate at MW-9, MW-10, MW-11; and
- TDS at MW-9 and MW-10.

All other Appendix III constituents were within the statistical background limits. As discussed in the August 2019 Annual Groundwater Monitoring Report (TRC, August 2019), verification resampling was conducted on July 8 and 9, 2019, by TRC personnel for boron at MW-8S, sulfate and TDS at MW-9 and MW-10, and sulfate at MW-11. The verification resampling confirmed only the boron SSI at MW-8S.

In accordance with §257.94(3)(2), DTE Electric may demonstrate that a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. This Alternate Source Demonstration (ASD) has been prepared to evaluate the initial boron SSI identified in the May 2019 detection monitoring event. The results of this ASD show that the SSI at MW-8S is not due to a release from the MONPP BAI Inactive CCR unit.

Background

The MONPP is located in Section 15, Township 7 South, Range 9 East, at 3500 East Front Street, Monroe in Monroe County, Michigan. The site location is shown in Figure 1. The MONPP BAI Inactive CCR unit is located within the southern portion of the MONPP parcel and is bounded by the MONPP facility to the north and northeast, Lake Erie to the southeast and south, and Plum Creek/the discharge canal to the west. The MONPP BAI Inactive CCR unit was operated from the early-1970s through part of 2015.

As presented in the Stats Plan, the bedrock in the site vicinity is overlain by approximately 40 to 50 feet of unconsolidated deposits of glacial origin. The deposits are comprised of two (2) distinct units: a hard glacial till immediately overlying bedrock and lacustrine (lake bed or lake shore) deposits which overlay the till unit. The till is comprised of over consolidated (highly compacted) gray silty to sandy clay with some cobbles and boulders, and ranges from approximately 20 to 50 feet in thickness. The overlying lacustrine deposits are composed of 10 to 30 feet of fine-grained sand and silt with some soft clay except where there is a thin, discontinuous coarse sand unit at the base of the lacustrine sequence.

The detection monitoring well network for the MONPP BAI Inactive CCR unit currently consists of twelve monitoring wells that are screened in the uppermost aquifer. As discussed in the Stats Plan, intrawell statistical methods for the MONPP BAI Inactive CCR unit were selected based on the

geology and hydrogeology at the Site (the variability in the presence of the sand unit aquifer across the site and the strong confined hydraulic pressure in the sand unit aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). Monitoring wells MW-1S through MW-3S and MW-7S through MW-15 are located around the perimeter of the MONPP BAI and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of twelve background/downgradient monitoring wells). The monitoring well locations are shown in Figure 2. The *Monitoring Well Installation Report Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Impoundment DTE Monroe* (Well Installation Report) (AECOM, April 2019, Revised August 2019) details the groundwater monitoring system.

Alternate Source Demonstration

Verification resampling for boron at MW-8S, sulfate and TDS at MW-9 and MW-10, and sulfate at MW-11 was performed as recommended per the Stats Plan and the *USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance, USEPA, 2009) to achieve performance standards as specified by §257.93(g) in the CCR rules. The verification resampling confirmed the boron exceedance at MW-8S during the July 2019 verification sampling event (Table 1). The following discussion presents the ASD for the confirmed prediction limit exceedance.

Boron at MW-8S: Based on historical site modifications that changed the underlying lithology beneath the discharge channel, groundwater in the area of monitoring well MW-8S is not hydraulically connected to groundwater in the vicinity of the MONPP BAI Inactive CCR unit. Therefore, concentrations in groundwater at MW-8S are not indicative of a release from the CCR unit.

A deep channel was historically dredged along the current location of the MONPP discharge channel to provide access to the MONPP parcel during the late 1960s/early 1970s based on the historic topographic maps (from 1952 to 1973) and aerial photographs (from 1961 and 1973) provided in Attachment A. As shown on Figure 2, the deep channel extended from the area near East Front Street (adjacent to the main plant building) toward Lake Erie to the south (between MW-8S and the MONPP BAI). Based on current available bathymetry data that was collected on July 24, 2019 using a Lowrance HDS9 sonic sonar unit, the channel was dredged to a depth of approximately 28 feet (to an elevation of approximately 546 feet above sea level per NAVD88) such that the bottom of the deep channel intersects the uppermost aquifer (Attachment B). The portion of the discharge channel south of the main channel of Plum Creek (between MW-8S and the MONPP BAI) has been partially filled with sediment since the MONPP was completed in the 1970s, as the channel was no longer maintained for navigation.

As illustrated on Figures 3 and 4, the upper portion of the uppermost aquifer at MW-7S and MW-9 is at a higher elevation than the bottom of the now partially sediment filled discharge channel. This demonstrates that the sediment fill within the discharge channel intersects the uppermost aquifer, creating a hydraulic connection between the uppermost aquifer and the discharge channel.

Groundwater and Lake Erie surface water elevation data also support the hydraulic connection between the discharge channel/Lake Erie and the uppermost aquifer. A graphical depiction of the MONPP BAI Inactive CCR unit groundwater elevations at select monitoring wells and surface water elevations in Lake Erie are shown in Figure 5. These data demonstrate that groundwater in the uppermost aquifer is interacting with surface water as shown by the monitoring well groundwater surface elevations rising and lowering concurrently with the Lake Erie surface water elevations.

Groundwater naturally flows horizontally in the downgradient direction (from high potential to low potential) along the path of least resistance toward the closest discharge features, which in this case are Plum Creek, the discharge channel, and Lake Erie. At the point of discharge, vertical groundwater flow gradients are expected as groundwater discharges to surface water. Groundwater potentiometric surface elevation data from MW-7S, MW-9 and MW-8S are consistently higher than the Lake Erie surface elevation recorded on the same date as shown on Figure 5. This demonstrates that the groundwater from the area of MW-8S will flow east and groundwater from the area of MW-7S and MW-9 will flow west toward the discharge channel and discharge into the channel, given that the surface water elevation in the channel is lower and there is a hydraulic connection between the uppermost aquifer and the channel (Figures 3 and 4). As such, groundwater beneath the MONPP BAI cannot physically flow west of the discharge channel to the area of MW-8S.

In addition, clay is present beneath the uppermost aquifer preventing downward vertical migration of groundwater in the area of the discharge channel (Figures 3 and 4). Upward vertical flow potential is observed in groundwater beneath the uppermost aquifer as evidenced by the artesian flowing conditions at MW-7D and MW-8D that are at higher groundwater elevations compared to their shallow counterparts, MW-7S and MW-8S, further demonstrating that vertical flow potential is upward beneath the uppermost aquifer (Figure 5).

Given that groundwater from the area of the MONPP BAI cannot reach monitoring well MW-8S due to the hydraulic separation along the discharge channel, the boron SSI at MW-8S is not indicative of a release from the MONPP BAI Inactive CCR unit.

Conclusions and Recommendations

The information provided in this report serves as the ASD for the DTE Electric MONPP BAI Inactive CCR unit, was prepared in accordance with 40 CFR 257.94(e)(2) of the CCR Rule, and demonstrates that the boron SSI determined based on the initial semiannual detection monitoring event performed in 2019 is not due to a release of CCR leachate into the groundwater from the MONPP BAI Inactive CCR unit. Therefore, based on the information provided in this ASD, DTE Electric will continue detection monitoring as per 40 CFR 257.94 at the MONPP BAI Inactive CCR unit removing monitoring well MW-8S from the well network for future detection monitoring since MW-8S is not hydraulically connected to the MONPP BAI Inactive CCR unit.

Certification Statement

I hereby certify that the alternative source demonstration presented within this document for the MONPP BAI Inactive CCR unit has been prepared to meet the requirements of Title 40 CFR §257.94(e)(2) 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 §257.94(e)(2).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2019	
Company: TRC Engineers Michigan, Inc.	Date: 10/14/19	

References

TRC Environmental Corporation. July 2019. Annual Groundwater Monitoring Report – DTE Electric Company Monroe Power Plant Bottom Ash Basin Inactive Coal Combustion Residual Unit, 3500 East Front Street, Monroe, Michigan. Prepared for DTE Electric Company.

AECOM. September 2017. Groundwater Monitoring Work Plan Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Basin, DTE Monroe Plant, Monroe, Michigan. Prepared for DTE Electric Company.

AECOM. April 2019, Revised August 2019. Groundwater Statistical Evaluation Plan Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Impoundment, DTE Monroe Plant, Monroe, Michigan. Prepared for DTE Electric Company.

AECOM. April 2019, Revised August 2019. Monitoring Well Installation Report Coal Combustion Residuals (CCR) Rule – Inactive Bottom Ash Impoundment, DTE Monroe Plant, Monroe, Michigan. Prepared for DTE Electric Company.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.

Attachments

Table 1 Comparison of Verification Sampling Results to Background Limits

Figure 1 Site Location Map
Figure 2 Well Location Map
Figure 3 Generalized Cross-Section A-A'
Figure 4 Generalized Cross-Section B-B'
Figure 5 MW-7S, MW-8S, MW-9, MW-7D, MW-8D, and Lake Erie Ground/Surface Water Elevation Time Series Plot

Attachment A Historic Topographic Maps and Aerial Photographs
Attachment B Bottom of Discharge Channel Depth Map

Table 1

Table 1
Comparison of Verification Sampling Results to Background Limits
Monroe Power Plant Inactive Bottom Ash Impoundment – RCRA CCR Monitoring Program
Monroe, Michigan

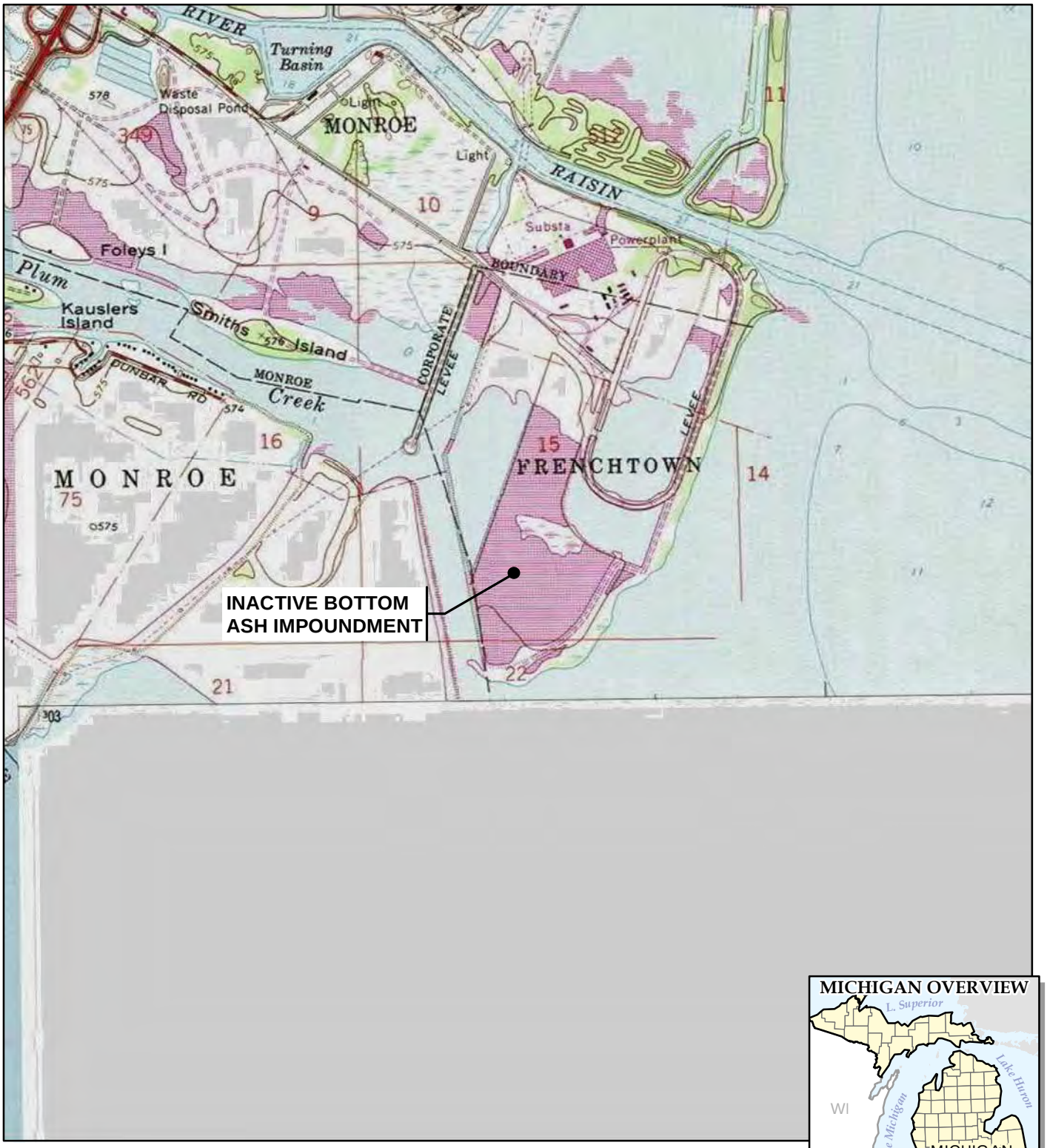
Sample Location:		MW-8S		MW-9		MW-10		MW-11	
Sample Date:		7/9/2019		7/8/2019		7/8/2019		7/8/2019	
Constituent	Unit	Data	PL	Data	PL	Data	PL	Data	PL
Appendix III									
Boron	ug/L	**490**	440	--	640	--	530	--	920
Sulfate	mg/L	--	1,600	3.6	12	3.7	19	1,300	1,500
Total Dissolved Solids	mg/L	--	2,400	800	810	830	840	--	2,100

Notes:

-- = not analyzed

RESULT Shading and bold font indicates a confirmed exceedance of the Prediction Limit (PL).

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
MONROE POWER PLANT BOTTOM ASH IMPOUNDMENT
3500 EAST FRONT STREET
MONROE, MI 48161

TITLE:

SITE LOCATION MAP

DRAWN BY:	R. SUEMNICHT
CHECKED BY:	S. HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	SEPTEMBER 2019
PROJ. NO.:	320511.0006
FILE:	320511-001slm.mxd

FIGURE 1

S:\1-PROJECTS\DTE_Energy\MonroeMI_PP\320511_0006_Area15\320511-001slm.mxd -- Saved By: RSUEMNICHT on 9/23/2019, 15:17:03 PM

Plot Date: 9/23/2019, 15:21:27 PM by RSUEMNICHT -- LAYOUT: ANSI B (11"x17")
Path: S:\1-PROJECTS\DTE_Energy\MonroeMI_PP\320511_0006_Area15\320511-002.mxd

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

TRC - GIS

LEGEND

- CCR PROGRAM MONITORING WELL
- INVESTIGATION MONITORING WELL (STATIC WATER LEVELS ONLY)
- UNIT SEPARATION BERM
- CROSS SECTION LOCATION
- APPROXIMATE BOUNDARY OF INACTIVE BOTTOM ASH IMPOUNDMENT
- APPROXIMATE PLANT BOUNDARY

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, APRIL 2018.

0 700 1,400 FEET

1 " = 700 '
1:8,400

N

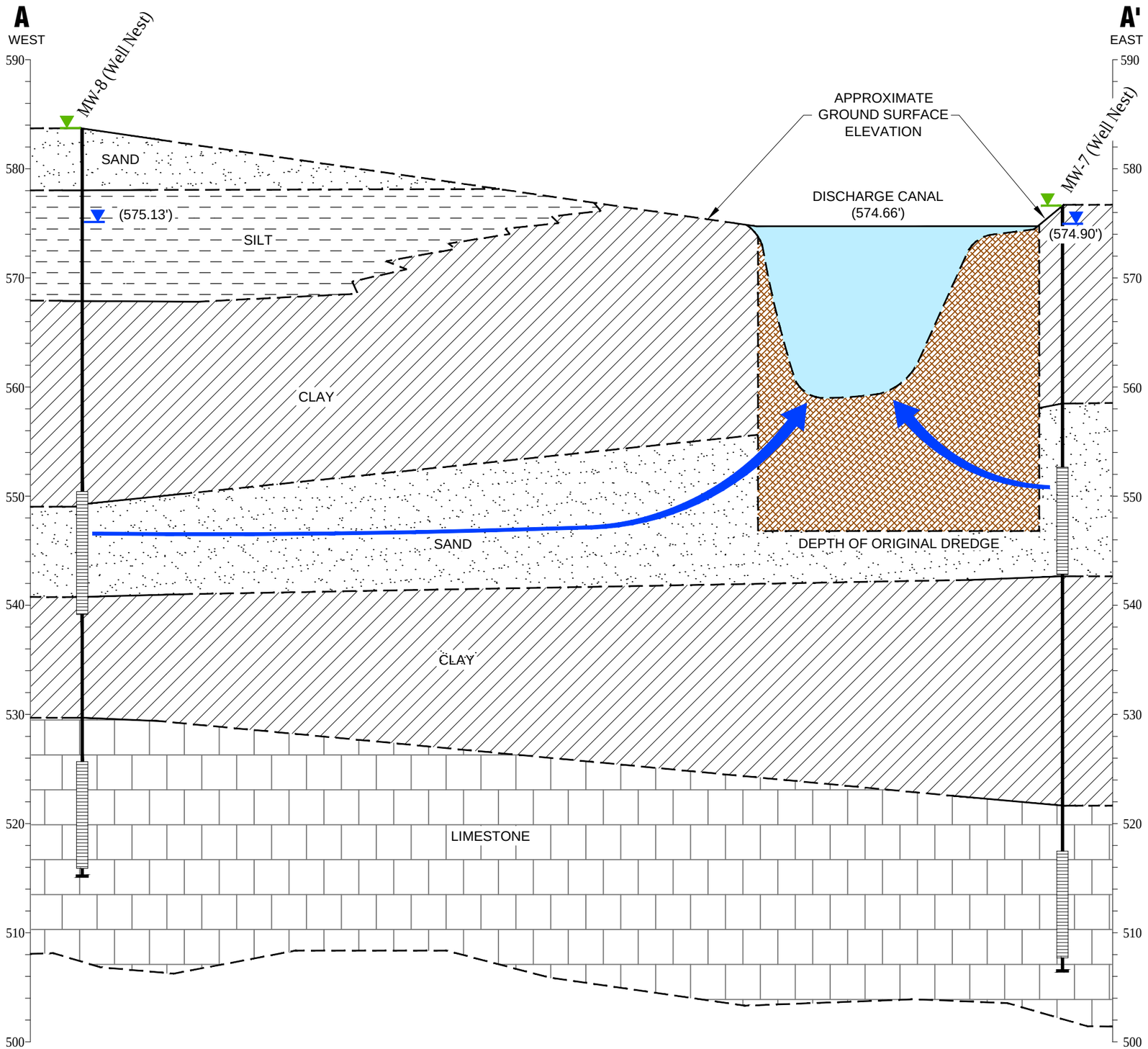
TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT BOTTOM ASH IMPOUNDMENT
3500 EAST FRONT STREET
MONROE, MI 48161

TITLE:
INACTIVE BOTTOM ASH IMPOUNDMENT WELL LOCATION MAP 2019

DRAWN BY:	R. SUEMNICHT
CHECKED BY:	S. HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	SEPTEMBER 2019
PROJ. NO.:	320511.0006
FILE:	320511-002.mxd

FIGURE 2



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION IN LIMESTONE AQUIFER WELL (ARTESIAN)
- GROUNDWATER ELEVATION IN UPPERMOST AQUIFER WELL
- MONITORING WELL
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SAND
- CLAY
- SILT
- LIMESTONE
- SEDIMENT
- GROUNDWATER FLOW

NOTE

1. ALL GROUNDWATER ELEVATIONS AND SURFACE WATER ELEVATIONS ARE FROM 5/21/2019 AND ARE IN NAVD88.
2. DEPTH OF DISCHARGE CANAL APPROXIMATED FROM BIOBASE MAP - LAKE ERIE 7/24/2019 (PROVIDED IN ATTACHMENT B).

SCALE IN FEET
VERTICAL: 10 to 0
HORIZONTAL: 0 to 200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
INACTIVE BOTTOM ASH IMPOUNDMENT
MONROE, MICHIGAN

TITLE:
GENERALIZED CROSS-SECTION A-A'

WORKING COPY

DRAWN BY:	D.STEHLE	PROJ NO.:	320511.0006.01
CHECKED BY:	M.BREHOB		
APPROVED BY:	-		**FIGURE 3**
DATE:	SEPTEMBER 2019		

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Ann Arbor, MI 48108
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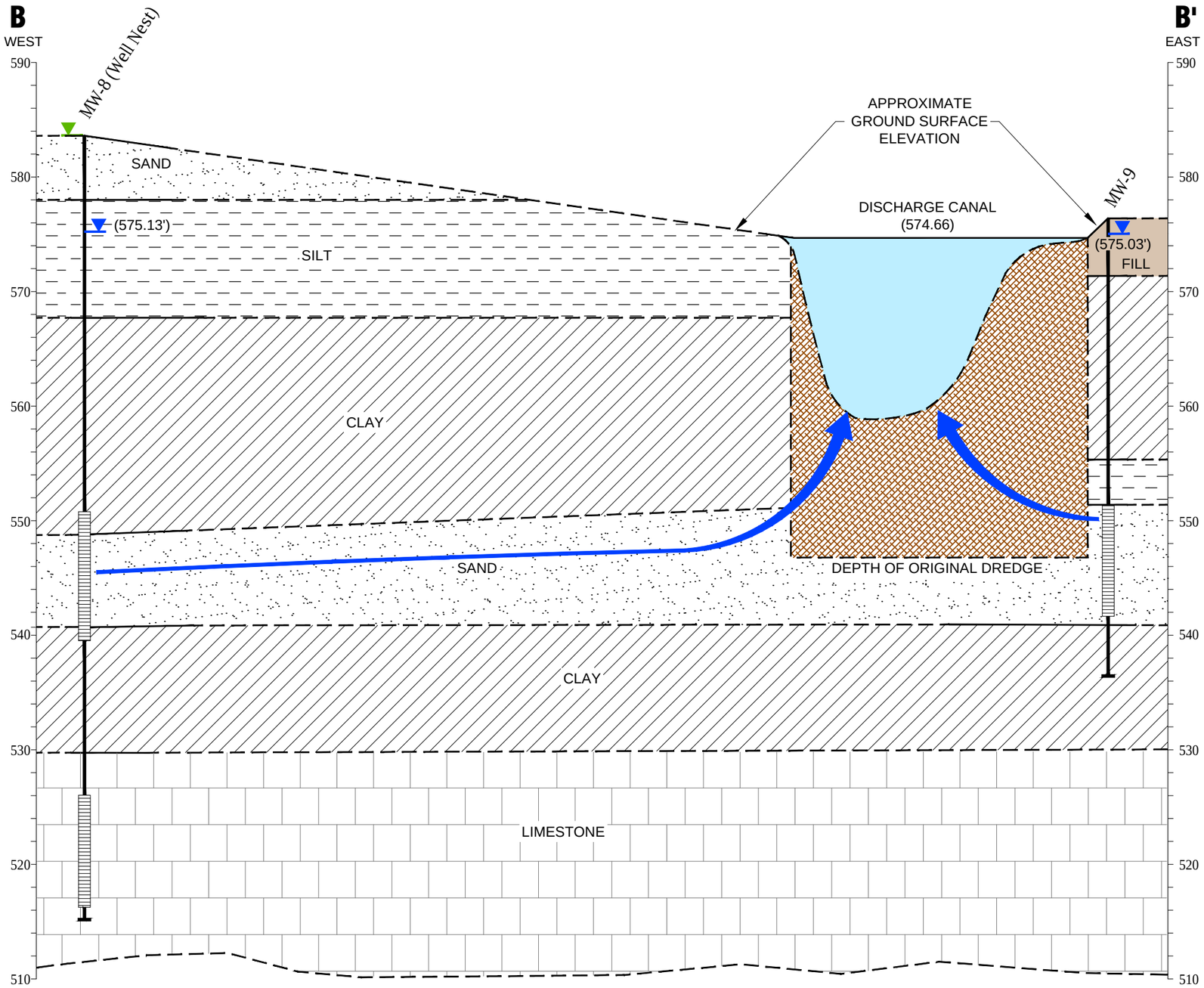
FILE NO.: 320511.0006.01.03-04 ASD.dwg



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION IN LIMESTONE AQUIFER WELL (ARTESIAN)
- GROUNDWATER ELEVATION IN UPPERMOST AQUIFER WELL
- MONITORING WELL
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SAND
- CLAY
- SILT
- LIMESTONE
- SEDIMENT
- FILL
- GROUNDWATER FLOW

NOTE

1. ALL GROUNDWATER ELEVATIONS AND SURFACE WATER ELEVATIONS ARE FROM 5/21/2019 AND ARE IN NAVD88.
2. DEPTH OF DISCHARGE CANAL APPROXIMATED FROM BIOBASE MAP - LAKE ERIE 7/24/2019 (PROVIDED IN ATTACHMENT B).

SCALE IN FEET
VERTICAL: 0 – 10
HORIZONTAL: 0 – 200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
INACTIVE BOTTOM ASH IMPOUNDMENT
MONROE, MICHIGAN

TITLE:
GENERALIZED CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	320511.0006.01
CHECKED BY:	M.BREHOB		
APPROVED BY:	-		**FIGURE 4**
DATE:	SEPTEMBER 2019		

TRC
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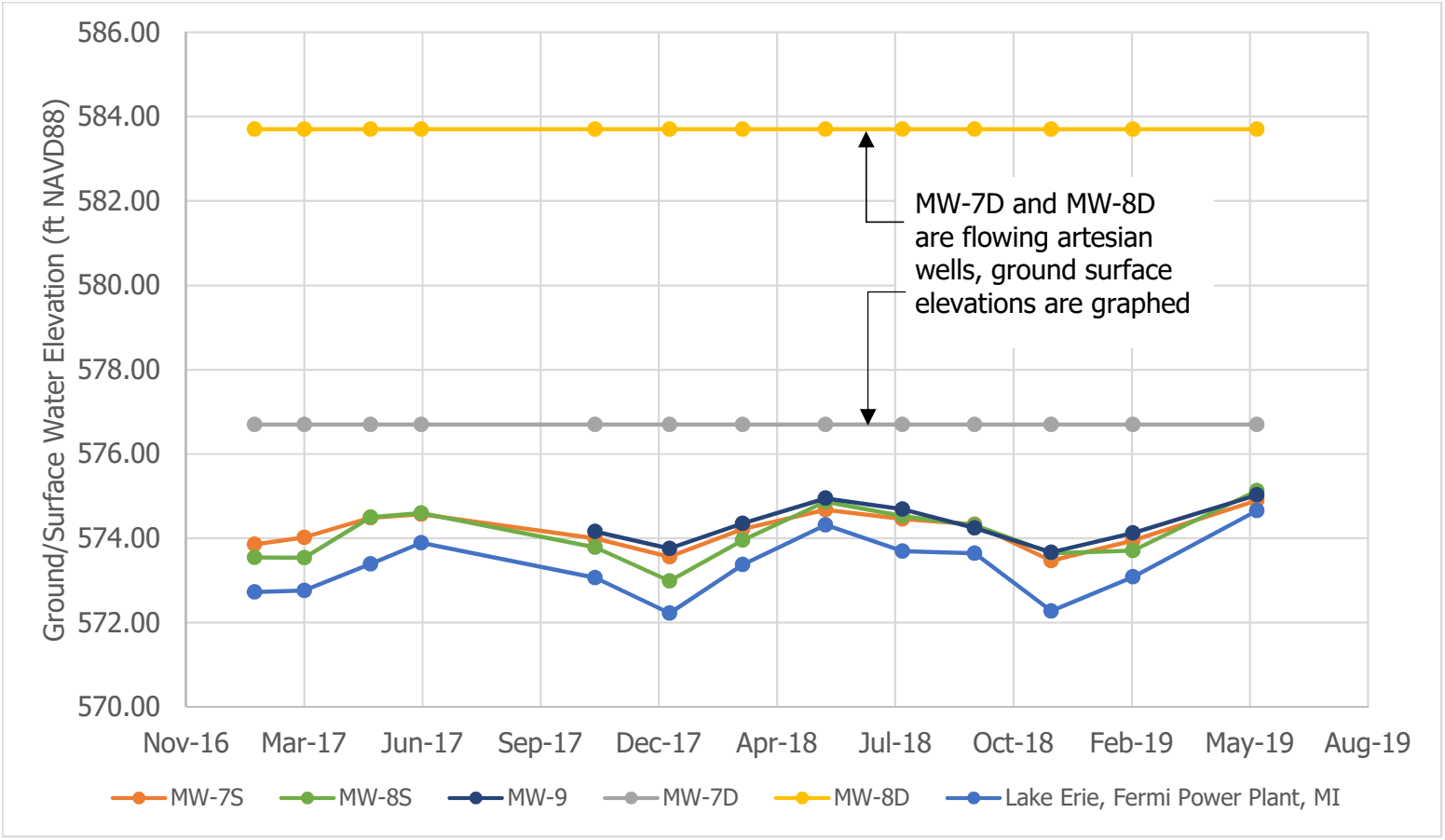
Phone: 734.971.7080
www.trccompanies.com

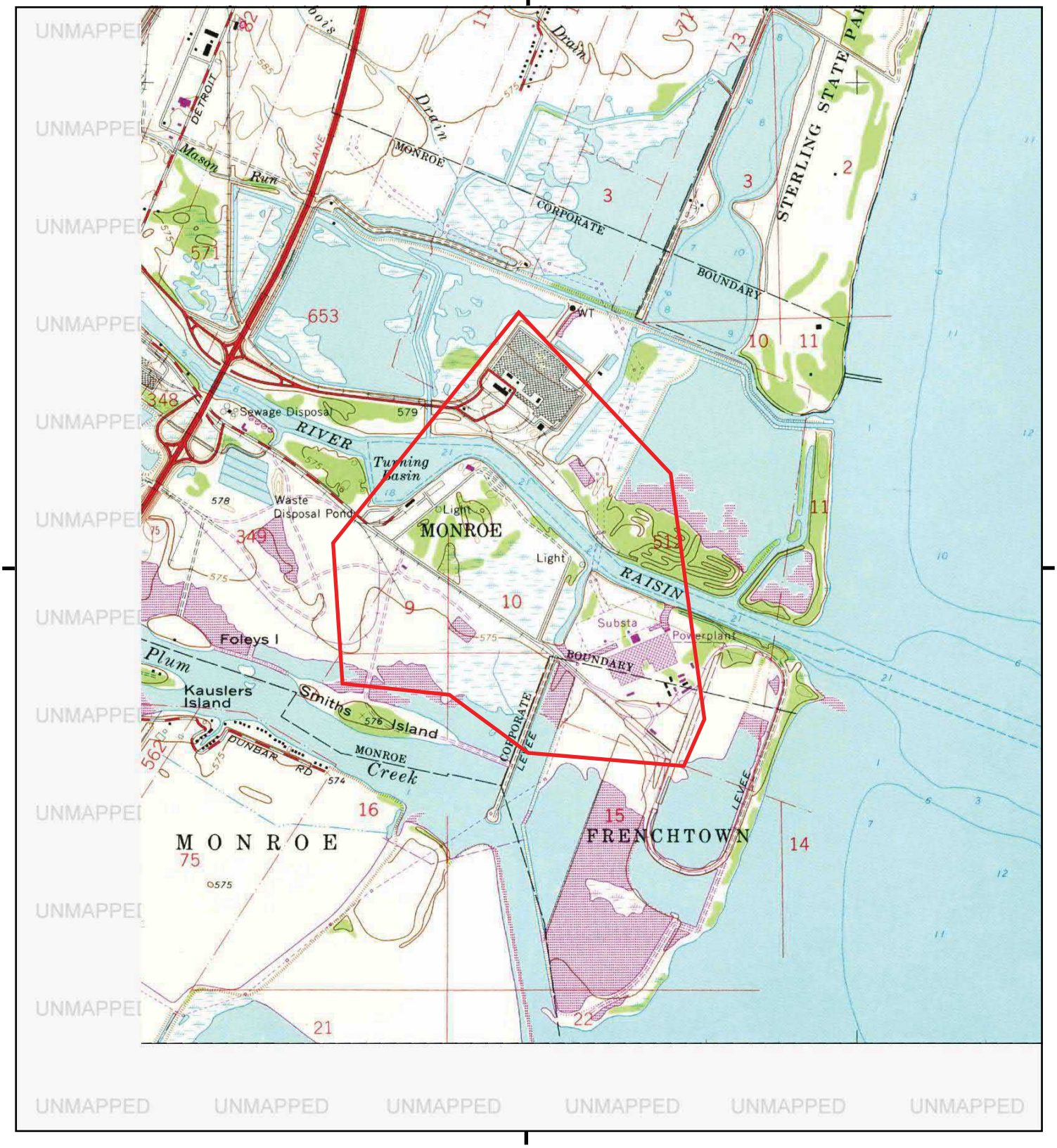
FILE NO.: 320511.0006.01.03-04 ASD.dwg

Figure 5

MW-7S, MW-8S, MW-9, MW-7D, MW-8D, and Lake Erie Ground/Surface Water Elevation Time Series Plot
Monroe Power Plant Inactive Bottom Ash Impoundment – RCRA CCR Monitoring Program



Attachment A
Historic Topographic Maps and Aerial Photographs



This report includes information from the following map sheet(s).

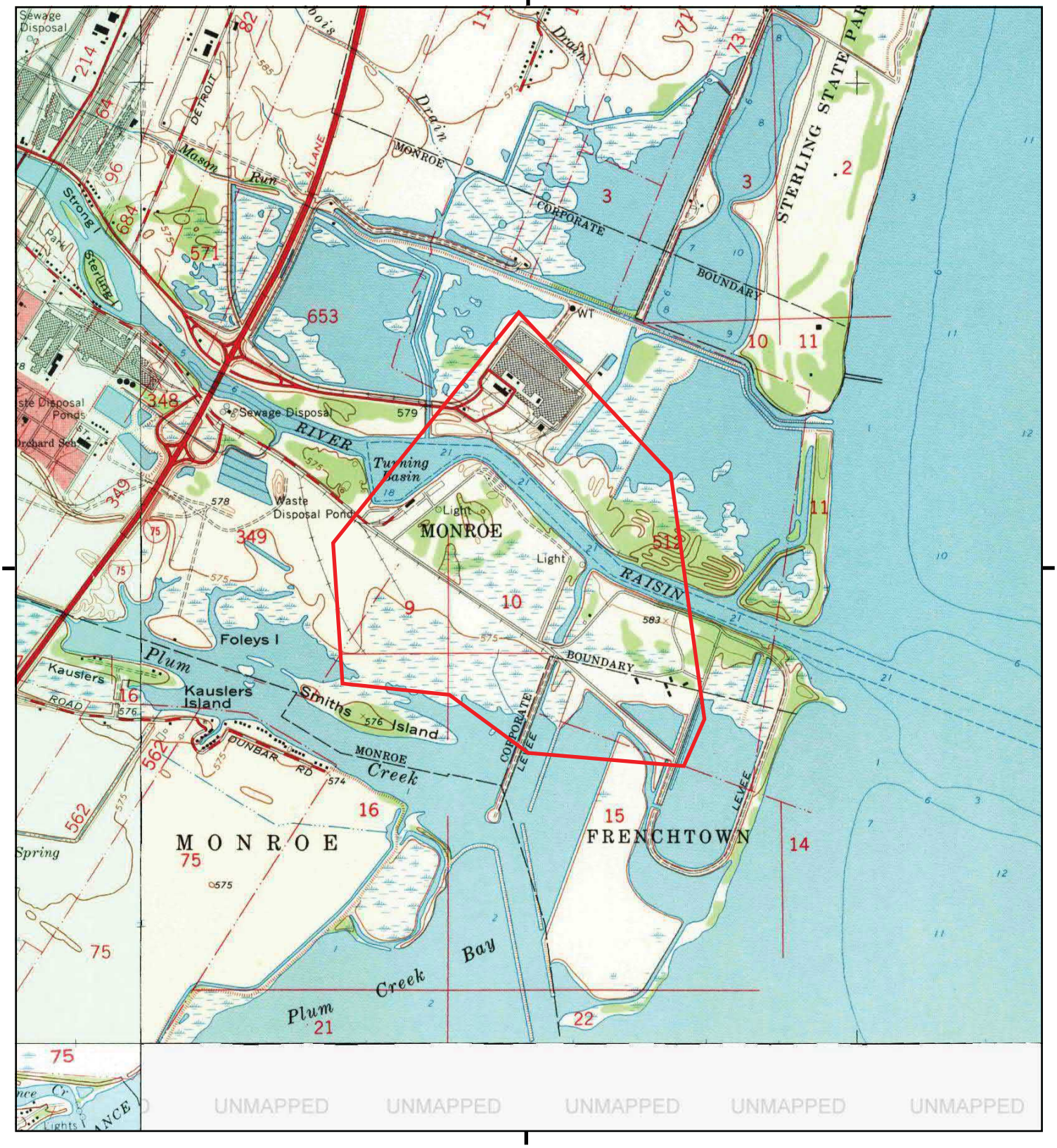
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Stony Point, 1973, 7.5-minute

SITE NAME: Port of Monroe/Gerdau Ameristeel
ADDRESS: 3000 E. Front Street
Monroe, MI 48161
CLIENT: AECOM

N



This report includes information from the following map sheet(s).

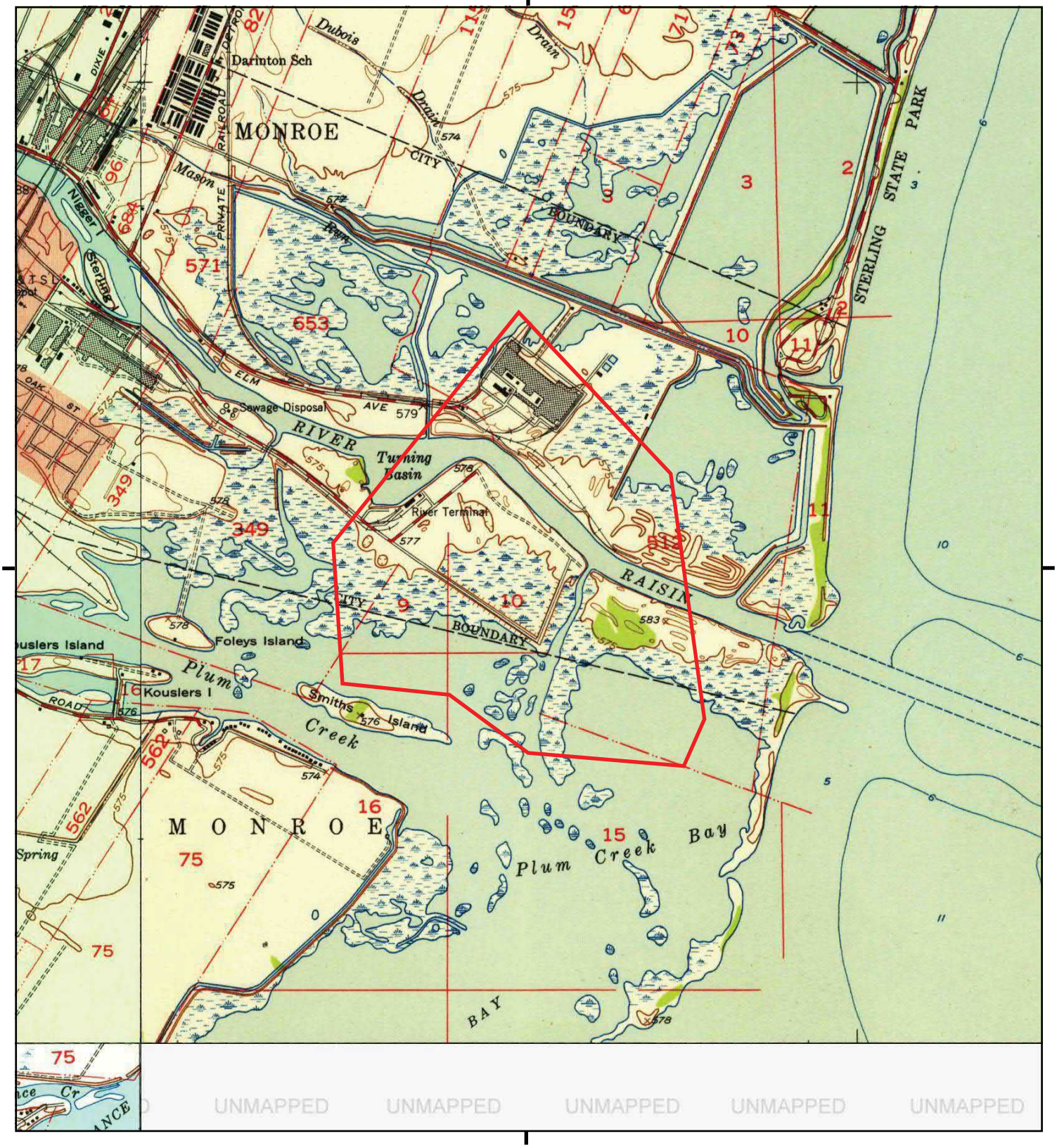
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Stony Point, 1967, 7.5-minute
SW, Erie, 1967, 7.5-minute
NW, Monroe, 1967, 7.5-minute

SITE NAME: Port of Monroe/Gerdau Ameristeel
ADDRESS: 3000 E. Front Street
Monroe, MI 48161
CLIENT: AECOM

N



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Stony Point, 1952, 7.5-minute
SW, Erie, 1952, 7.5-minute
NW, Monroe, 1952, 7.5-minute

SITE NAME: Port of Monroe/Gerdau Ameristeel
ADDRESS: 3000 E. Front Street
Monroe, MI 48161
CLIENT: AECOM

N

INQUIRY #: 4694578.9

YEAR: 1973

= 600'

N

EDR

INQUIRY #: 4694578.9

YEAR: 1961

= 500'

N

EDR

Attachment B
Bottom of Discharge Channel Depth Map

Lowrance HDS9 Sonic Sonar unit used to collect bathymetric data from Plum Creek and Discharge Channel.
BioBase Mapping Software used to generate figure.