ARCADIS

BASF Corporation

Geophysics Report

Point Hennepin
Wayne County, Michigan

December 22, 2022

Geophysics Report

Point Hennepin
Wayne County, Michigan

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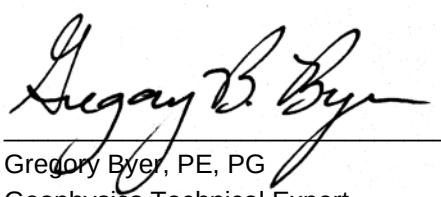

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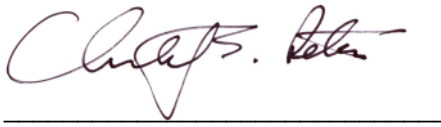

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Principal Geologist

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Acronyms and Abbreviations

Arcadis	Arcadis of Michigan, LLC
ASI	Aqua Survey, Inc.
BASF	BASF Corporation
DBO	distiller blowoff
DGPS	differential global positioning system
EC	electrical conductivity
ECT	electrical conductivity tool
EGLE	Department of Environment, Great Lakes, and Energy
EM	electromagnetic
EM31	Geonics EM31-MK2 electromagnetic induction conductivity meter
ERI	electrical resistivity imaging
GSI Work Plan	Groundwater to Surface Water Interface Assessment Work Plan
HMD	horizontal magnetic dipole
HPT	hydraulic profiling tool
ISA	inverse Schlumberger array
NOAA	National Oceanic and Atmospheric Administration
mS/m	milliSiemen per meter
report	Groundwater to Surface Water Assessment – Geophysics Report
Site	Point Hennepin, located in Wayne County, Michigan
TDS	total dissolved solids
VMD	vertical magnetic dipole

1 Introduction

On behalf of BASF Corporation (BASF), Arcadis of Michigan, LLC (Arcadis) prepared this Groundwater to Surface Water Assessment – Geophysics Report (report) for Point Hennepin, located in Wayne County, Michigan (Site; Figure 1). This report presents the results of activities conducted at the Site between November 3, 2021 and July 15, 2022, which were performed according to the Groundwater to Surface Water Interface Assessment Work Plan (GSI Work Plan; Arcadis 2021). The GSI Work Plan was submitted to Michigan's Department of Environment, Great Lakes, and Energy (EGLE) on August 31, 2021. Activities discussed in the GSI Work Plan included electrical resistivity imaging (ERI) on land near the site perimeter, hydraulic profiling tool (HPT)/electrical conductivity tool (ECT) borings and soil borings on land, and an in-river marine electrical conductivity (EC) investigation.

2 Background and Purpose of Investigation

Point Hennepin is a 225-acre island in the Detroit River located immediately north of Grosse Ille and east of Wyandotte, Michigan, upon which distiller blow off (DBO) was placed from the early to mid-1900s. DBO was a waste product resulting from soda ash production at a facility to the west of the island, across the Detroit River in Wyandotte.

The objective of the investigation activities documented in this report is to refine the conceptual site model for the Site using the following:

- Land-based geophysics
  - Electrical conductivity
  - ERI
- HPT/ECT borings
- Direct-push calibration soil borings
- Marine EC profiling.

The purpose of the geophysical investigation activities was to collect nearly continuous bulk EC of the fill and native geologic materials along the margins of the island, both on land and in the river bottom sediments adjacent to the island. Historical conditions associated with the island have the potential to exhibit elevated electrical conductivity, as such EC was selected as the preferred geophysical method. . The geophysics investigation scope of work was provided in the GSI Work Plan (Arcadis 2021).

ERI was the first tool used to around the perimeter of the island. Because ERI is an indirect measurement of the formation bulk EC, it was necessary to calibrate the results. The on-land ERI results were calibrated using:

- Historical soil and groundwater data
- Electrical conductivity and hydraulic conductivity data gathered with direct- push HPT/ECT measurements
- Continuously logged soil borings placed along the ERI lines at anomalous locations.

The combined ERI, historical data, HPT/ECT data, and soil boring data were used to create an interpretation of the geologic conditions, which was used to guide the extent of the in-river marine EC. The in-river marine EC investigation used electromagnetics (EM) to quantify the formation bulk EC of the river bottom sediments.

The results of this investigation will be used to guide the development of a hydraulic investigation to evaluate groundwater flux to surface water in key areas identified by the ERI and EM work. A Hydraulic Investigation Work Plan will be submitted to the EGLE under separate cover.

3 Schedule of Site Activities

The following activities were completed and are detailed further in this report:

- *November 3, 2021*. Site reconnaissance was performed to refine the locations of ERI survey lines presented in the GSI Work Plan (Arcadis 2021) based on practical considerations such as accessibility, ground conditions, potential interferences, and other site conditions.
- *November 8 through December 3, 2021*. Prepared for land-based ERI data collection.
- *December 6 through 10, 2021*. Performed land-based ERI data collection field activities.
- *December 13, 2021 through March 1, 2022*. Completed data processing and interpretation of ERI data, and select HPT/ECT and soil boring locations.
- *March 10 through 18, 2022*. Prepared for drilling activities, including staking and utility clearance.
- *March 22 through April 6, 2022*. Advanced HPT/ECT and soil borings.
- *April 10 through June 2, 2022*. Integrated HPT/ECT and soil boring results into ERI interpretations, and completed final planning of the marine survey.
- *June 21 through 25, 2022*. Performed the first phase of marine data collection, including use of a single beam echo sounder and a multibeam echo sounder
- *July 11 through 15, 2022*. Performed the second phase of marine data collection, consisting of EC measurements with a Geonics EM31-MK2 electromagnetic induction conductivity meter (EM31).

4 Investigation Methods

This section discusses the methods used to collect ERI data, advance HPT/ECT and soil borings, and perform a marine geophysical survey.

4.1 Electrical Resistivity Imaging Data Collection

Arcadis collected formation bulk EC measurements via ERI on the western and eastern perimeters of the Site on December 6 through 10, 2021 (see Figure 2 for line locations). The field team conducted the geophysical surveys over approximately 6,600 feet on the west side of the island and over approximately 6,800 feet on the east side of the island. Although the line on the east side was originally planned to run along the entire perimeter, standing water present and lack of access in the southeast area of the island prevented the ERI line from being closer to the perimeter in that location.

Data were collected with an Advanced Geosciences, Inc. SuperSting R8 8-channel earth resistivity meter programmed to collect inverse Schlumberger arrays (ISAs) and dipole-dipole arrays. One hundred twelve electrodes were used, with spacing of approximately 16.4 feet between electrodes. The West Line was placed on the west side of the perimeter road and was a net length of 6,824 feet. There were 59 feet of overlap between segments to improve subsurface coverage. The East Line was placed on the east side of the perimeter road and

separated into north and south halves, each 3,445 feet in length with 197 feet of overlap. The final positions of the resistivity electrodes were obtained using a differentially corrected global positioning system (DGPS) with submeter accuracy.

Quality assurance and control procedures were followed for layout of the electrode cables and the data collection process. Initial layout was performed using engineering tapes marked in meters to an accuracy of 2 millimeters. DGPS surveying verified the electrode positional accuracy. Noncorrosive stainless-steel stakes were placed into the subsurface between 6 and 12 inches in depth. Approximately 500 milliliters of saltwater solution were poured around each stainless-steel stake to improve ground contact. Once all electrode stakes were emplaced and connected to the electrode cable, the resistivity meter was used to collect contact resistance readings, which verified that all electrodes were physically connected to the cable and that contact resistance between electrodes fell within the manufacturer's recommended resistance. Additionally, saltwater was added and, if necessary, stakes were reinserted if resistance criteria were not met. During data collection, the resistivity meter was programed to run two data collection cycles to verify consistency of readings. A rejection threshold of 4 percent difference between readings was used to trigger a repeat data collection. Details on the ERI data processing and ISA modeling procedures are provided in Appendix A.

The cross sections, along with historical borehole data, were used to select the HPT/ECT and soil boring locations by targeting locations with anomalously elevated values. The modeled EC indicated background values less than 50 mS/m and anomalous values in the range of approximately 50 to 10,000 mS/m. Borings were also placed in locations interpreted to be representative of background conditions for making comparisons that were used to calibrate the ERI results. A total of 22 locations (designated W1 through W11 and E1 through E11) were selected for HPT/ECT measurements and 10 of the 22 locations were selected for soil borings. Section 4.2 provides details for the HPT/ ECT and soil borings.

4.2 Hydraulic Profiling Tool, Electrical Conductivity Tool, and Soil Borings

A total of 20 Geoprobe® HPT/ECT borings were completed based on the results of the ERI data. The HPT/ECT borings identified intervals in the subsurface characterized by high hydraulic conductivity and EC, respectively. These borings were supplemented by conventional Geoprobe® soil borings at 16 selected locations to confirm the geology. Boring logs are provided in Appendix B. A description of the HPT/ECT methodologies is provided in Appendix A.

At the Site, the ECT was used as a line of evidence to verify of ERI modeling results associated with the locations of elevated specific conductance. Geoprobe® soil cores logged by a geologist were key to differentiating between fill and native materials (see Appendix B for boring logs). The ERI modeling results were joined with the HPT/ECT and geologic logs to develop geologic cross sections. The primary goals of advancing HPT/ECT and soil borings was to provide direct observations to guide the interpretation of the ERI cross sections and provide a refined understanding of the geologic and geochemical conditions along the western and eastern site perimeters.

Logs incorporating HPT/ECT and soil boring results, and ERI modeling results were plotted using WellCAD software to visualize and compare results from the onshore investigation (Appendix C). EC results from the ERI modeling were plotted with depth at electrode locations most proximal to confirmation borings for comparison with the direct-push EC results.

The GSI Work Plan (Arcadis 2021) proposed 10 HPT/ECT boring and 2 Geoprobe® soil borings; however, 20 HPT/ECT borings and 16 Geoprobe® soil borings were completed. These additional borings were added to the scope of work during the field event to better correlate the geophysics data with the EC from the borings and due to unexpectedly high hydraulic conductivity measured in some of the clay material, most notably where ECT measurements were anomalously high. The borings were advanced from March 22 through April 6, 2022. The continuous soil borings were advanced adjacent (approximately 2 feet) to an HPT/ECT boring to verify correlation between soil type, HPT/ECT data, and ERI results. The maximum depth drilled was 64 feet below ground surface. Due to deep high EC anomalies observed in ERI imaging, the boring termination depths proposed in the GSI Work Plan (Arcadis 2021) were adapted to cover the extent of the anomalies in the model formation bulk electrical resistivity data. Borings were drilled in the dirt and gravel roads a few feet from the ERI line locations.

Before the HPT work was initiated, a pre-test calibration was performed to ensure the HPT pressure response and EC response were consistent between borings. Response tests were completed before and after the first log, and after each subsequent log to verify that the system was responding appropriately. In addition to the response tests, HPT dissipation tests were completed at each boring. A dissipation test consists of pausing the HPT boring, turning off the flow, and allowing the pressure to return to a static condition. These data were used to verify the elevation of the water table, correct for hydrostatic pressure, and calculate estimated hydraulic conductivity. Dissipation tests were completed in at least two depth locations per boring, one within a relatively shallow portion of the aquifer and one within a deeper interval of the aquifer near the total depth of the boring (and in between if additional sands were encountered). The tests were expected to be biased to more hydraulically conductive zones to ensure a static condition could be achieved within a reasonable time frame.

The HPT probe was linked to a control box, where the signal was received by a field computer. HPT parameters such as transducer pressure, flow rate, EC, line pressure, probe rate, and diagnostic parameters were recorded and available for export and evaluation immediately following borehole completion.

The Direct Image® Viewer software was used to view the data and to complete corrections for hydrostatic and atmospheric pressure effects, if needed. Once corrected, the software provided a continuous log of estimated hydraulic conductivity.

4.3 Marine Geophysical Survey

The ECT and ERI results indicated anomalous conditions at the north end of the ECT and ERI investigation area; therefore, the area of data collection for the marine EC survey was expanded to encompass the northern tip of the island, beyond the area that was presented in the GSI Work Plan (Arcadis 2021). The data presented in this report includes the area identified in the GSI Work Plan plus the data collected encompassing the northern tip of the island. The goal of the marine EC survey was to quantify the formation bulk EC of the bottom sediments to determine how the anomalous EC on shore relates to the river bottom sediments. An EM31 was mounted in a nonmetallic canoe and towed along transects positionally controlled by a DGPS. The EM31 has a coil separation of 12 feet and a transmitter frequency of 9.8 kilohertz. The data density was sufficient to grid the data and create a contour map of the formation bulk EC.

Because the formation bulk EC in the river setting is a composite (bulk conductivity of both the river water and the bottom sediments), a data correction was necessary to eliminate the influence of the water column for quantification of the bottom sediment formation bulk EC. Therefore, it was necessary to also perform a bathymetric survey for the data correction computations. Single beam echo sounder and a multibeam echo sounder data were gathered for this purpose. In addition, the multibeam echo sounder data were used to create

bottom images, where conditions permitted, with the primary goal of searching for pipelines and other metallic objects that can be a source of interference for the EM instrument. Side-scan sonar data collection was performed in select areas; however, the side-scan sonar dataset is incomplete due to issues associated with thick vegetation in the shallower, near-shore areas and was not incorporated into this project.

4.3.1 Bathymetric Data Collection and Processing

Aqua Survey, Inc. (ASI), under the supervision of Arcadis, conducted a marine bathymetry survey prior to the EM survey from June 21 through 25, 2022. ASI used data gathered with single beam echo sounder and multibeam echo sounder instruments for the bathymetry work. Bathymetry data were primarily needed to obtain water depth data used to correct the EM conductivity data.

Heavy vegetation limited the areas where multibeam echo sounder data collection was feasible (mainly in the deeper water areas away from the shoreline). ASI relied on a series of parallel single beam echo sounder traverses run perpendicular to the shoreline to gather data in the heavily vegetated areas. In some areas, most notably the shoal located southwest of the island, heavy vegetation limited the ability of the vessel to traverse the area due to vegetation enveloping the vessel, binding the propeller, and potentially damaging the motor. The vessel made limited passes and a calibrated sounding pole was used to manually touch the bottom and estimate the water depth.

ASI was able to process a hybrid dataset consisting of multibeam echo sounder, single beam echo sounder,, and manual soundings to create a qualified bathymetry grid that was suitable for performing the EM data corrections (accuracy on the order of 1 foot or more is sufficient). However, ASI does not consider the hybrid dataset to be of survey grade and reliance on the bathymetry beyond the purpose of correcting EM measurements is not recommended. Arcadis used the bathymetry grid provided by ASI and augmented it beyond the boundaries of the ASI grid with bathymetry data provided by the National Oceanic and Atmospheric Administration (NOAA) in electronic format (NOAA, 2001).

4.3.2 Marine Electrical Conductivity Data Collection

Arcadis performed a near-shore marine frequency domain electromagnetics survey with an EM31. Note that EM31 does not require ground contact and data are typically collected continuously as the instrument is conveyed across the study area (in this case, mounted to a canoe). The EM31 is designed to measure and map the formation bulk EC nominally up to 18 feet below the instrument.

The EM31 was mounted to a nonconductive watercraft and towed by a piloted vessel (see Exhibit 1). The navigational path of the canoe where formation bulk EC data were collected is shown on Figure 3. The canoe was towed along roughly parallel transects, 25 to 50 feet apart, generally parallel to the shoreline. Wind, current, and dense vegetation at times complicated the pilot's ability to maintain a regular grid. The tow paths were reviewed and infill data collection was performed where data gaps existed and where feasible. More than 67 miles of formation bulk EC data were gathered during this phase of the project.

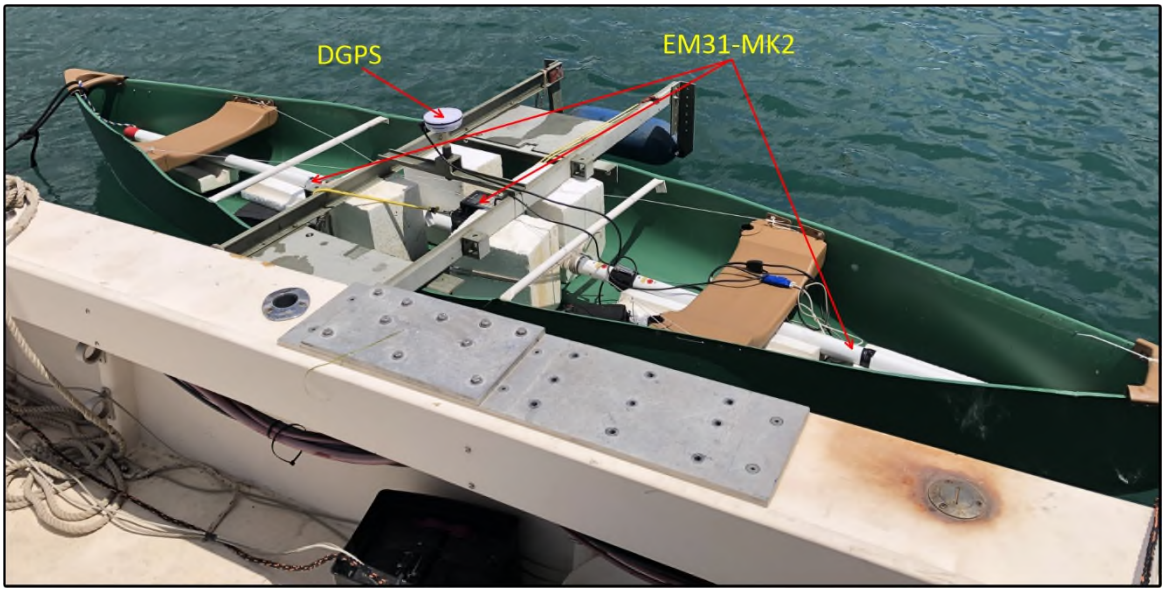


Exhibit 1. EM31 Mounted in a Nonmetallic Canoe[1]

The position of the EM31 system was determined with an on-board DGPS receiver as shown on Exhibit 1. The receiver was equipped with real-time differential correction, resulting in a horizontal accuracy of less than 1 meter. The DGPS and EM31 data streams (1 and 10 hertz, respectively) were automatically merged during data collection by an on-board data logger used to control the data collection process.

To assure accuracy of the data collected with the EM31, Arcadis followed the manufacturer's recommended procedures listed below:

- Daily battery check
- At the beginning of the survey:
  - Instrument zero check and adjustment
  - In-phase zero compensation check and adjustment
  - Phase compensation check.

Periodically during the marine EC survey, the data logger was downloaded and the data were reviewed for completeness by the project geophysicist. As the survey progressed, periodic data review and quality assurance and quality control checks were performed to both assure the proper data were being gathered and to make interpretive analysis of the EC data to assure that the results were geologically consistent with the onshore results of the ERI and HPT/ECT work. Data collection was performed in the center of the river channels several times per day to measure the ambient conductivity, presumably of only river water. By doing this, a measure of data variation related to instrument fluctuations could be evaluated.

The marine EM31 data processing and mapping procedures are provided in Appendix A. The corrected formation bulk EC values in sediments in the shallow water shoals southwest, north, and east of the island fall within a

[1] The DGPS unit was mounted at the measurement point in the center of the EM31. The canoe was tethered behind the vessel at an offset distance of 25 feet. Outriggers and a sea anchor were used to limit the pitch and yaw of the canoe. Serial cables were used to connect the EM31 and DGPS to a laptop computer onboard the vessel.

range of approximately 40 to 50 milliSiemens per meter (mS/m). Therefore, anomalous conditions are defined as greater than the value of 50 mS/m. On this basis, the bathymetry corrected formation bulk EC data were gridded and contoured with Surfer mapping, modeling, and analysis software.

5 Results

This section summarizes the results of the investigation activities discussed in this report. These results will be used to guide the next steps of a hydraulic investigation to understand groundwater flux.

5.1 Electrical Resistivity Imaging Results

The conductivity cross-section results for the West Line (W1 through W4) are shown on Figure 4. Results for the East Line are split up into two cross-sections, E1-E2 and E3-E4, shown south to north on Figure 5.

The ERI cross sections terminate at an elevation of 480 feet, which corresponds to a variable depth range of approximately 90 to 100 feet, except in the elevated portion of the southern half of the East Line where the maximum depth reaches approximately 130 feet. The general trend is that anomalous conditions exist starting at the ground surface and increase to a peak value, between approximately 560 and 550 feet in elevation, and then gradually decrease to background conditions.

The exceptions to this general trend are in areas of subsidence. During ERI data collection, the electrical current can be drawn out of the vertical plane of investigation toward the subsidence areas at the interior of the island. During the modeling process, the anomalous zone is extended vertically and creates an artifact that reflects the conductive zone in the subsidence area rather than actual conditions along the transect. Select borings were placed in these anomalous zones (W2, W4, and W10) with the finding that the direct-push EC values did not corroborate the depths of anomalies for the ERI modeled values in areas of subsidence.

5.2 Hydraulic Profiling Tool and Electrical Conductivity Tool Confirmation Boring Results

Detailed, descriptive soil boring logs for locations E1, E2, E3, E5, E7, E8, E9, E11, W2 through W8, and W10 are provided in Appendix B. Logs created in WellCAD, which combine abbreviated soil descriptions with sample photos, direct-push EC, modeled EC from ERI, corrected HPT pressure, HPT maximum flow, estimated hydraulic conductivity, and rate of penetration, are provided in Appendix C. Note that locations E4, E6, W9 and W11 did not have corresponding soil borings, only direct push HPT and ECT results.

Key observations about the boring results are summarized below:

- Comparison of the ECT conductivity values with the ERI modeling values shows that the magnitude of the peak values is generally similar, but that the ERI model values tend to extend deeper than the actual ECT values.
- DBO can have hydraulic conductivity values that are similar to sands in some locations but low hydraulic conductivity in other locations.
- Where ECT values are anomalously high in DBO, the EC tends to extend downward into the underlying clay. Where this deeper penetration of EC occurs in clays, the HPT tool indicates that the clay has higher than

expected hydraulic conductivity. These clays will be further investigated as part of the hydraulic flux investigation.

Arcadis overlaid the HPT/ECT results on the ERI cross sections and performed a joint interpretation of both datasets. The interpretation was constrained with preference for HPT/ECT results and, between borings, by the use of the relative trends in the ERI cross sections. The West Line and East Line are shown on Figures 6 and 7, respectively.

These interpretive sections show the following:

- Zones of conductivity grouped in four ranges (0 to 300, 300 to 500, 500 to 1,000, and greater than 1,000 mS/m)
- Simplified lithology (DBO/fill, clay/silt, and sand)
- Point at which HPT-based hydraulic conductivity values are less than the quantification limit
- Approximate elevation of the Detroit River
- Location of subsidence-related offset.

5.3 Marine Multibeam Echo Sounder Results

The multibeam echo sounder point cloud elevation map created by ASI is shown on Figure 8 and the blended bathymetric elevation map created by Arcadis is shown on Figure 9.

Besides providing bathymetric data used in the correction of the EM31 data, multibeam echo sounder imaged manmade objects on the riverbed. These objects included pipelines and metallic and nonmetallic debris. The confirmation of the metallic nature of the pipelines was provided by a negative deflection in the EM response. Several pipelines were identified, connecting Point Hennepin to the mainland. The locations of these metal pipelines are shown on Figures 3, 8, and 9. Additionally a pipeline off the northeast side of Point Hennepin was identified and appeared to terminate in a bell shape. The bell-shaped pipe termination is detailed in the multibeam echo sounder map shown on Figure 8.

5.4 Marine Geonics EM31-MK2 Electromagnetic Induction Conductivity Meter Results

The bathymetrically corrected data collected in the Detroit River with the EM-31 is shown on Figure 9**,** which is similar to what would be gathered if the EM31 were towed on the river bottom without water present. Due to the difference in methods used to collect the data off shore versus onshore, the range of conductivity values is narrower than the onshore ECT and ERI values.

A contour map shown on Figure 10 is color coded to indicate where anomalous conductivity values are present in a manner similar to the ERI results shown on Figures 4 and 5. The color scheme on Figures 4 and 5 is the same as Figure 10 because they represent the same variation in anomalous EC. Note this is despite the scale of the values being different as the scale is a function of the type of data being collected. See Appendix A for additional details. Gray indicates background values, and the progression of colors indicates gradational increase in conductivity and the increase in anomalous EC. In general, anomalous conditions are measured around the entire perimeter of the island and decline to background, outwardly. The marine conductivity correlates well with the

the onshore ERI and ECT values. A cross section of the island showing both the land-based ERI with the EM-31 marine work is included as Figure 11.

It is important to note that the EM31 results provide an indication of bulk conductivity in the upper 21 feet of sediments beneath the river. The EM31 results do not specifically indicate the depth distribution of the conductivity in the sediments, and do not provide the location or magnitude of flux into the river. EC is related to TDS, but is not specific to individual anions and cations or their concentrations. However, the EM31 results do indicate the approximate lateral extent of anomalous conductivity.

6 Key Findings and Next Steps

Key findings for the work completed are summarized below:

- In-river EM31 anomaly positions and onshore ERI modeling results show a good correlation.
- ERI profiles and HPT/ECT borings on shore (with the exception of the subsidence areas) show a good correlation.

The geophysics work completed does not specifically indicate the depth distribution of the conductivity in the sediments, and does not provide the location or magnitude of flux into the river. Results could be indicative of groundwater flux to the river and/or DBO in contact with the river.

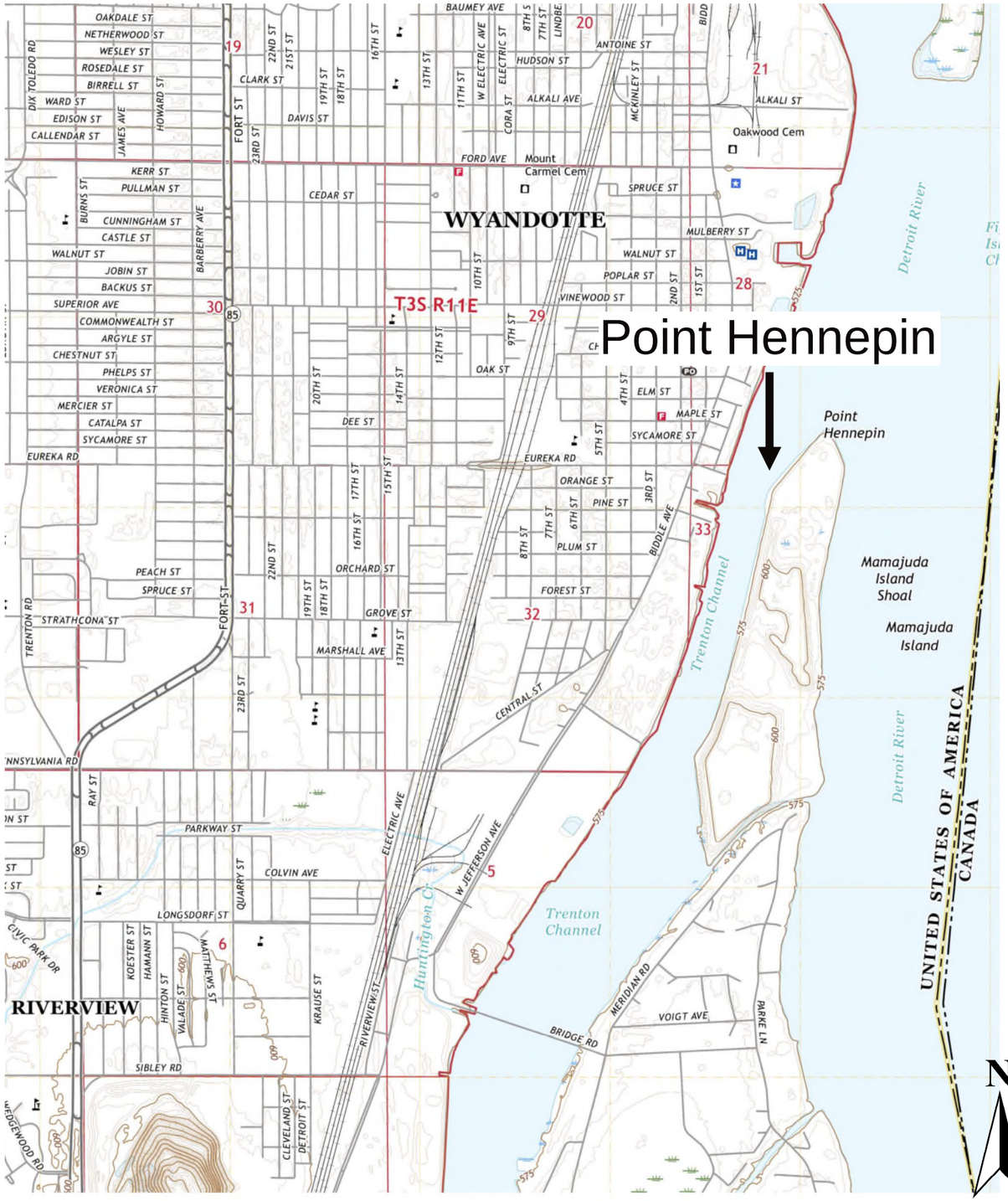
The next step in the investigation will be to conduct a hydraulic investigation to determine groundwater flux in key areas identified during this phase of work. The hydraulic investigation will evaluate groundwater flux and develop next steps for groundwater to surface water interface sampling. A work plan for the hydraulic investigation will be submitted under separate cover. In parallel BASF has been actively working on erosion control efforts on the island and will begin evaluation of early actions that may be completed in the short term (e.g., abandoning utilities, placement of cover or caps in river in high-priority areas).

7 References

Arcadis. 2021. Groundwater to Surface Water Interface (GSI) Assessment Work Plan. Point Hennepin, Wyandotte, Michigan. August 31.

NOAA, 2021. zip file named US5MI22M, https://www.charts.noaa.gov/ENCs/ENCsIndv.shtml.

Figures



2019 Quad

Wyandotte Quadrangle Michigan-Wayne County

7.5-Minute Series

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POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

SITE LOCATION MAP

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FIGURE
1

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West Line

East Line (south)

East Line (north)

W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11

E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11

DMW-1 DMW-2 SMW-3 SMW-4 SMW-5 DMW-6 DMW-7 DMW-8 DMW-9 DMW-10 DMW-12

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13

N

LEGEND

- HPT boring
- HPT + Confirmation boring
- Boring not completed (refusal)
- 2021 Geotechnical Borings by Golder
- Wells

Notes:

1.) Scale as shown

2.) Aerial imagery dated September 2021 downloaded from Google Earth

0 1000 2000

SCALE IN FEET

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POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

ELECTRICAL RESISTIVITY SURVEY LOCATION AND HPT/ECT BORING MAP

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FIGURE 2

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Location of EM31 Data Points

Notes:

1.) Scale as shown

2.) Aerial imagery dated September 2021 downloaded from Google Earth

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EM31 DATA COLLECTION POINTS

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FIGURE
3

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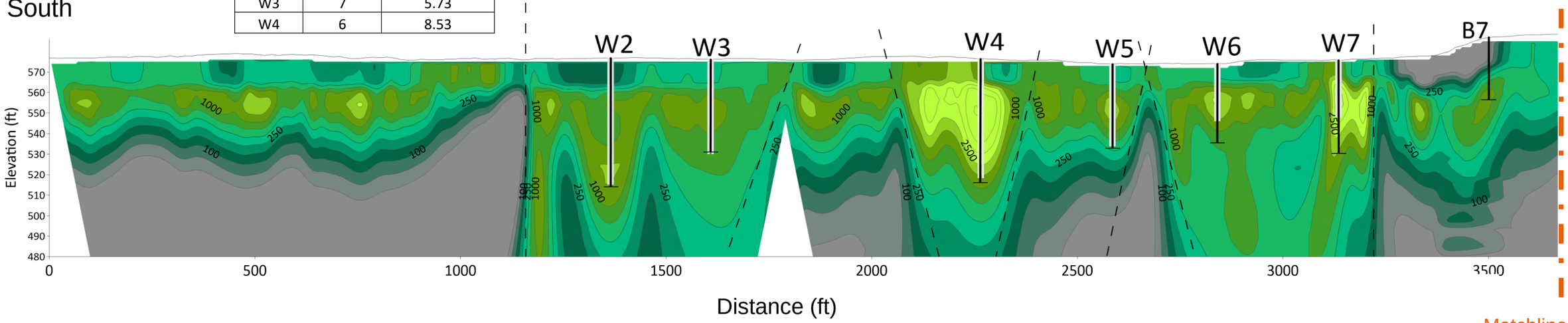
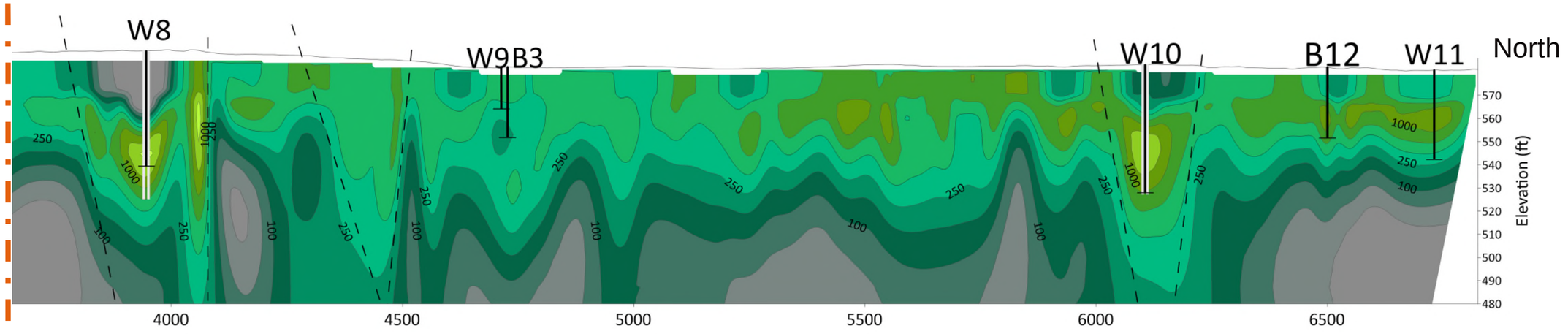
West Line

Line Segment	Number of Iterations	Percent Absolute Error
W1	8	9.51
W2	8	8.82
W3	7	5.73
W4	6	8.53

South



Matchline



Matchline

Notes:

1.) Scale - 5 x vertical exaggeration

2.) ft=feet

3.) mS/m=millisiemens per meter

4) HPT/EC=Hydraulic Profiling Tool/Electrical Conductivity

5) goodness-of-fit is reported as percent absolute error

LEGEND

- Subsidence Related Offset
- Soil Boring
- HPT/EC Boring

Conductivity (mS/m)

100 1000 10000

Background Values

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WEST LINE ELECTRICAL RESISTIVITY MODELING RESULTS

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FIGURE 4

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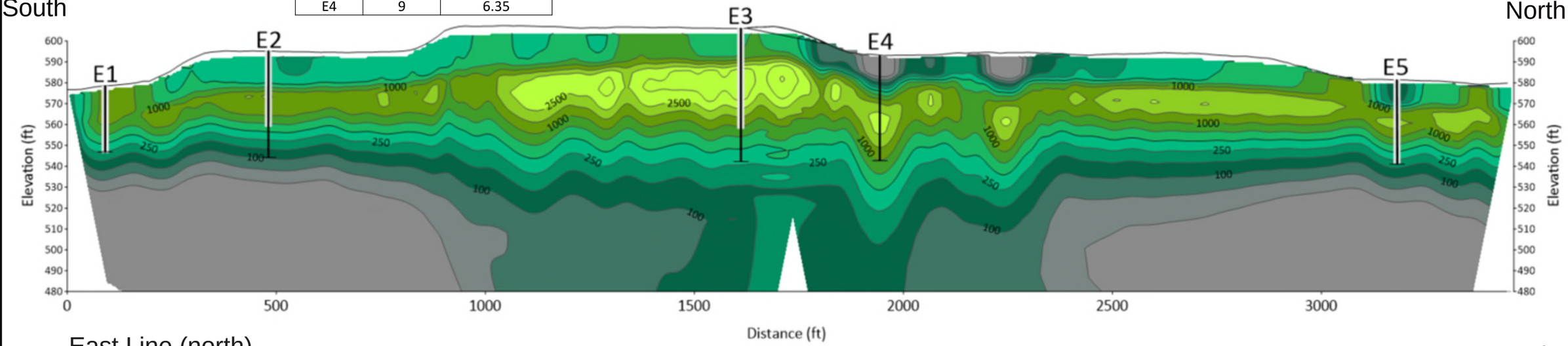
Line Segment	Number of Iterations	Percent Absolute Error
E1	7	9.52
E2	8	7.78
E3	6	6.71
E4	9	6.35

East Line (south)

South

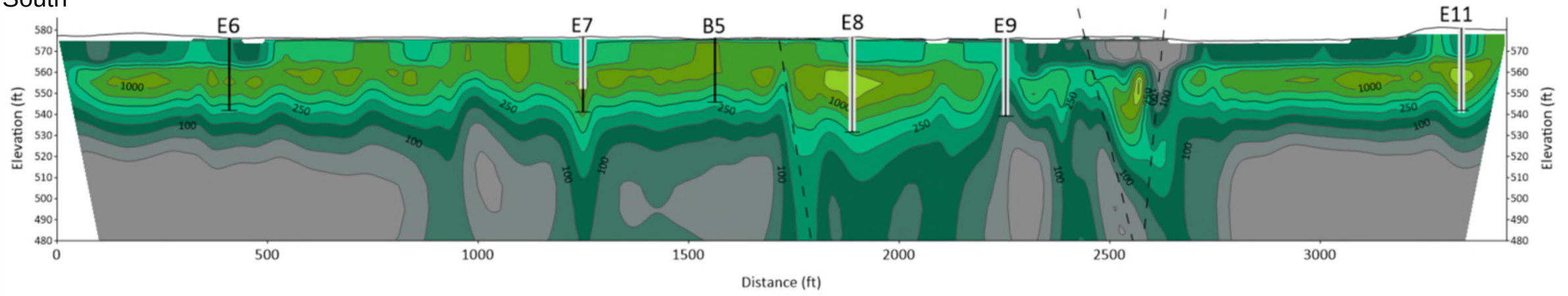
North



East Line (north)

South

North



Notes:

1.) Scale - 5 x vertical exaggeration

2.) ft=feet

3.) mS/m=millisiemens per meter

4) HPT/EC=Hydraulic Profiling Tool/Electrical Conductivity

5) goodness-of-fit is reported as percent absolute error

LEGEND

- Subsidence Related Offset
- Soil Boring
- HPT/EC Boring

Conductivity (mS/m)

100 1000 10000

Background Values

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

EAST LINE ELECTRICAL RESISTIVITY MODELING RESULTS

ARCADIS

FIGURE 5

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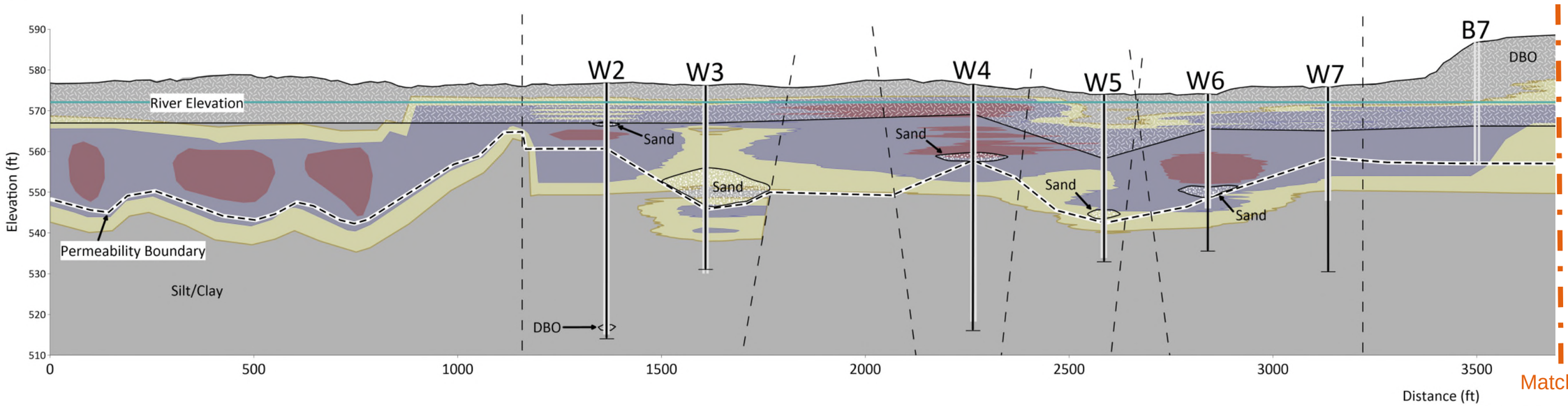
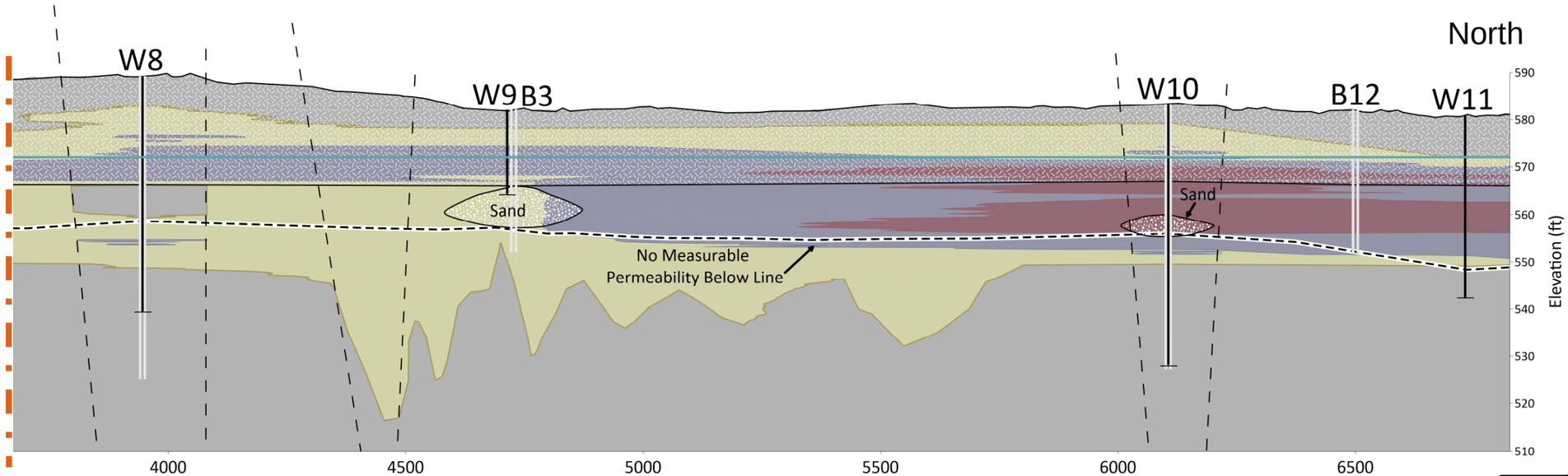
West Line

South



Matchline

North



Matchline

LEGEND

- > 1000 mS/m EC
- 500-1000 mS/m EC
- 300-500 mS/m EC
- 0-300 mS/m EC
- Subsidence Related Offset
- Soil Boring
- HPT/EC Boring
- Permeability Boundary
- River Elevation (572 ft)
- Sand Unit
- DBO/Fill Unit

Notes:

1.) Scale - 10 x vertical exaggeration

2.) ft=feet

3.) mS/m=millisiemens per meter

4.) HPT/EC=Hydraulic Profiling Tool/Electrical Conductivity

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

HPT/ECT CROSS SECTION WITH SOIL BORING DATA – WEST LINE

ARCADIS

FIGURE
6

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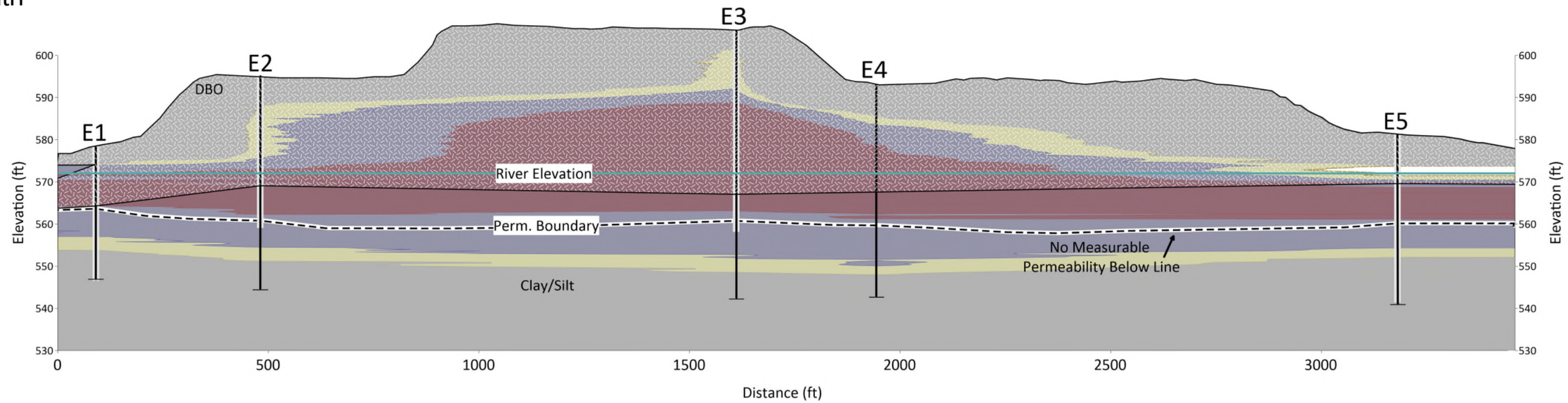
East Line (north)

South

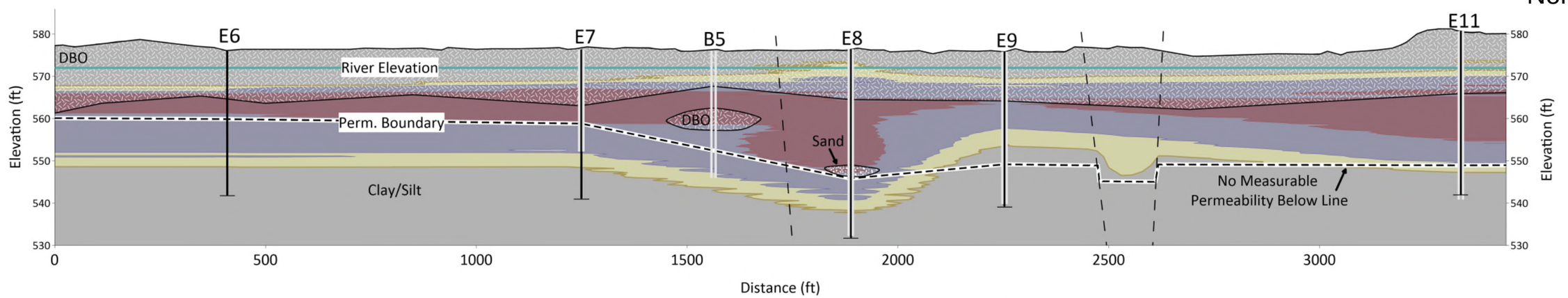
North



East Line (north)

South

North



Notes:

1.) Scale-10 x vertical exaggeration

2.) ft=feet

3.) mS/m=millisiemens per meter

4.) HPT/EC=Hydraulic Profiling Tool/Electrical Conductivity

LEGEND

- > 1000 mS/m EC
- 500-1000 mS/m EC
- 300-500 mS/m EC
- 0-300 mS/m EC
- Subsidence Related Offset
- Soil Boring
- HPT/EC Boring
- Permeability Boundary
- River Elevation (572 ft)
- Sand Unit
- DBO/Fill Unit

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

HPT/ECT CROSS SECTION WITH SOIL BORING DATA – EAST LINE

ARCADIS

FIGURE
7

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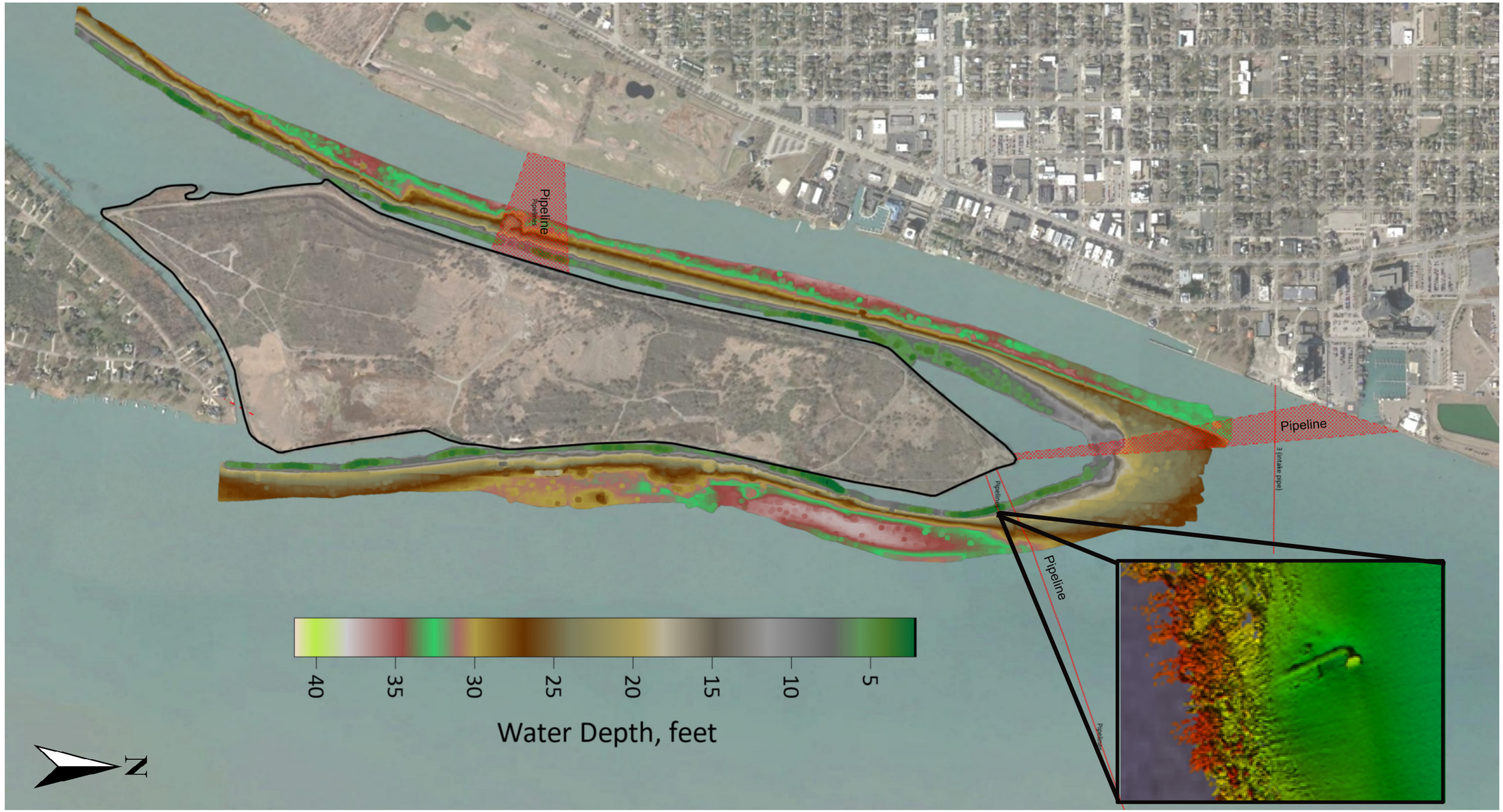

Notes:

1.) Scale As Shown

2.) Aerial imagery dated September 2021 downloaded from Google Earth

0 1000 2000 3000 4000

SCALE IN FEET

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

MULTIBEAM ECHO SOUNDER MAP

ARCADIS

FIGURE
8

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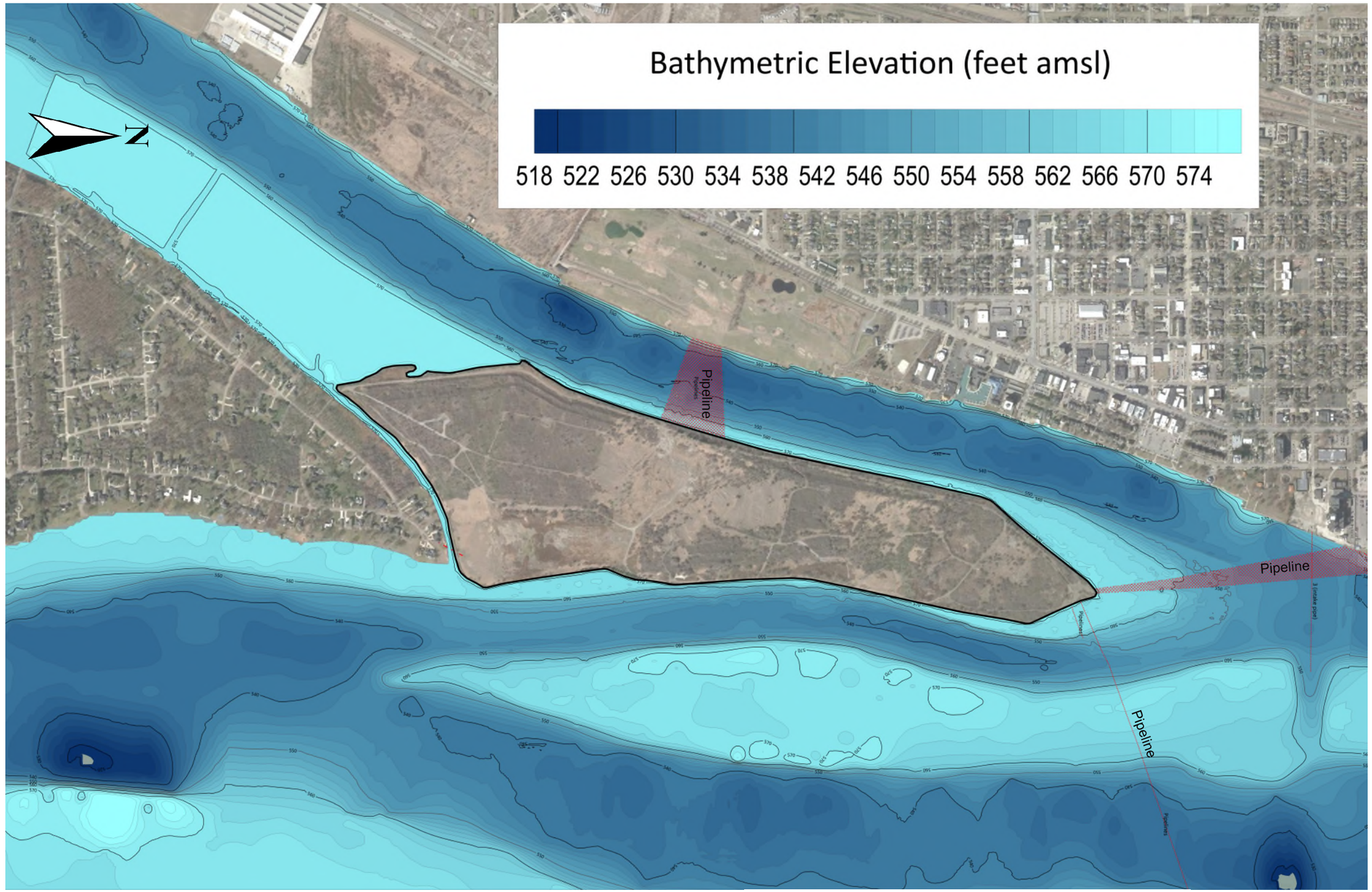

Notes:

1.) Scale As Shown

2.) Aerial imagery dated September 2021 downloaded from Google Earth

3.) amsl- Above mean sea level

4.) bathymetry data sources include SBES, MBES and Sounding Pole measurements made for this project combined with publicly available bathymetry provided by NOAA

5.) Note that this is not a certified bathymetry map and accuracy varies.

0 1000 2000 3000 4000

SCALE IN FEET

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

FINAL BATHYMETRIC ELEVATION MAP

ARCADIS

FIGURE
9

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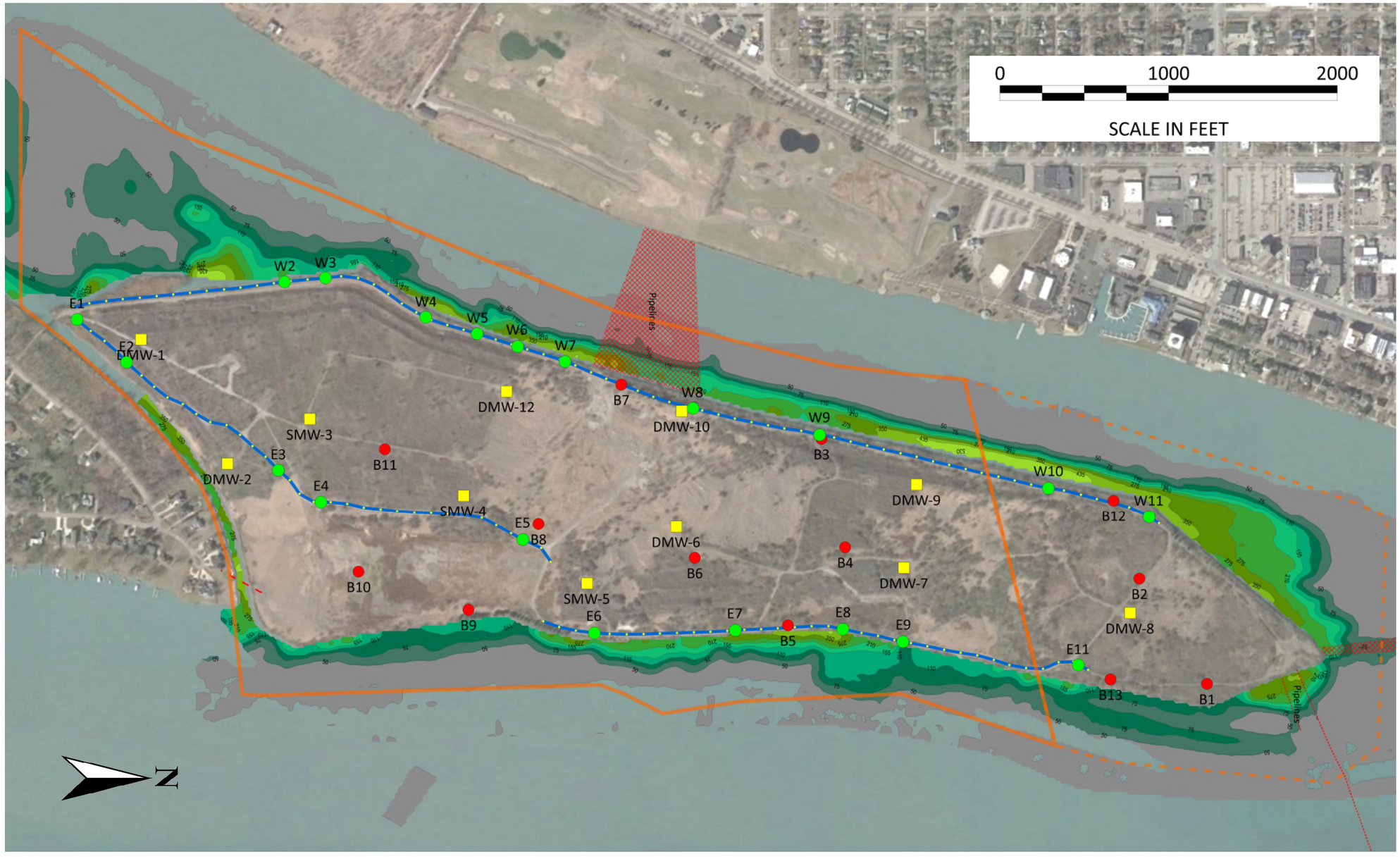

Background Values

FEC in mS/m

50 110 210 350 530

LEGEND

- Original Work Plan Study Area
- Extended Study Area
- ERI Lines
- Golder 2021 Borings
- HPT/EC Borings with Logs
- Wells

Notes:

1.) Scale As Shown

2.) Aerial imagery dated September 2021 downloaded from Google Earth.

3.) FEC = Bulk electrical conductivity of sediments beneath river bottom

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

EM31 IN-RIVER FEC MAP

ARCADIS

FIGURE
10

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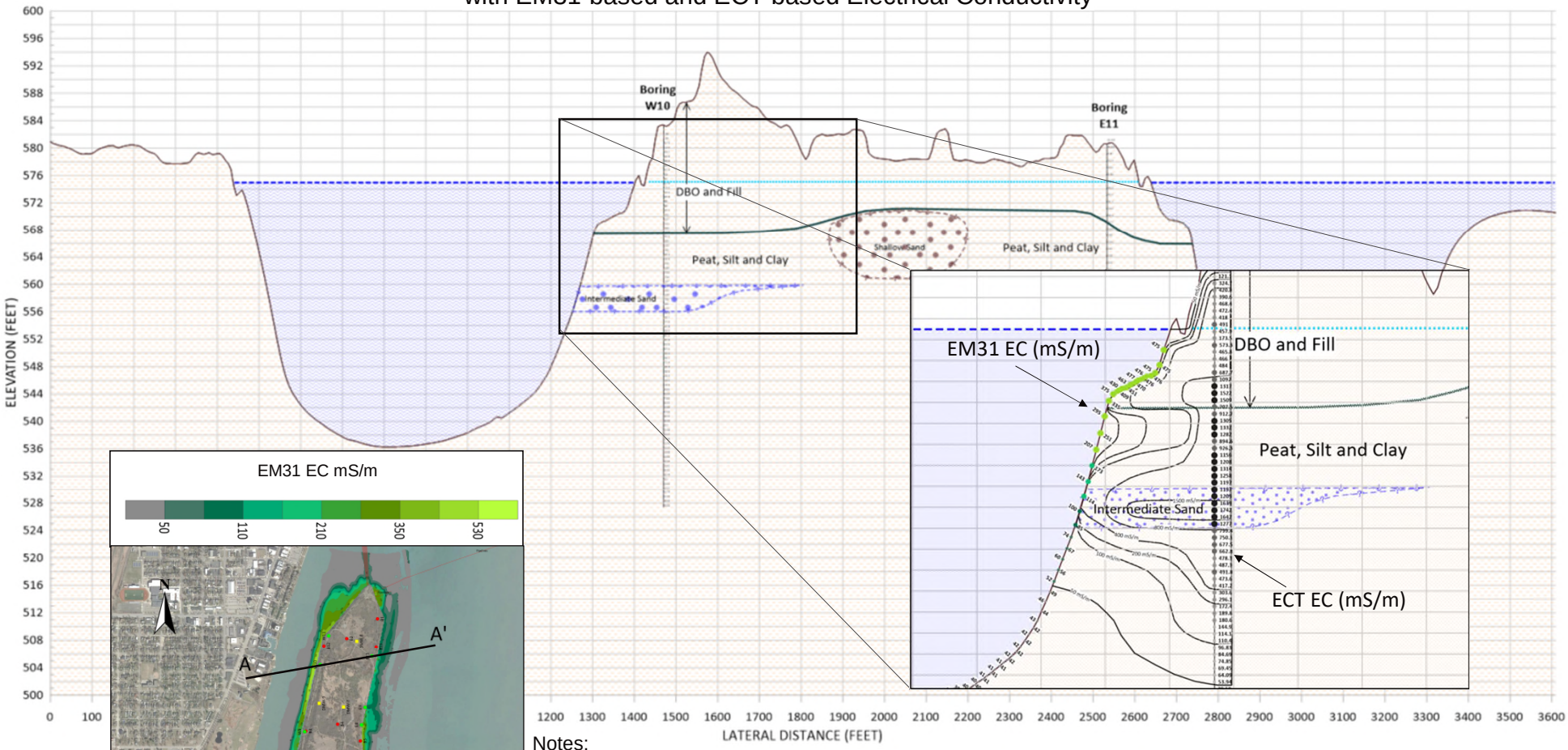
Conceptual Geologic Cross-Section with EM31-based and ECT-based Electrical Conductivity

A

A'



Notes:

1.) Scale -6 x vertical exaggeration

2.) Electrical Conductivity (EC) in millisiemens per meter (mS/m)

3.) Aerial imagery dated September 2021 downloaded from Google Earth.

4.) ECT= Electrical Conductivity Tool

5.) The scale of the EM31 and ECT EC are different because the scale is a function of the type of data being collected

BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN

ISLAND SCALED CROSS SECTION

ARCADIS

FIGURE
11

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Appendix A

Technical Methodology

Appendix A: Technical Methodology

ERI Methodology

Bulk formation electrical resistivity (FER), and its the mathematical inverse, formation bulk electrical conductivity[1], is an intrinsic property of geologic materials that varies widely in the subsurface and responds primarily to a combination of porosity, cementation, water chemistry, other factors such presence of clay minerals. Note that FER is a volume-weighted bulk property of the entire mass of geologic material within the measurement volume of the specific geophysical method used. The true electrical resistivity (TER) is the electrical resistivity of the individual strata measured on a scale small enough to be representative of the formation being tested. TER can be measured directly in-situ with devices such as the ECT or borehole geophysical probes. FER data can also be modeled, and an approximation of the TER can be made. Broadly speaking, modeled FER results can often be used to interpret lithology, especially when groundwater chemistry is relatively invariant. The specific conductance (SC) of the groundwater can strongly influence FER values. The geophysical method referred to as ERI is a process of gathering a two-dimensional, vertical cross-section of FER values which are then subjected to a modeling process called inversion modeling. The outcome of inversion modeling is superior to working with raw FER data because it is an estimate of the TER distribution in the subsurface. By inversion modeling the distribution of TER values in the subsurface, geological features can be interpreted in their proper subsurface positions and the TER values can be compared with well-known ranges of values.

One means for collecting FER data is known as galvanic, or direct current (DC), resistivity method. Collection of FER data using DC resistivity consists of injecting a DC electrical current into the subsurface and simultaneously measuring the potential difference within the vicinity of where the current is being injected using a series of electrodes at the ground surface - generally two current electrodes (designated as A and B) and pairs of potential (voltage) electrodes (designated as M and N) in various arrangements and separations called arrays. The injected current (I) and measured potential (V) values are quantified and recorded by the instrument. From these data the electrical resistance (in ohms) is calculated using Ohm's Law (resistance [R] is equal to voltage [V] divided by current [I], or R=V/I]). The FER, also known as the apparent electrical resistivity or ρ_a (in ohm-meters) is calculated from the resistance (R) using volumetric geometrical scale factors related to the specific electrode arrangement (array). These geometric factors are what distinguish the various array types (see **Exhibit A-1** below).

The horizontal and vertical sensitivities, as well as the penetration ability and efficiency of data collection, vary between array types, and the array type choice is dependent on the project objectives and practical considerations. For this project two array types were used to gather data (see **ExhibitA-1**). For sensitivity to predominantly horizontal features, the inverse-schlumberger array (ISA) was used. The advantages of the ISA include not only sensitivity to horizontal layering, but also a strong signal-to-noise ratio and less susceptibility to interferences. The dipole-dipole array (DDA) was tested as a means to image near vertical features. The DDA generally produces higher data density and resolution of both lateral and vertical heterogeneities, but can be more susceptible to unwanted electrical noise from metallic structures such as pipes than the ISA. Preliminary assessment of the ISA and DDA data sets indicated that the DDA data was subjected to significant interferences from buried metal objects, which were more completely overcome by the ISA. The ISA was also determined to be more appropriate because of the dominance of horizontal features overall. As a result, Arcadis proceeded to work with only the ISA results after completion of field activities.

[1] FER (ohm-meters) = 1000/FEC (milliSiemens/meter)

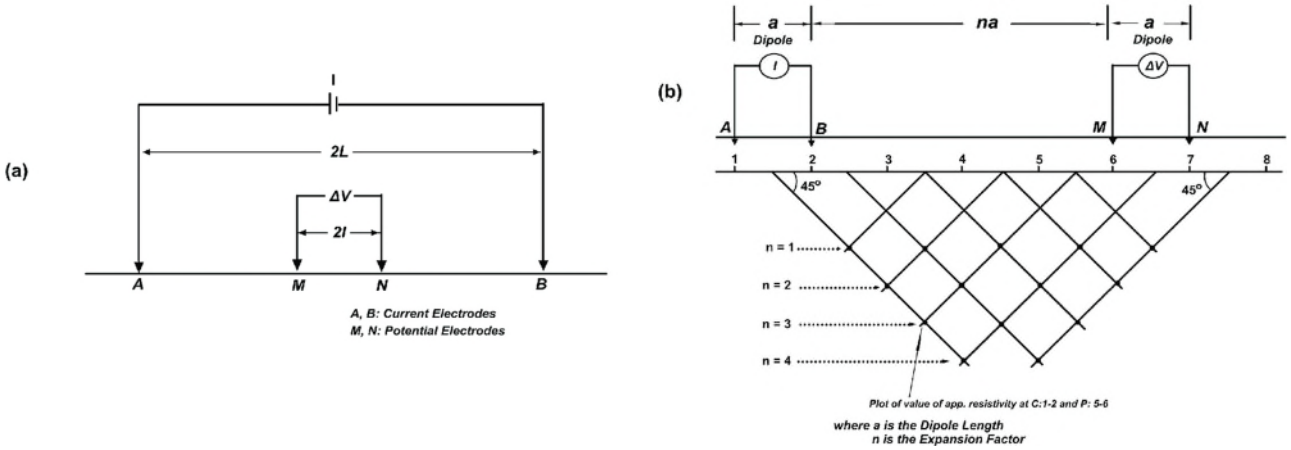


Exhibit C-1. *a. Schlumberger array, where current and potential electrodes are nested around a center point (inverse Schlumberger is places the current electrodes nearest the array center and the potential electrodes at the at the outside). Greater depth is achieved by increasing the separation distance around the center point. b. Dipole-dipole array, where current electrodes are placed beside potential electrode pairs. Greater distance is achieved by increasing the separation between current and potential electrode pairs.*

ERI Data Processing Methodology

Once the FER data were collected on land, they were downloaded to a computer and subsequently inverse-modeled using the software RES2DINV to obtain an estimate of the TER values in cross-section of the subsurface. The inversion modeling iterates through the process of 1) generating a modeled TER cross-section (using the raw FER data as a starting point), 2) calculating the corresponding FER pseudosection[2] that would result from modeled TER results, 3) differencing the calculated FER pseudosection and the actual field FER pseudosection to calculate the root mean square (RMS) error. Criteria are set to determine if the change in RMS difference from one iteration to the next is smaller than a set percentage, usually less than five percent, otherwise the model is then refined either until the maximum number of iterations has been reached (usually 10 or less) or the percent change has met the threshold. The modeler then reviews the final RMS error and if the RMS error is unreasonably elevated, the raw data points which contributed to the difference can be extracted. The modeling is carried out until culling data no longer provides significant improvement. At this point the model is considered to be a reasonable estimation of the true resistivity structure of the subsurface. The final RMS error values are provided on **Figures 4 and 5.** The vertical direction on the electrical resistivity cross-sections are portrayed in elevation feet based on laser imaging, detection, and ranging (LIDAR) surface elevations of the individual electrodes. To facilitate comparability with other types of data such as groundwater SC, direct push ECT values, and data collected in the Detroit River with EM, the TER model values converted to true electrical conductivity.

[2] A pseudosection indicates how the raw FER values vary as a function of position and electrode separation, which is nonlinearly related to the depth of investigation.

HPT/ECT Methodology

The Geoprobe® HPT is an injection logging tool used to provide a continuous profile of relative soil permeability at the centimeter scale. The resulting profile can be used to correlate hydrostratigraphic units across Pt. Hennepin. The HPT probe is attached to the end of a drill string and advanced by a direct-push drilling rig. A continuous metered injection of small volumes of water (typically between 200 to 300 milliliters per minute) occurs during advancement. At the same time, the fluid backpressure due to injection into the formation, as well as the flow rate, is measured and logged at a frequency of 5 samples per second. A relative measure of hydraulic conductivity (K) can be obtained by recognizing that K is generally proportional to flow divided by pressure (Q/P).

The HPT pressure log provides an inverse pattern to hydraulic conductivity, showing low pressure within permeable soils and high pressure in less permeable material. During advancement, the HPT was periodically paused so a dissipation test would be completed to determine the depth to water via hydrostatic pressure measurements. The flow, pressure, and hydrostatic data are then processed within Geoprobe’s software to produce the continuous measure of “Estimated K” through the saturated portion of the profile.

The ECT is integrated into the HPT which consists of a 3-inch long set of four equally spaced electrodes that can be programmed to gather either a 4-electrode wenner array or a 2-electrode dipole array. Similar to the operating principle of ERI, the ECT simultaneously passes current and measures voltage in the formation. The output of the ECT is electrical conductivity which is analogous to true electrical conductivity. Ideally, the conductivity profile created by the ECT should be equivalent to the true electrical conductivity model created in the ERI data processing.

Bathymetric Data Collection and Processing

Single beam echo sounders (SBES) are also known as depth sounders or fathometers. SBES instruments determine water depth by measuring the travel time of a short sonar pulse, or “ping”. The sonar ping is emitted from a transducer positioned just below the water surface, and the SBES listens for the return echo from the bottom. In reality, the sonar energy will be reflected by anything that may be in the path of the pulse – fish, debris, aquatic vegetation and suspended sediment. Areas of heavy vegetation were present in shallower (i.e., less than 15 to 20 feet water depth) portions of the investigation area, which created significant interference for both the SBES and the multibeam echo sounder (MBES).

Unlike SBES, which uses just one transducer to map the river bottom, a multibeam echo sounder (MBES) sends out multiple, simultaneous sonar beams (or sound waves) at once in a fan-shaped pattern. This covers the space both directly under the vessel and out to each side. MBES is used to collect two types of data: seafloor depth and backscatter. The water depth, or bathymetry, is computed by measuring the time it takes for the sound to leave the array, hit the bottom, and return to the array. Backscatter is a measurement of the intensity of the sound echo that reflects back to the multibeam array. A data set similar to a laser imaging, detection and ranging (LIDAR) point cloud is obtained with the MBES, allowing visualization of the river bottom similar to the level of detail offered by LIDAR.

For calibration and quality control purposes, AquaSurvey Inc. (ASI) used a multiparameter sonde to gather temperature, conductivity, and other parameters needed to perform adjustments to the sonic velocity of the water

column. A global positioning system (GPS) unit with survey grade accuracy (sub-centimeter) was used to determine the position of the instruments and the mean elevation of the Detroit River during the survey

Marine Electrical Conductivity Data Processing

The first step in the processing of the EM31 data was the evaluation of instrument variation based on periodic measurements made in deep water channels. **Exhibit A-2** illustrates the variability of the average conductivity of the water. The correction factors applied to the conductivity data are summarized in the upper right. It was assumed that the background conductivity was 24.91 mS/m based on the measurements made immediately after the initial set up. The manufacturer's stated accuracy is +/-5% at 20 mS/m.

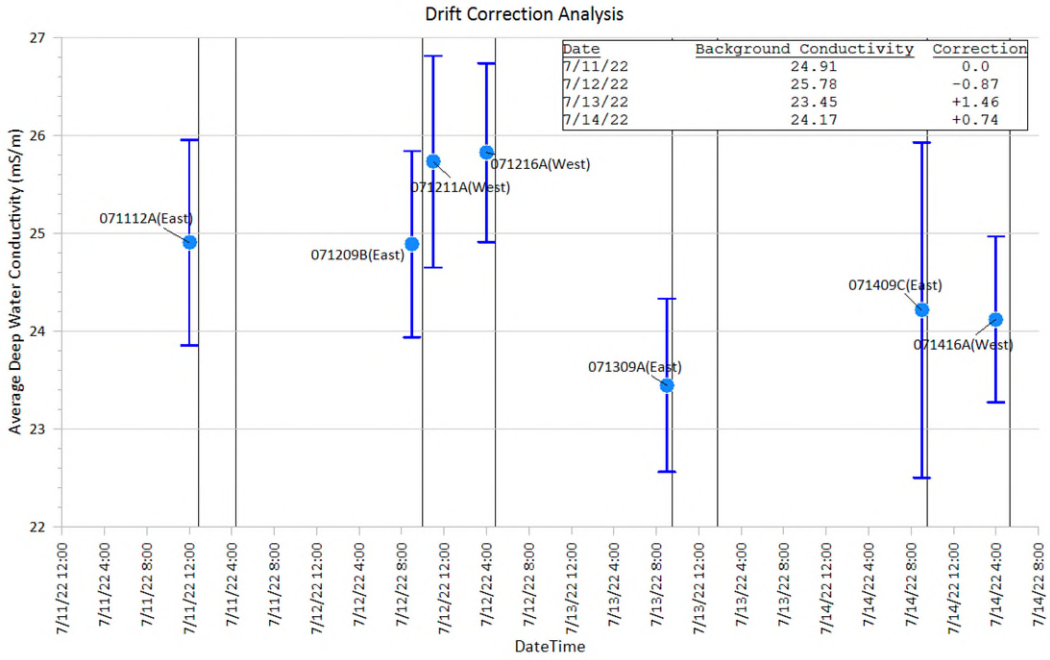


Exhibit C-2. EM31 drift correction analysis results. Corrections were made relative to the initial background (deep water) conductivity measured on 7/11/2022.

The water depths in the survey area fall in a range where the EM31 is very sensitive to the conductivity structure and therefore it is expected that measurements made with the EM31 would be affected by the bathymetry. As noted above, the EC of the river water was determined to be approximately 25 mS/m. In areas underlain by anomalously conductive bottom sediments (for example ten times water conductivity, or 250 mS/m), the formation bulk electrical conductivity measured by the EM31 would be expected to decrease with the depth of the more resistive river water. To correct for the variation introduced by varying water depth, Arcadis applied a bathymetric correction documented by Butler et al. (2004).

Assuming a simple 2-layer model consisting of water in Layer 1 and bottom sediment in Layer 2 (assumed to be uniform), the following equation was applied to the drift-corrected EM31 formation bulk electrical conductivity data:

$$\sigma_2 = \frac{\sigma_a - [1 - R_v(Z)]\sigma_1}{R_v(Z)}$$

Where:

$\sigma_a = FEC\ measured\ by\ the\ EM31$

$\sigma_1 = TEC\ of\ the\ river\ water\ (24.91\ mS/m)$

$\sigma_2 = FEC\ of\ bottom\ sediments$

$Z = normalized\ water\ depth\ (water\ depth\ divided\ by\ instrument\ coil\ separation\ [12\ feet])$

$R_v(Z) = \frac{1}{\sqrt{4Z^2 + 1}} = cumulative\ response\ function$

References

Butler, K. E., Nadeau, J. C., Parrott, R., & Daigle, A. (2004). Delineating recharge to a river valley aquifer by riverine seismic and EM methods. Journal of Environmental & Engineering Geophysics, 9(2), 95-109.

Appendix B

Boring Logs

SOIL BORING LOG

BORING NO.: **SB-E1**

TOTAL DEPTH: **32.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/31/2022**

DATE COMPLETED: **03/31/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0 – 2	28	NM		GC	(0.0-3.0') CLAY, no plasticity, rapid dilatancy; and GRAVEL; little sand, very fine to very coarse, subangular to subrounded; trace granules to large pebbles, angular to subrounded; trace silt; poorly sorted; medium stiff; moist; grayish brown (10YR 5/2). Note: Roots and grass at surface.
2 – 4				CH	(3.0-3.9') CLAY, high plasticity, no dilatancy; trace silt; medium stiff to stiff; moist; gray (10YR 5/1).
4 – 6	34.5	NM		ML ML	(3.9-4.2') SILT; no plasticity, rapid dilatancy; little clay; trace sand, very fine to medium; soft; moist; very dark gray (10YR 3/1). (4.2-13.5') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1) and light gray (10YR 7/1). Note: Distiller Blow-Off.
6 – 8					
8 – 10	46	NM			
10 – 12					(13.5-13.9') SILT, no plasticity, rapid dilatancy; little clay; very soft; moist to wet; very dark gray (10YR 3/1). Note: Hard brittle pieces of silt also present.
12 – 14	47	NM		ML CH	(13.9-19.3') CLAY, high plasticity, no dilatancy; trace silt; trace granules to small pebbles, subangular to subrounded; very stiff: moist; brown (10YR 5/3) and gray (10YR 5/1).
14 – 16					
16 – 18	48	NM			
18 – 20				CH	(19.3-32.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to large pebbles; subangular to subrounded; stiff; moist; gray (10YR 5/1).
20 – 22	48	NM			Note: From 22.0 to 24.0' bgs. medium stiff.
22 – 24					Note: From 24.0 to 28.0' bgs, soft.
24 – 26	48	NM			
26 – 28					Note: From 28.0 to 32.0' bgs, very soft.
28 – 30	48	NM			
30 – 32					
32 – 34					End of boring at 32.0' bgs.

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

Date: 5/10/2022

SOIL BORING LOG

BORING NO.: **SB-E2**

TOTAL DEPTH: **36.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Seth Miller**
DRILLING METHOD: **Direct Push**
DATE STARTED: **04/06/2022**
DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0					
2	22	NM		GC	(0.0-2.5') SAND, very fine to very coarse, angular to subrounded; and GRAVEL; some clay, no plasticity, rapid dilatancy; little granules to large pebbles, angular to subrounded; trace silt; poorly sorted; moist; grayish brown (10YR 5/2).
4				ML	(2.5-5.1') SILT, no plasticity, rapid dilatancy; very soft to soft; moist; very pale brown (10YR 8/3). Note: Distiller Blow-Off.
					(5.1-5.5') SILT, no plasticity, rapid dilatancy; hard; moist; light gray (10YR 7/1) and white (10YR 8/1). Note: Distiller Blow-Off.
6	33.5	NM		ML ML	(5.5-25.7') SILT, no plasticity, rapid dilatancy; very soft to soft; moist; white (10YR 8/1). Note: Distiller Blow-Off.
8					
10	46	NM			
12					
14	48	NM			
16					
18	48	NM			
20					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E2**

TOTAL DEPTH: **36.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/06/2022**

DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
22	48	NM			Note: From 20.0 to 22.0' bgs, very soft. Note: From 22.0 to 22.4' bgs, hard and light gray (10YR 7/1). Note: From 22.4 to 25.7' bgs, color changes to very pale brown (10YR 8/2) and gray (10YR 6/1).
24					Note: At 24.0' bgs, changes to moist to wet.
26	33	NM		ML	(25.7-26.0') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; light grayish brown (10YR 6/2). Note: Organics present (roots), likely Distiller Blow-Off, and silt transition.
				GM	(26.0-26.2') SILT, no plasticity, rapid dilatancy; and PEBBLES, large, subangular; little sand, very find to granules, subangular to subrounded; trace clay: poorly sorted; very soft; moist; dark gray (10YR 4/1).
				CH	
28				OL	(26.2-27.4') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; dark gray (10YR 4/1).
				CH	(27.4-27.9') SILT, no plasticity, rapid dilatancy; little clay; soft, moist; very dark brown (10YR 2/2). Note: Organics, peat.
30	24	NM		CH	(27.9-29.5') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; very dark gray (10YR 3/1). (29.5-33.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; medium stiff; moist; gray (10YR 5/1) and brown (10YR 5/3).
32					
34	48	NM		CH	(33.0-36.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to large pebbles, subangular to subrounded; very stiff; moist; brownish gray (10YR 5/2).
36					End of boring at 36.0' bgs.
38					
40					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E3**

TOTAL DEPTH: **48.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Seth Miller**
DRILLING METHOD: **Direct Push**
DATE STARTED: **04/06/2022**
DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0 – 2	27	NM		GC	(0.0-2.5') SAND, very fine to very coarse, angular to subrounded; and GRAVEL; some clay, no plasticity, rapid dilatancy; little granules to large pebbles, angular to subrounded; trace silt; poorly sorted; moist; grayish brown (10YR 5/2).
2 – 4				ML	(2.5-8.6') SILT, no plasticity, rapid dilatancy; very soft to soft; moist; white (10YR 8/1) and light gray (10YR 7/1). Note: Distiller Blow-Off.
4 – 6	33.5	NM			Note: From 2.5 to 3.11' bgs, very pale brown (10YR 8/3). Note: Some hard laminations throughout.
6 – 8					
8 – 10	40.5	NM		ML	(8.6-38.3') SILT, no plasticity, rapid dilatancy; very soft, moist, white (10YR 8/1).
10 – 12					
12 – 14	48	NM			
14 – 16					
16 – 18	45.5	NM			
18 – 20					
20 – 22	43.5	NM			Note: From 20.0 to 28.0' bgs, white (10YR 8/1) and light gray (10YR 7/1).
22 – 24					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E3**

TOTAL DEPTH: **48.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Seth Miller**
DRILLING METHOD: **Direct Push**
DATE STARTED: **04/06/2022**
DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
26	48	NM			
28					
30	48	NM			
32					
34	48	NM			
36					Note: From 35.6 to 35.7' bgs, gray (GLEY1 6/N). Note: At 36.0' bgs, moist to wet, very pale brown (10YR 8/2) and gray (10YR 6/1).
38	48	NM		ML	(38.3-38.6') SILT, no plasticity, rapid dilatancy; little clay; very soft; moist to wet; dark gray (10YR 4/1) and very dark brown (10YR 2/2). Note: Distiller Blow-Off and peat, organics.
				OL	(38.6-38.8') SILT, no plasticity, rapid dilatancy; little clay; soft; moist; very dark brown (10YR 2/2). Note: Organics, peat.
40				CL	
				ML	(38.8-39.2') CLAY, low plasticity, rapid dilatancy; and SILT; soft; moist; very dark gray (10YR 3/1) and very dark brown (10YR 2/2). Note: trace organics, clay and peat.
42	42.5	NM		CH	
				CH	(39.2-39.5') SILT, no plasticity, rapid dilatancy; little clay; soft; moist; very dark brown (10YR 2/2). Note: Organics, peat.
					(39.5-40.0') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; dark gray (10YR 4/1).
44					(40.0-42.5') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; soft to medium stiff; moist; gray (10YR 5/1) and brown (10YR 5/3).
46	48	NM			(42.5-48.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to large pebbles, subangular to subrounded; very stiff; moist; brown (10YR 5/3).
48					End of boring at 48.0' bgs.
50					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E5**

TOTAL DEPTH: **40.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/29/2022**

DATE COMPLETED: **03/29/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0				CL	(0.0-0.2') CLAY, medium plasticity, slow dilatancy; some silt; trace sand, very fine to fine; trace medium pebbles, subangular; medium stiff; moist, brown (10YR 5/3). Note: Grass at surface.
				ROCK	(0.2-0.5') ROCK core, very fine; hard; very pale brown (10YR 8/2).
2	31	NM		CH	(0.5-4.0') CLAY, medium to high plasticity, no dilatancy; some silt; little gravel; little granules to large pebbles, angular to subrounded; stiff; moist; grayish brown (10YR 5/2).
4				ROCK	(4.0-4.3') ROCK core, very fine; hard; very pale brown (10YR 8/2).
				CH	(4.3-6.0') CLAY, medium to high plasticity, no dilatancy; little silt; trace granules to small pebbles, subangular to subrounded; stiff; moist; grayish brown (10YR 5/2) and brown (10YR 5/3).
6	44	NM		ML	(6.0-10.7') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; trace very coarse sand to small pebbles, subangular to subrounded; moist to wet; light gray (10YR 7/1) and white (10YR 8/1). Note: Hard and soft, Distiller Blow-Off.
8					
10	39	NM		ML	(10.7-11.7') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off.
12				OL	(11.7-13.0') SILT; low plasticity, rapid dilatancy; some clay; very soft; moist; very dark gray (10YR 3/1). Note: Organics.
14	30.5	NM		CH	(13.0-15.7') CLAY, high plasticity, no dilatancy; trace silt; medium stiff; moist; dark gray (10YR 4/1).
16				CH	(15.7-27.6') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; stiff; moist; (10YR 5/1) and brown (10YR 5/3).
18	37.5	NM			
20					Note: From 20.0 to 37.6 bgs, very stiff.

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E5**

TOTAL DEPTH: **40.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/29/2022**
DATE COMPLETED: **03/29/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
22	48	NM			
24	48	NM			
26	48	NM			
28	48	NM		CH	(27.6-40.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to small pebbles, subangular to subrounded; soft to medium stiff; moist; gray (10YR 5/1).
30	48	NM			
32	48	NM			
34	48	NM			
36	48	NM			
38	48	NM			
40					End of boring at 40.0' bgs.
42					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E7**

TOTAL DEPTH: **24.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Seth Miller**
DRILLING METHOD: **Direct Push**
DATE STARTED: **04/06/2022**
DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0				GC	(0.0-0.7') SAND, very fine to very coarse, subangular to subrounded; and GRAVEL; some clay, no plasticity, rapid dilatancy; little granules to large pebbles, subangular to subrounded; trace silt; poorly sorted; moist; dark gray (10YR 4/1). Note: At 0.3' bgs, light grayish brown (10YR 10/2).
				SW	(0.7-2.5') SAND, very fine to very coarse, subangular to subrounded; and GRANULES to large PEBBLES, subangular to subrounded; little silt; poorly sorted; moist; black (10YR 2/1) and very dark gray (10YR 3/1).
2	44	NM			
				ML	(2.5-4.1') SILT, no plasticity rapid dilatancy; some granules to large pebbles, subangular to subrounded; little sand, very fine to medium, subangular to subrounded; poorly sorted; stiff; moist; light gray (10YR 7/1) and gray (10YR 6/1). Note: Distiller Blow-Off, mostly stiff with some very soft to soft components.
4				CH	(4.1-4.3') CLAY, high plasticity, no dilatancy; some granules to medium pebbles, subangular to subrounded; trace silt; very stiff; moist; grayish brown (10YR 5/2).
				ML	(4.3-12.7') SILT, no plasticity rapid dilatancy; some granules to large pebbles, subangular to subrounded; little sand, very fine to medium, subangular to subrounded; poorly sorted; stiff; moist; light gray (10YR 7/1) and gray (10YR 6/1). Note: Distiller Blow-Off, mostly stiff with some very soft to soft components.
6	48	NM			
8					Note: From 8.0 to 12.0' bgs, poor recovery.
10	10	NM			
12				CH	(12.7-17.2') CLAY, high plasticity, no dilatancy, little silt: very soft to soft; moist; gray (10YR 5/1).
14					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E7**

TOTAL DEPTH: **24.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/06/2022**

DATE COMPLETED: **04/06/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
16	30	NM			Note: From 17.0 to 17.2' bgs, stiff.
18	48	NM		CH	(17.2-20.0') CLAY, high plasticity, no dilatancy, trace silt; trace granules to medium pebbles, subangular to subrounded; very stiff; moist; grayish brown (10YR 5/2).
20					
22	48	NM		CH	(20.0-24.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to large pebbles, subangular to subrounded; very stiff; moist; gray (10YR 5/1).
24					End of boring at 24.0' bgs.
26					
28					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E8**

TOTAL DEPTH: **44.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/28/2022**

DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	40.5	NM		SW	(0.0-1.4') SAND, very fine to fine; some very coarse sand to large pebbles, angular to subrounded; poorly sorted; moist; light grayish brown (10YR 6/2).
2				SW	(1.4-1.8') SAND, very fine to coarse, subangular to subrounded; some very coarse sand to medium pebbles, subangular to subrounded; trace silt; poorly sorted; moist to wet; black (10YR 2/1).
4				ML	(1.8-11.5') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; trace granules to medium pebbles, subangular to subrounded; moist to wet; light gray (10YR 7/1). Note: Hard and soft, Distilled Blow-Off.
6	48	NM			
8					
10	48	NM			
12				SM	(11.5-11.8') SAND, very fine to fine; and SILT, no plasticity, rapid dilatancy; trace granules to medium pebbles, subangular to subrounded; poorly sorted; moist; very dark gray (10YR 3/1) and grayish brown (10YR 5/2).
				ML	(11.8-11.9') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1) Note: Distilled Blow-Off.
14	31	NM		ML	(11.9-12.2') SILT, no plasticity, rapid dilatancy; some clay; very soft; moist; very dark gray (10YR 3/1) Note: Trace organics.
16				CH	(12.2-26.8') CLAY, medium to high plasticity, no to slow dilatancy; little silt; very soft to soft; moist; gray (10YR 5/1).
18	31	NM			
20					
22	32	NM			

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

Date: 5/11/2022

SOIL BORING LOG

BORING NO.: **SB-E8**

TOTAL DEPTH: **44.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/28/2022**

DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
24					
26	35	NM		CL	(26.8-27.5') CLAY, medium plasticity, slow dilatancy; and SILT; trace very fine sand; soft; moist; gray (10YR 5/1).
28				ML	(27.5-28.0') SILT, low plasticity, rapid dilatancy; and SAND, very fine to fine; well sorted; trace clay; moist to wet; gray (10YR 5/1).
	39	NM		SP	(28.0-29.3') SAND, very fine to fine; little silt; trace granules to medium pebbles, subangular to subrounded; well sorted; wet; gray (10YR 5/1).
30				SW	(29.3-30.0') SAND, very fine to fine; some coarse sand to large pebbles, subangular to subrounded; little silt; poorly sorted, wet; gray (10YR 5/1).
32				CH	(30.0-44.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; soft; moist; gray (10YR 5/1).
34	41	NM			
36					
38	48	NM			
40					
42	48	NM			
44					End of boring at 44.0' bgs.
46					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E9**

TOTAL DEPTH: **36.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/28/2022**

DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0				SW	(0.0-0.8') SAND, very fine to fine; and GRAVEL; trace very coarse sand to medium pebbles, subangular to subrounded; poorly sorted; trace silt; dry to moist; dark grayish brown (10YR 4/2).
				ML	
2	46	NM		ML	(0.8-1.6') SILT, no plasticity, rapid dilatancy; little sand, very fine to coarse, subangular to subrounded; trace very coarse sand to large pebbles, subangular to subrounded; poorly sorted; moist; grayish brown (10YR 5/2). Note: Likely Distiller Blow-Off.
4					(1.6-11.6') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; trace granules to medium pebbles, subangular to subrounded; moist to wet; gray (10YR 6/1). Note: Hard and soft. Note: At 4.5' bgs, light gray (10YR 7/1). Note: Distiller Blow-Off.
6	48	NM			
8					
10	38	NM			
12				SW	(11.6-11.8') SAND, very fine to fine; little very coarse sand to large pebbles, subangular to subrounded; trace silt; poorly sorted; moist; very dark gray (10YR 3/1).
				CH	(11.8-24.0') CLAY, medium to high plasticity, no to slow dilatancy trace silt; very soft to soft; moist; gray (10YR 5/1).
14	28	NM			
16					
18	31	NM			

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E9**

TOTAL DEPTH: **36.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/28/2022**
DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
20					
22	36	NM			
24	39	NM		CL	(24.0-27.0') CLAY, no plasticity, rapid dilatancy; and SILT; trace sand, very fine to fine; soft; moist to wet; gray (10YR 5/1).
26					
28	36	NM		CH	(27.0-36.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; stiff; moist; gray (10YR 5/1).
30					
32	39.5	NM			
34					
36					End of boring at 36.0' bgs.
38					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-E11**

TOTAL DEPTH: **40.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/28/2022**

DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	34	NM		SW	(0.0-0.4') SAND, very fine to fine; little granules, subangular to subrounded; trace silt; poorly sorted, moist, very dark grayish brown (10YR 3/2). Note: Organics, roots present.
				SM	
				ML	(0.4-1.2') SAND, very fine to fine; and SILT, no plasticity, rapid dilatancy; trace granules to medium pebbles, subangular to subrounded; poorly sorted; moist; light grayish brown (10YR 6/2). Note: Likely Distiller Blow-Off.
2				SW	
				SW	
				ML	(1.2-1.8') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; trace very coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; light gray (10YR 7/1) and white (10YR 8/1). Note: Hard and soft, Distiller Blow-Off.
4				ML	(1.8-2.0') SAND, very fine to fine; trace granules, subangular to subrounded; trace silt; poorly sorted; moist; very dark grayish brown (10YR 3/2). Note: Organics and roots present, another topsoil layer.
6	10	NM			(2.0-2.7') SAND, very fine to fine; and SILT, no plasticity, rapid dilatancy; trace granules to medium pebbles, subangular to subrounded; poorly sorted; moist; light grayish brown (10YR 6/2). Note: Likely Distiller Blow-Off.
8					(2.7-4.5') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; trace very coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; light gray (10YR 7/1) and white (10YR 8/1). Note: Hard and soft, Distiller Blow-Off.
10	32	NM			(4.5-14.5') SILT, no plasticity, rapid dilatancy; very stiff; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off. Note: From 8.0 to 8.2' bgs, hard. Note: From 10.3 to 10.5' bgs, hard. Note: From 13.3 to 13.4' bgs, hard.
12					
14	30	NM			
				OL	(14.5-16.2') SILT; no plasticity, rapid dilatancy; some clay; little organics; very soft; moist; very dark grayish brown (10YR 3/2).
16				CH	(16.2-31.5') CLAY, medium to high plasticity, no to slow dilatancy; trace silt; soft; moist; gray (10YR 5/1).
18	31	NM			
20					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

Date: 5/10/2022

SOIL BORING LOG

BORING NO.: **SB-E11**

TOTAL DEPTH: **40.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/28/2022**

DATE COMPLETED: **03/28/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
22	32.5	NM			
24					
26	36	NM			
28					
30	39	NM			
32				CL	(31.5-32.6') CLAY; no plasticity, rapid dilatancy; and SILT; some sand, very fine to fine; soft; moist to wet; gray (10YR 5/1).
				ML	(32.6-33.0') SILT, no plasticity, rapid dilatancy; some sand, very fine to coarse, subangular to subrounded; little clay; trace very coarse sand to small pebbles; subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).
				CH	
34	38	NM		CL	(33.0-33.8') CLAY, high plasticity, no dilatancy, trace silt; trace granules to medium pebbles, subangular to subrounded; medium stiff; moist; gray (10YR 5/1).
				CL	(33.8-34.8') CLAY, no plasticity, rapid dilatancy; and SILT; some sand, very fine to very coarse, subangular to subrounded; trace granules to large pebbles, subangular to subrounded; soft; moist; gray (10YR 5/1).
36				CH	(34.8-36.2') CLAY, no plasticity, rapid dilatancy; and SILT: some sand, very fine to fine; soft; moist to wet; gray (10YR 5/1).
38	43	NM			(36.2-40.0') CLAY, high plasticity, no dilatancy, trace silt; trace granules to medium pebbles, subangular to subrounded; medium stiff; moist; gray (10YR 5/1).
40					End of boring at 40.0' bgs.
42					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W2**

TOTAL DEPTH: **61.75 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/24/2022**

DATE COMPLETED: **03/24/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0				SW	(0.0-1.1') SAND, very fine to very coarse, subangular to subrounded; and GRAVEL; little silt; trace clay, poorly sorted; moist; light brownish gray (10YR 6/2). Note: At 0.5' bgs, fabric; road base.
2	41	NM		SP	(1.1-6.7') SAND, very fine to fine, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; well sorted; moist to wet; light gray (10YR 7/1) and white (10YR 8/1). Note: Distiller Blow-Off, hard and soft.
4					
6	32	NM			(6.7-7.0') SAND, very fine to fine, subangular to subrounded; little silt; well sorted; moist; dark gray (10YR 4/1). Note: Hard/brittle
				SP	
				SP	(7.0-7.6') SAND, very fine to fine, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; well sorted; moist to wet; light gray (10YR 7/1) and white (10YR 8/1). Note: Distiller Blow-Off, hard and soft.
8				SP	
				SP	(7.6-7.8') SAND, very fine to fine, subangular to subrounded; little silt; well sorted; moist; dark gray (10YR 4/1). Note: Hard/brittle
				SP	
10	29	NM		ML	(7.8-8.0') SAND, very fine to fine, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; well sorted; moist to wet; light gray (10YR 7/1) and white (10YR 8/1). Note: Distiller Blow-Off, hard and soft.
				SP	
				CH	(8.0-8.5') SAND, very fine to fine, subangular to subrounded; some silt, no plasticity, rapid dilatancy; well sorted; moist; (10YR 5/1). Note: Possible Distiller Blow-Off.
12				CH	(8.5-9.0') SILT, no plasticity, rapid dilatancy; some sand, very fine to fine; well sorted; hard; moist; white (10YR 8/1). Note Distiller Blow-Off.
14	20	NM			(9.0-10.0') SAND, very fine to fine, subangular to subrounded; little silt; well sorted; moist to wet; dark gray (10YR 4/1).
					(10.0-12.0') CLAY, medium to high plasticity, slow dilatancy; little silt; soft; moist; very dark gray (10YR 3/1).
16				CH	(12.0-16.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules, subangular to subround; soft to medium stiff; moist; gray (10YR 5/1).
18	48	NM			(16.0-24.0') CLAY, medium to high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; very stiff; moist; dark grayish brown (10YR 4/2).
20					
22					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W2**

TOTAL DEPTH: **61.75 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/24/2022**

DATE COMPLETED: **03/24/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
24	48	NM			
26	48	NM		CH	(24.0-48.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; medium stiff to stiff; moist; gray (10YR 5/1).
28	48	NM			Note: At 25.0' bgs, gray.
30	48	NM			Note: At 28.0' bgs, soft.
32	48	NM			Note: At 32.0' bgs, very soft.
34	48	NM			
36	48	NM			
38	48	NM			
40	48				
42					
44					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W2**

TOTAL DEPTH: **61.75 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/24/2022**
DATE COMPLETED: **03/24/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
46	48	NM			
48	0	NM		NO RECOVERY	(48.0-56.0') NO RECOVERY.
50					
52	0	NM			
54					
56	35.5	NM		CH	(56.0-59.7') CLAY, high plasticity, no dilatancy; trace silt; trace granules, subangular to subrounded; soft to medium stiff; moist; dark gray (10YR 4/1).
58					
60	10.5	NM		ML ML	(59.7-60.0') SILT, no plasticity, rapid dilatancy; moist; very pale brown (10YR 8/2). Note: Distiller Blow-Off, sulfur odor, hard and soft. (60.0-61.7') SILT, no plasticity, rapid dilatancy; some granules to large pebbles, angular to subround; soft to hard; wet; gray (10YR 5/1) and light grayish brown (10YR 6/2). Note: Sulfur odor.
62					End of boring at 61.75' bgs, refusal.
64					
66					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W3**

TOTAL DEPTH: **46.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	40.5	NM		GC	(0.0-1.4') CLAY, no plasticity, rapid dilatancy; little silt; and GRAVEL; little sand, very fine to very coarse, subangular to subrounded; trace granules to large pebbles, angular to subrounded; medium stiff, poorly sorted; dry to moist; grayish brown (10YR 5/2). Note: At 0.6' bgs, fabric; road base.
2				GC	
				ML	(1.4-1.9') CLAY, medium plasticity, slow dilatancy; little silt; and GRAVEL; trace sand, very fine to very coarse, subangular to subrounded; stiff; poorly sorted; moist; dark gray (10YR 4/2).
4					(1.9-9.2') SILT, no plasticity, rapid dilatancy; little sand, very fine to medium, subangular to subrounded; mois to wet; white (10YR 8/1) and light gray (10YR 7/1). Note: Distiller Blow-Off; hard and soft.
6	36	NM			
8					
10	39	NM		CL	(9.2-12.0') CLAY, low plasticity, rapid dilatancy; some silt: trace granules to small pebbles, subangular to subrounded; soft; moist; very dark gray (10YR 3/1).
12					
14	39	NM		CL	(12.0-20.2') CLAY, medium plasticity, no to slow dilatancy; little silt; trace granules, subangular to subrounded; soft; moist; dark gray (10YR 4/1).
16					
18	34	NM			
20					
22	32	NM		SC	(20.2-28.0') SAND, very fine to fine; and CLAY, medium plasticity, rapid dilatancy; trace silt; trace granules, subangular to subrounded; soft; well sorted; moist to wet; gray (10YR 5/1).
24					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W3**

TOTAL DEPTH: **46.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
26	48	NM			
28	20	NM		SP	(28.0-31.7') SAND, very fine to fine; trace clay; well sorted; moist to wet; dark gray (10YR 4/1).
30					(31.7-31.9') SAND, very fine to large pebbles, subangular to subrounded; trace clay; poorly sorted; moist to wet; dark gray (10YR 4/1).
32	48	NM		SW	
				CH	(31.9-32.0') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; gray (10YR 5/1).
				SP	(32.0-33.3') SAND, very fine to fine; little clay; well sorted; wet; dark gray (10YR 4/1).
34				CH	(33.3-46.0') CLAY, high plasticity; no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; very soft to soft; moist; gray (10YR 5/1).
36	48	NM			
38	48	NM			
40					
42	46	NM			
44					Note: Driller pushed 2.0', from 44.0-46.0' bgs, but recovered 46" due to clay expanded.
	46	NM			
46					End of boring at 46.0' bgs.
48					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W4**

TOTAL DEPTH: **58.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/24/2022**

DATE COMPLETED: **03/24/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	48	NM		SW	(0.0-1.0') SAND, very fine to very coarse, subangular to subrounded; and GRAVEL; little silt; trace clay; poorly sorted; moist; light brownish gray (10YR 6/2).
2				SC	Note: At 0.5' bgs, fabric; road base.
4	48	NM		SP	(1.0-2.2') CLAY, medium to high plasticity, slow dilatancy; and SAND, very fine to coarse, subangular to subrounded; little pebbles, small to medium; subangular; trace silt; poorly sorted; soft to medium stiff; moist; dark gray (10YR 4/1).
6	48	NM			(2.2-7.2') SAND, very fine to fine, subangular to subrounded; trace silt; well sorted; dry; light gray (10YR 7/1). Note: Distiller Blow-Off, hard.
8	26	NM		CL	(7.2-8.0') CLAY, no plasticity, rapid dilatancy; and SILT; trace sand, very fine to medium, subangular to subrounded; stiff; dry to moist; very dark gray (10YR 3/1) and gray (10YR 5/1).
10				CH	(8.0-9.7') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; gray (10YR 5/1).
12	24	NM			(9.7-13.8') CLAY, medium to high plasticity, no to slow dilatancy; little silt; soft; moist; gray (10YR 5.1) and very dark gray (10YR 3/1).
14				CH	(13.8-16.8') CLAY, medium to high plasticity, no dilatancy; little silt; medium stiff; moist; gray (10YR 5/1).
16	36	NM		CL	(16.8-18.0') CLAY, low plasticity, rapid dilatancy; some sand, very fine to medium, subangular to subrounded; little silt; trace medium pebbles, subangular; very soft; moist to wet; gray (10YR 5/1).
18				CH	(18.0-28.0') CLAY, medium to high plasticity, no dilatancy; trace silt; very stiff; moist; dark grayish brown (10YR 4/2).
20	48	NM			Note: At 20.0' bgs, color changes to gray (10YR 5/1).
22					
24	48	NM			
26					
28	48	NM		CH	(28.0-55.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; very soft to soft; moist to wet; gray (10YR 5/1).
30					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W4**

TOTAL DEPTH: **58.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/24/2022**
DATE COMPLETED: **03/24/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
32					
34	48	NM			
36	48	NM			
38	48	NM			
40	48				
42	48	NM			
44	48	NM			
46	48	NM			
48	48	NM			
50	48	NM			
52	48	NM			(55.0-56.0') CLAY, high plasticity, no dilatancy; little granules to medium pebbles, subangular to subrounded; trace silt; trace sand, very fine to fine; soft; poorly sorted; moist to wet; gray (10YR 5/1). Note: Till.
54				CH	
56	5	NM		ML	(56.0-58.0') SILT, no plasticity, rapid dilatancy; some granules to large pebbles, angular to subrounded; hard; dry to moist; gray (10YR 5/1). Note: Sulfur odor. Note: From 56.0 to 58.0' bgs, poor recovery, wrinkled tube, very hard material unable to drill, large pebble in tube.
58					End of boring at 58.0' bgs, hit refusal.
60					
62					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W5**

TOTAL DEPTH: **32.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	32.5	NM		GC	(0.0-2.6') CLAY, no plasticity, rapid dilatancy; and GRAVEL; little silt; little sand, very fine to very coarse, subangular to subrounded; trace granules to large pebbles, subangular to subrounded; stiff; poorly sorted; dry to moist; grayish brown (10YR 5/2). Note: At 1.5' bgs, fabric; road base.
2				GM	(2.6-2.9') SILT, no plasticity, rapid dilatancy; and GRAVEL; trace clay; trace sand, very fine to coarse; subangular to subrounded; moist; black (10YR 2/1).
				ML	(2.9-3.0') SILT, no plasticity, rapid dilatancy; little sand, very fine to very coarse, subangular to subrounded; hard; moist; grayish brown (10YR 5/2). Note: Possibly Distiller Blow-Off.
4	48	NM		ML	(3.0-4.7') SILT, no plasticity, rapid dilatancy, some coarse sand to large pebbles, angular to subrounded; trace clay; medium stiff; moist; dusky red (10YR 3/2) and very dark gray (10YR 3/1).
6				ML	(4.7-8.0') SILT, no plasticity, rapid dilatancy; some sand, very fine to medium, subangular to subrounded; hard; gray (10YR 5/1) and light gray (10YR 7/1). Note: Distiller Blow-Off.
8	24	NM		ML	(8.0-14.1') SILT, no plasticity, rapid dilatancy; very soft to soft; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off.
10					
12	29	NM			
14				ML	(14.1-18.0') SILT, no to low plasticity, rapid dilatancy; and CLAY; very soft; moist to wet; very dark gray (10YR 3/1).
16					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W5**

TOTAL DEPTH: **32.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Seth Miller**
DRILLING METHOD: **Direct Push**
DATE STARTED: **04/04/2022**
DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
18	32	NM		CH	(18.0-28.7') CLAY, medium to high plasticity, no dilatancy; trace silt; trace granules to large pebbles, subangular to subrounded; soft to very soft; moist; gray (10YR 5/1).
20					
22	40	NM			
24					
26	34	NM			
28				SP	(28.7-30.0') SAND, very fine to fine; some clay; trace granules to small pebbles; subrounded; trace silt; well sorted; moist to wet; gray (10YR 5/1). Note: Shell fragments.
30	27	NM		CH	(30.0-32.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; soft; moist; gray (10YR 5/1).
32					End of boring at 32.0' bgs.
34					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W6**

TOTAL DEPTH: **28.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	39	NM		GC	(0.0-1.9') CLAY, no plasticity, rapid dilatancy; and GRAVEL; little silt; little sand, very fine to very coarse, subangular to subrounded; trace granules to very large pebbles, subangular to subrounded; stiff; poorly sorted; dry to moist; grayish brown (10YR 5/2). Note: Road material.
2				ML	(1.9-2.8') SILT, no plasticity, rapid dilatancy; some sand, very fine to very coarse, subangular to subrounded; little granules to large pebbles, subangular to subrounded; trace clay; hard; poorly sorted; dry to moist; very dark grayish brown (10YR 3/2).
4				ML	(2.8-5.2') SILT, no plasticity, rapid dilatancy; and SAND, very fine to coarse, subangular to subrounded; hard; well sorted; moist; light gray (10YR 7/2). Note: Distiller Blow-Off.
6	42	NM		ML	(5.2-6.8') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off.
8				SP	(6.8-8.3') SAND, very fine to coarse, subangular to subrounded; little silt; well sorted; moist to wet; gray (10YR 6/1). Note: Distiller Blow-Off.
10	26	NM		ML	(8.3-11.0') SILT, no to low plasticity, rapid dilatancy; and CLAY; very soft; moist to wet; dark gray (10YR 4/1). Note: Little organics present, roots, etc.
12				CH	(11.0-23.0') CLAY, medium to high plasticity, no dilatancy; trace silt; very soft; moist; gray (10YR 5/1).
14	42.5	NM			

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W6**

TOTAL DEPTH: **28.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
16					
18	42	NM			
20					
22	42	NM			
24				SP	(23.0-24.5') SAND, very fine to coarse, subangular to subrounded; little clay; little silt; well sorted; wet; dark gray (10YR 4/1).
26	41	NM		SW	(24.5-27.4') SAND, very fine to very coarse, subangular to subrounded; trace granules, subangular to subrounded; trace silt; poorly sorted; wet; dark gray (10YR 4/1). Note: Drill brow out on last run 24.0 to 28.0' bgs, first 5 feet is likely from bottom of the 20.0 to 24.0' bgs run.
28				CH	(27.4-28.0') CLAY, high plasticity, no dilatancy; trace silt; medium stiff; moist; gray (10YR 5/1).
30					End of boring at 28.0' bgs.

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W7**

TOTAL DEPTH: **28.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

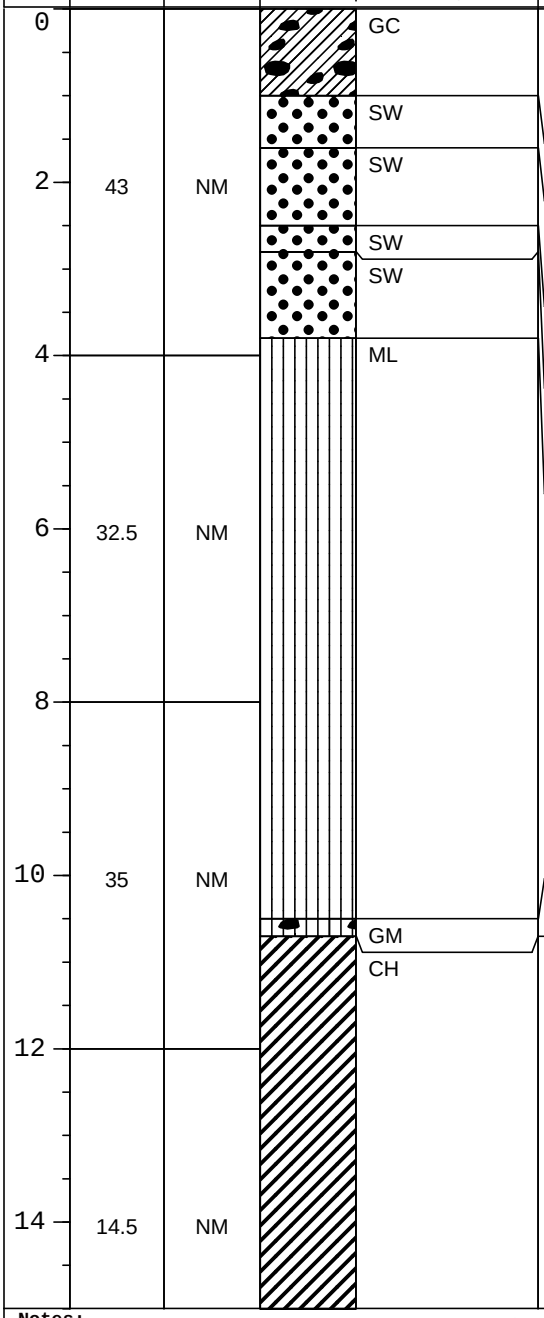
DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**



SOIL DESCRIPTION

(0.0-1.0') CLAY, no plasticity, rapid dilatancy; and GRAVEL; some sand, very fine to medium, subangular to subrounded; little granules to large pebbles, subangular to subrounded; trace silt; stiff; poorly sorted, dry to moist; grayish brown (10YR 5/2).

Note: At 0.4' bgs, fabric; road base material.

(1.0-1.6') SAND, very fine to coarse, subangular to subrounded; some granules to medium, pebbles, subanglar to subrounded; little silt; poorly sorted; moist; black (10YR 2/1).

(1.6-2.5') SAND, very fine to coarse, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; little granules to medium pebbles, angular to subrounded; poorly sorted; moist; dark gray (10YR 4/1).
Note: Hard material, red (2.5YR 5/6) present at 21.0' bgs.

(2.5-2.8') SAND, very fine to coarse, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; some granules to large pebbles, subangular to subrounded; poorly sorted; moist; gray (10YR 5/1).

(2.8-3.8') SAND, very fine to coarse, subangular to subrounded; and SILT, no plasticity, rapid dilatancy; little granules to medium pebbles, angular to subrounded; poorly sorted; moist; dark gray (10YR 4/1).
Note: Man-made material at 3.0' bgs, red (2.5YR 4/8).

(3.8-10.5') SILT, no plasticity, rapid dilatancy; very soft to soft; moist to wet; white (10YR 8/1).
Note: Hard and light gray (10YR 7/1) at 3.8 to 4.4' bgs, 5.7 to 5.8' bgs, and 6.3 to 6.5' bgs.

(10.5-10.7') SILT, no plasticity, rapid dilatancy; and GRANULES to large PEBBLES, angular to subrounded; little clay; very soft; moist to wet; very dark gray (10YR 3/1).

(10.7-15.2') CLAY, medium to high plasticity, no dilatancy; some silt; soft; moist; dark gray (10YR 4/1).

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W7**

TOTAL DEPTH: **28.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Seth Miller**

DRILLING METHOD: **Direct Push**

DATE STARTED: **04/04/2022**

DATE COMPLETED: **04/04/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
16				CH	(15.2-20.1') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; very stiff; moist; gray (10YR 5/1) and brown (10YR 5/3).
18	28.5	NM			
20				CH	(20.1-28.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; very stiff; moist; gray (10YR 5/1).
22	48	NM			
24					Note: At 24.0' bgs, changes to stiff.
26	48	NM			
28					Note: At 27.2' bgs, changes to medium stiff.
30					End of boring at 28.0' bgs.

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W8**

TOTAL DEPTH: **64.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/25/2022**

DATE COMPLETED: **03/25/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	34	NM		SW	(0.0-0.5') SAND, very fine to fine; some gravel; little medium sand to medium pebbles, subangular to subrounded; trace silt; poorly sorted; moist; dark gray (10YR 4/1). Note: Grass and twigs at surface.
2				SW	(0.5-1.6') SAND, very fine to fine; little granules to medium pebbles, subangular to subrounded; trace silt; poorly sorted; moist; black (10YR 2/1).
4				SW	(1.6-1.8') SAND, very fine to medium, subangular to subrounded; some granules to small pebbles, subangular to subrounded; trace silt; poorly sorted; moist; grayish brown (10YR 5/2).
6	31.5	NM		ML	(1.8-2.0') SAND, very fine to fine; little granules to medium pebbles, subangular to subrounded; trace silt; poorly sorted; moist; black (10YR 2/1).
8				ML	(2.0-3.3') SILT, no plasticity, rapid dilatancy; some granules to medium pebbles, subangular to subrounded; little sand, very fine to fine; trace clay; soft; poorly sorted; moist; brown (10YR 5/3) and dark gray (10YR 4/1).
10	46	NM		ML	(3.3-3.6') SILT, no plasticity, rapid dilatancy; some sand, very fine to fine, subrounded to subangular; well sorted; moist; gray (10YR 5/1). Note: Hard and soft, likely start of the Distiller Blow-Off.
12					(3.6-23.2') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off. Note: From 4.0 to 4.3' bgs, hard. Note: From 4.9 to 6.0' bgs, hard
14	47	NM			
16					
18	48	NM			
20					
22					

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W8**

TOTAL DEPTH: **64.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/25/2022**
DATE COMPLETED: **03/25/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
	45	NM			
				CH	(23.2-24.0') CLAY, medium to high plasticity, no dilatancy; little silt; trace organics; very stiff; moist; very dark gray (10YR 3/1). Note: From 23.7 to 23.8' bgs, more silt and organics, peat.
24				CH	(24.0-26.6') CLAY, high plasticity, no dilatancy; trace silt; trace organics; stiff to very stiff; moist; dark gray (10YR 4/1) and very dark gray (10YR 3/1).
26	39	NM			
				CL	(26.6-27.7') CLAY, low plasticity, slow to rapid dilatancy; and SILT; trace sand, very fine; medium stiff; moist; gray (10YR 5/1).
28				CL	(27.7-29.2') CLAY, no to low plasticity, rapid dilatancy; and SILT; some sand, very fine to fine; medium stiff; wet; gray (10YR 5/1). Note: At 29.2' bgs, large pebble.
				SM	(29.2-29.3') SAND, very fine to very coarse, subrounded to subangular; and SILT , no plasticity, rapid dilatancy; little clay; poorly sorted; soft; wet; very dark gray (10YR 3/1).
30	38	NM		CH	(29.3-32.0') CLAY, medium to high plasticity, no dilatancy; little silt; trace very fine sand to granules, subrounded to subangular; very stiff; moist; dark grayish brown (10YR 4/2).
32				CH	(32.0-64.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subrounded to subangular; stiff to very stiff; moist; gray (10YR 5/1).
34	48	NM			
36					
38	48	NM			
40					Note: At 40.0' bgs, changes to medium stiff.
42	48	NM			
44					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W8**

TOTAL DEPTH: **64.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/25/2022**
DATE COMPLETED: **03/25/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
46	28	NM			Note: At 44.0' bgs, changes to soft.
48	39	NM			
50					
52	48	NM			
54					
56	48	NM			
58					
60	48	NM			
62					
64					Note: At 63.5' bgs, large pebble, subrounded.
66					End of boring at 64.0' bgs.

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W10**

TOTAL DEPTH: **56.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**

SITE LOCATION: **Point Hennepin**

CITY, STATE: **Grosse Ile, Michigan**

PROJECT NUMBER: **30107326**

LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**

DRILLER: **Andy Kirsch/Robert Tieman**

DRILLING METHOD: **Direct Push**

DATE STARTED: **03/25/2022**

DATE COMPLETED: **03/25/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
0	32	NM		SM	(0.0-0.5') SAND, very fine; and SILT, no plasticity, rapid dilatancy; some gravel; poorly sorted; moist; brown (10YR 5/3). Note: Grass and roots at surface.
				SW	
2				SM	(0.5-1.5') SAND, very fine to coarse, subangular to subrounded; some granules to medium pebbles, subangular to subrounded; little silt; poorly sorted; moist; black (10YR 2/1) and dark gray (10YR 4/1).
				SW	
4				ML	(1.5-2.0') SAND, very fine to fine; and SILT, no plasticity, rapid dilatancy; trace granules, subangular to subrounded; poorly sorted; hard; moist; gray (10YR 5/1) and light gray (10YR 7/1). Note: Distiller Blow-Off, possible.
	19	NM		ML	
6					(2.0-2.4') SAND, very fine to coarse, subangular to subrounded; some granules to medium pebbles, subangular to subrounded; little silt; poorly sorted; moist; black (10YR 2/1) and dark gray (10YR 4/1).
8					(2.4-4.5') SILT, no plasticity, rapid dilatancy; some sand, very fine to medium, subangular to subrounded; little granules to large pebbles, subangular to subrounded; poorly sorted; hard; moist; light gray (10YR 7/1). Note: Distiller Blow-Off.
10	22	NM			(4.5-15.7') SILT, no plasticity, rapid dilatancy; very soft; moist to wet; white (10YR 8/1). Note: Distiller Blow-Off. Note: Hard at 9.8 to 10.2' bgs, 11.4 to 11.5' bgs, and 11.9 to 12.0' bgs.
12					
14	39	NM			
16				OL	(15.7-18.0') SILT, no plasticity, rapid dilatancy; some clay: little organics; very soft; moist to wet; very dark gray (10YR 3/1). Note: Organics, peat.
18	35	NM		OH	(18.0-19.7') CLAY, medium plasticity, rapid dilatancy; some silt: little organics; soft; moist; very dark gray (10YR 3/1). Note Organics, peat.
20				CH	(19.7-22.0') CLAY, high plasticity, no dilatancy; trace silt; stiff; moist; gray (10YR 5/1) and very dark gray (10YR 3/1).
22	30	NM		CH	(22.0-23.6') CLAY, high plasticity, no dilatancy; trace silt; soft; moist; gray (10YR 5/1).
24				SC	(23.6-26.3') SAND, very fine to medium, subangular to subrounded; and CLAY, medium plasticity, slow dilatancy; little silt; well sorted; wet; grayish brown (10YR 5/2).
26	36	NM		SP	(26.3-27.4') SAND, very fine to coarse, subangular to subrounded; little clay; trace silt; well sorted; wet; very dark gray (10YR 3/1).
28				CH	(27.4-46.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; stiff to very stiff; moist; gray (10YR 5/1).

Notes:

bgs: below ground surface

USCS: Unified Soil Classification System

NA: Not Available

NM: Not Measured

ppm: parts per million

PID: Photo-ionization Detector

SOIL BORING LOG

BORING NO.: **SB-W10**

TOTAL DEPTH: **56.0 feet bgs**

ARCADIS

PROJECT INFORMATION

CLIENT: **BASF Corporation**
SITE LOCATION: **Point Hennepin**
CITY, STATE: **Grosse Ile, Michigan**
PROJECT NUMBER: **30107326**
LOGGED BY: **K. Donahue**

DRILLING INFORMATION

DRILLING CO.: **Dakota Technologies**
DRILLER: **Andy Kirsch/Robert Tieman**
DRILLING METHOD: **Direct Push**
DATE STARTED: **03/25/2022**
DATE COMPLETED: **03/25/2022**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION
30	48	NM			
32					
34	47	NM			
36					
38	48	NM			
40					Note: At 40.0' bgs, changes to medium stiff.
42	48	NM			
44					
46	44	NM		ML	(46.0-47.2') SILT, no plasticity, rapid dilatancy; little clay; stiff; moist; gray (10YR 5/1).
48				CL	(47.2-50.2') CLAY, no to low plasticity, rapid dilatancy; and SILT; soft to stiff; moist to wet; gray (10YR 5/1).
50	48	NM		CH	(50.2-56.0') CLAY, high plasticity, no dilatancy; trace silt; trace granules to medium pebbles, subangular to subrounded; soft; moist; gray (10YR 5/1).
52					
54	48	NM			
56					End of boring at 56.0' bgs.
58					

Notes:
bgs: below ground surface
USCS: Unified Soil Classification System
NA: Not Available
NM: Not Measured
ppm: parts per million
PID: Photo-ionization Detector

Appendix C

Combined Soil Logs with Hydraulic Profiling Tool, Electrical Resistivity Imaging Electrical Conductivity, and Hydraulic Conductivity

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E1

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/31/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322536.23
Y 4672165.76

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 758.5 ft amsl

ELEVATION DATUM: World Geodetic System 1984

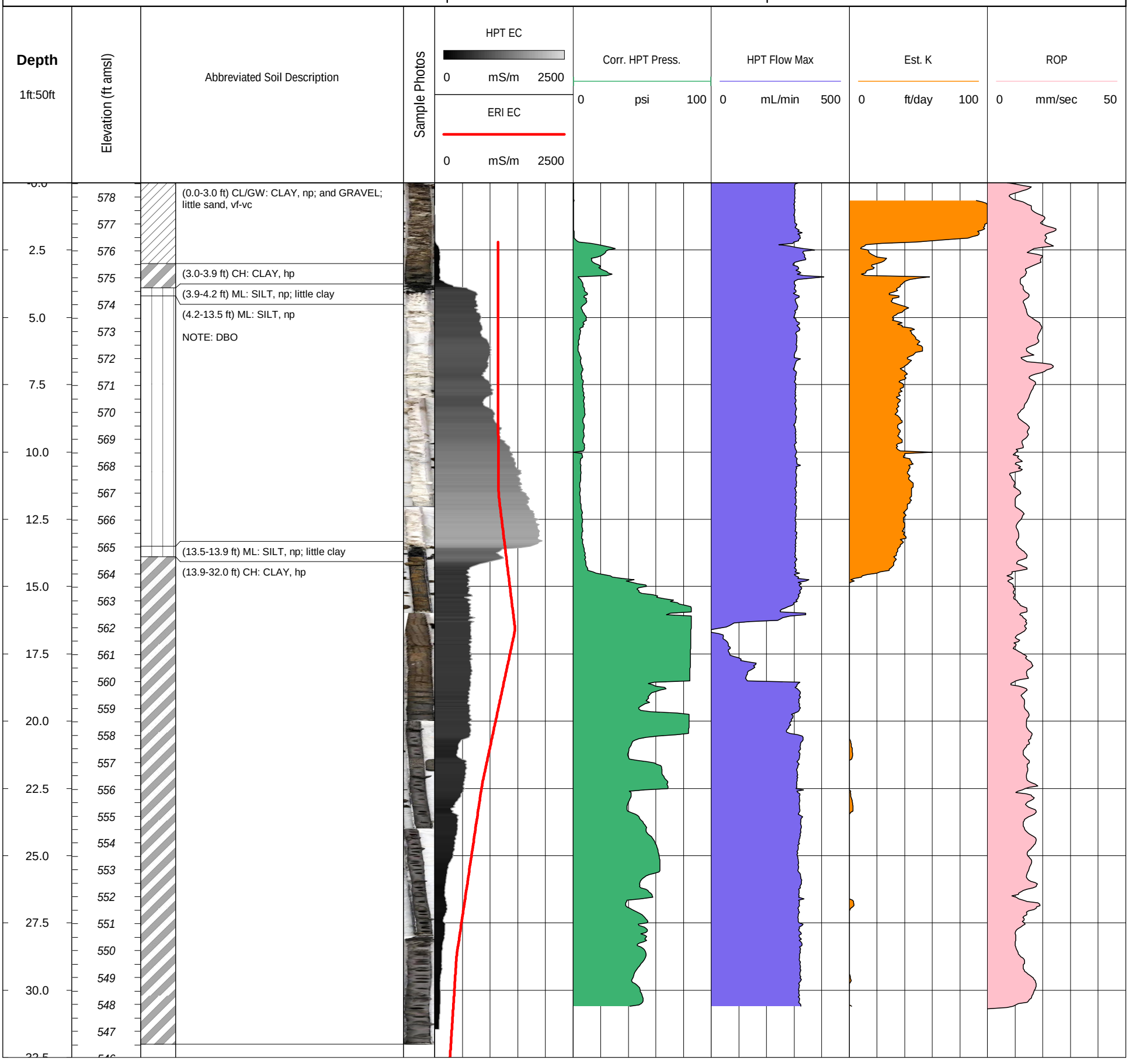
HPT TOTAL DEPTH: 31.5 ft bgs

SB TOTAL DEPTH: 32 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)



HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E2

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/06/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322613.54
Y 4672255.04

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 595.5 ft amsl

ELEVATION DATUM: World Geodetic System 1984

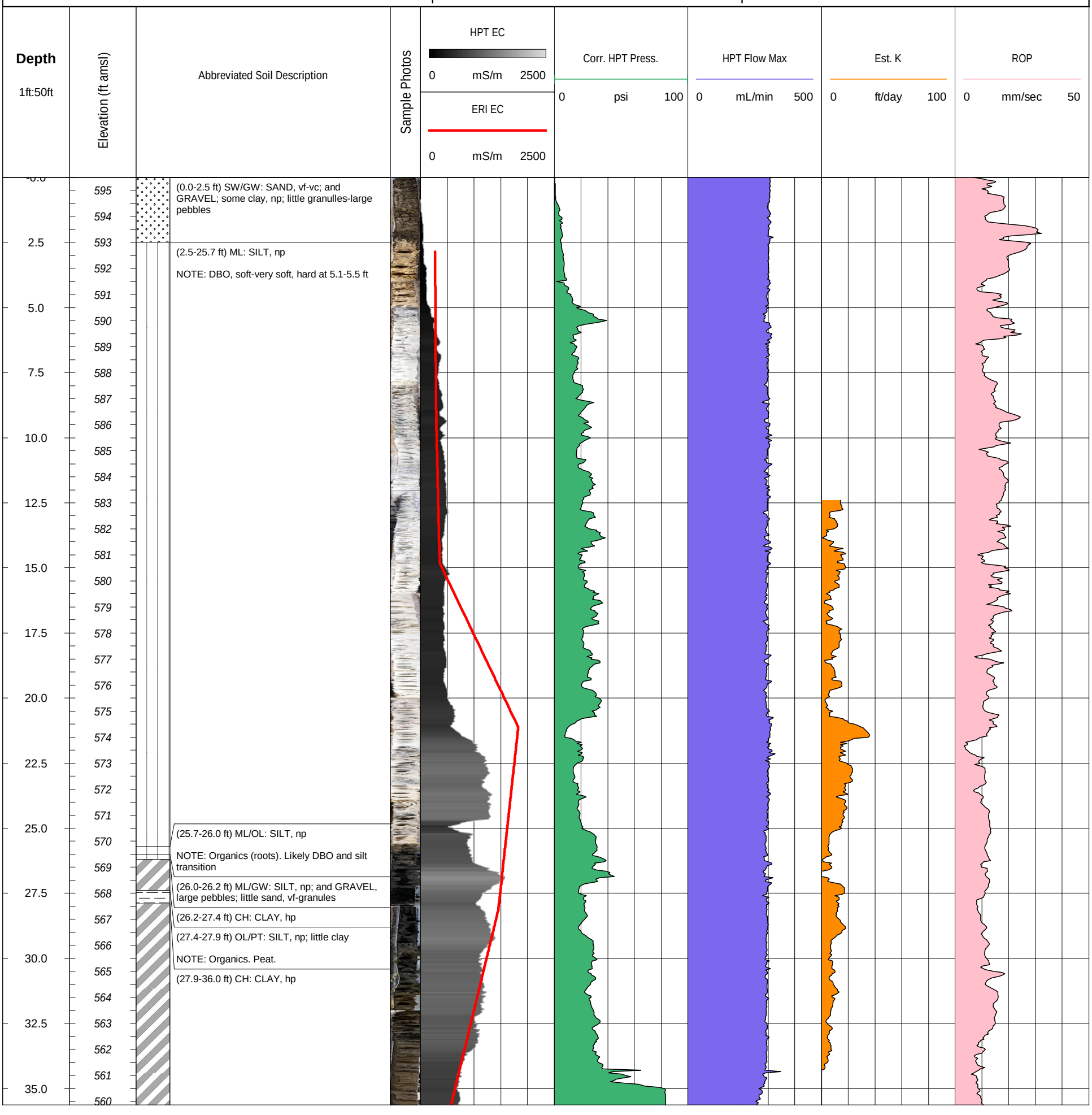
HPT TOTAL DEPTH: 51.3 ft bgs

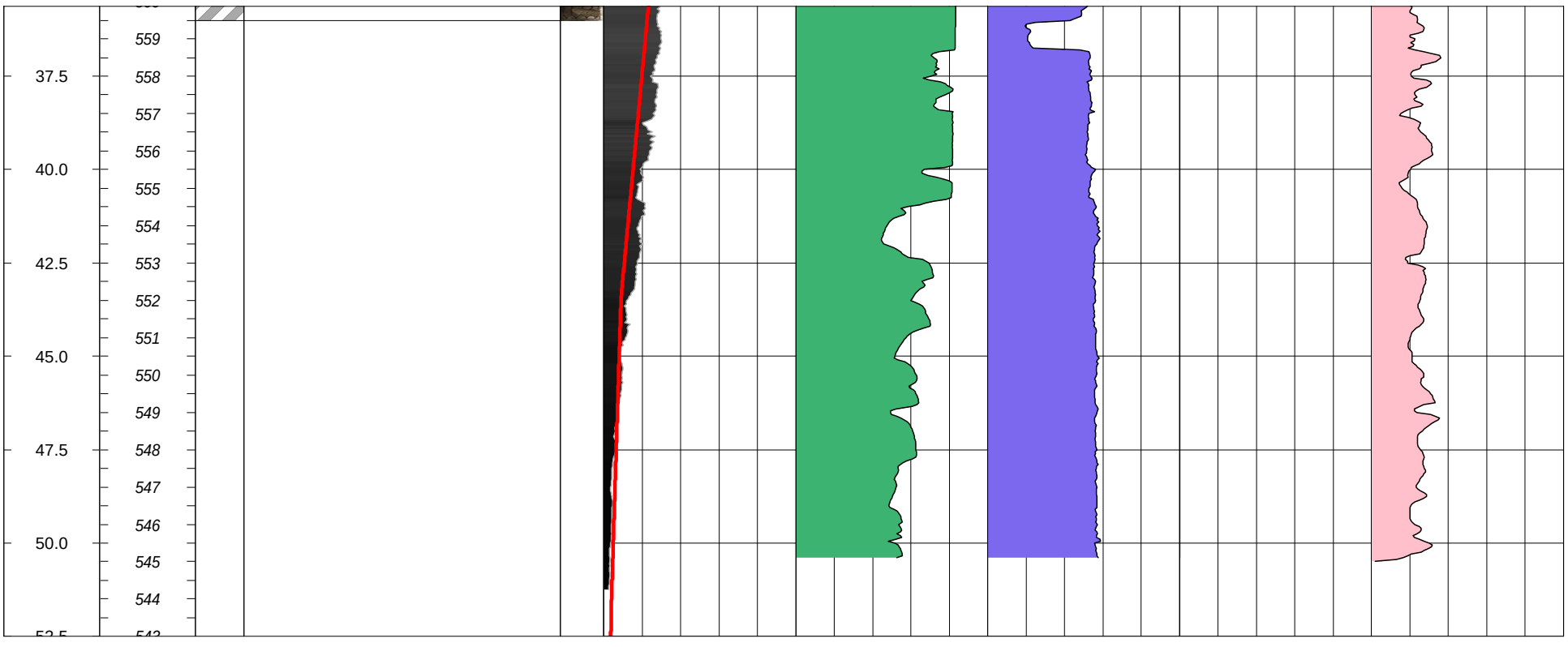
SB TOTAL DEPTH: 36 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E3

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/06/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322808.40
Y 4672529.12

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 606.1 ft amsl

ELEVATION DATUM: World Geodetic System 1984

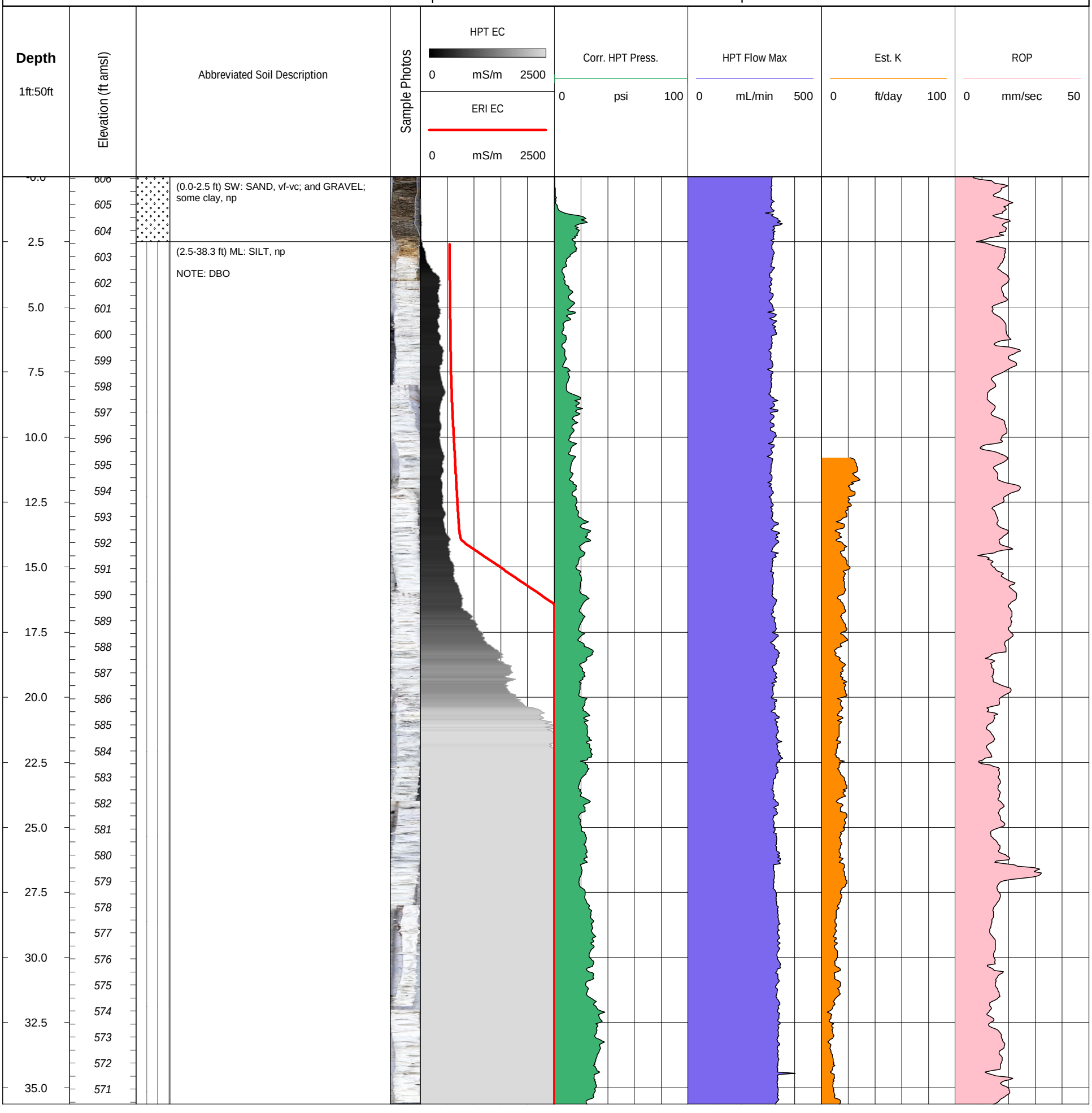
HPT TOTAL DEPTH: 64.6 ft bgs

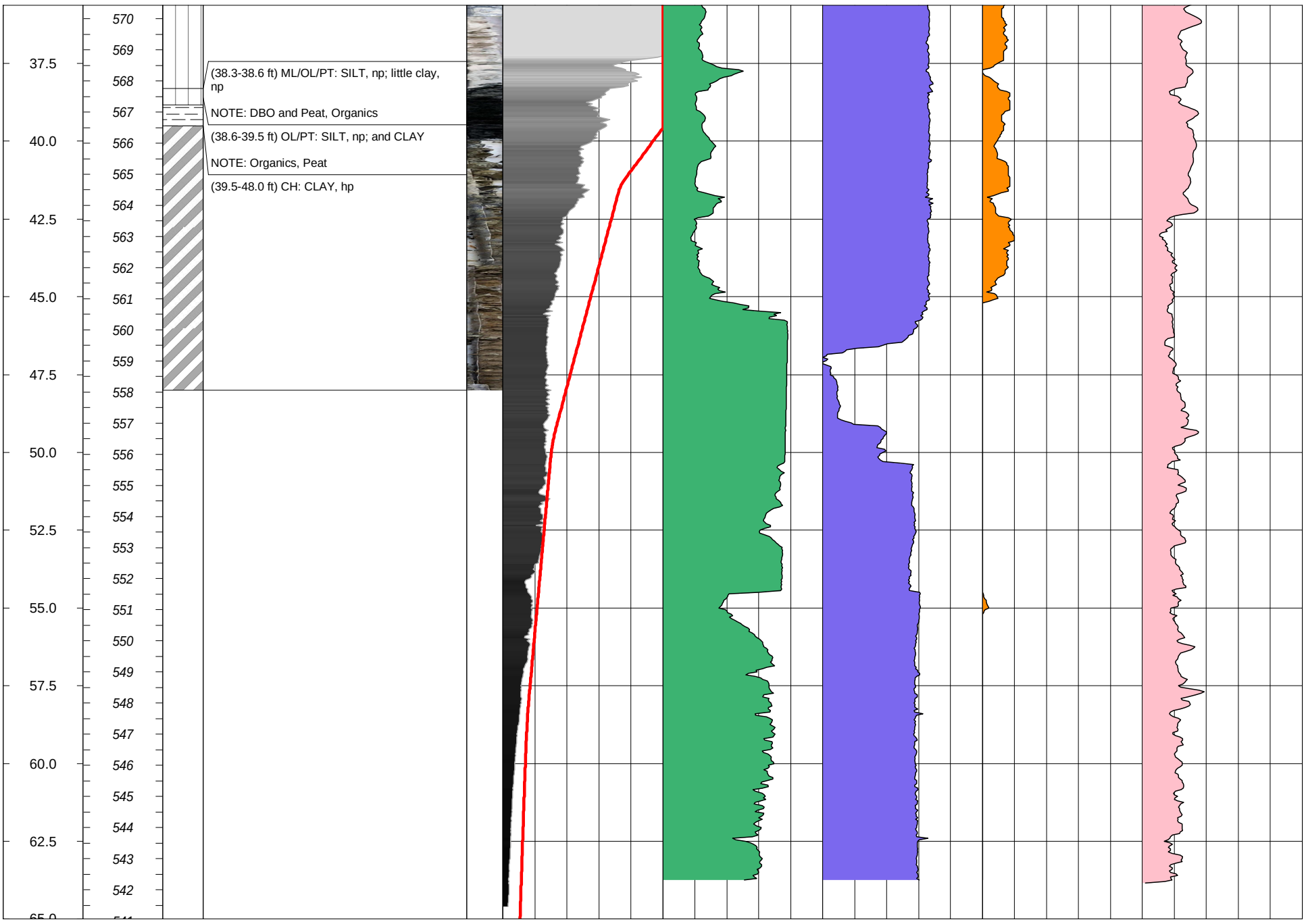
SB TOTAL DEPTH: 48 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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42.5
45.0
47.5
50.0
52.5
55.0
57.5
60.0
62.5
(38.3-38.6 ft) ML/OL/PT: SILT, np; little clay, np
NOTE: DBO and Peat, Organics
(38.6-39.5 ft) OL/PT: SILT, np; and CLAY
NOTE: Organics, Peat
(39.5-48.0 ft) CH: CLAY, hp

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E4

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/01/2022

LOGGED BY: Arcadis - Geophysics
Dakota - HPT

BORING COORDINATES: X 322866.00
Y 4672606.21

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 593.2 ft amsl

ELEVATION DATUM: World Geodetic System 1984

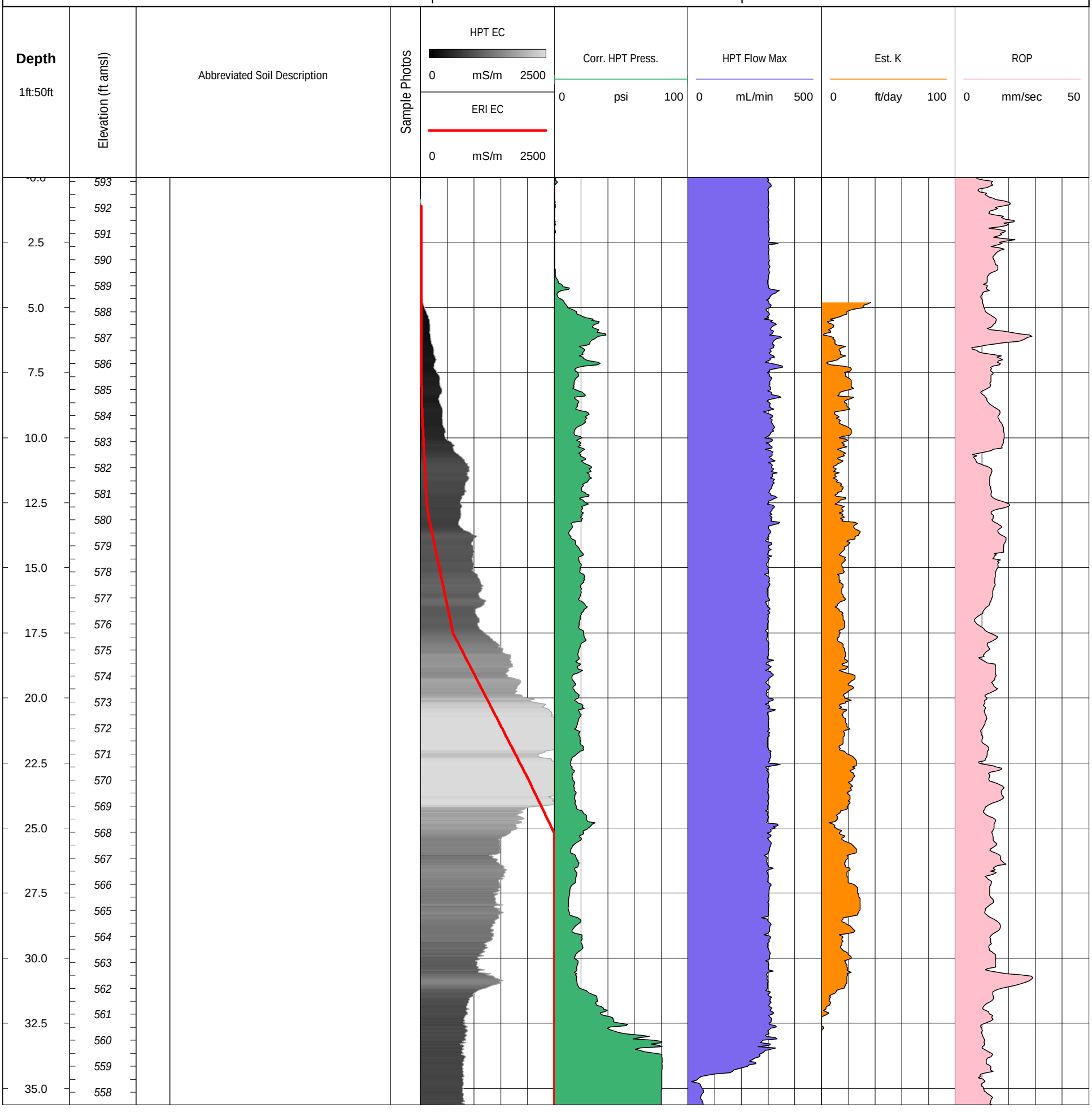
HPT TOTAL DEPTH: 51.0 ft bgs

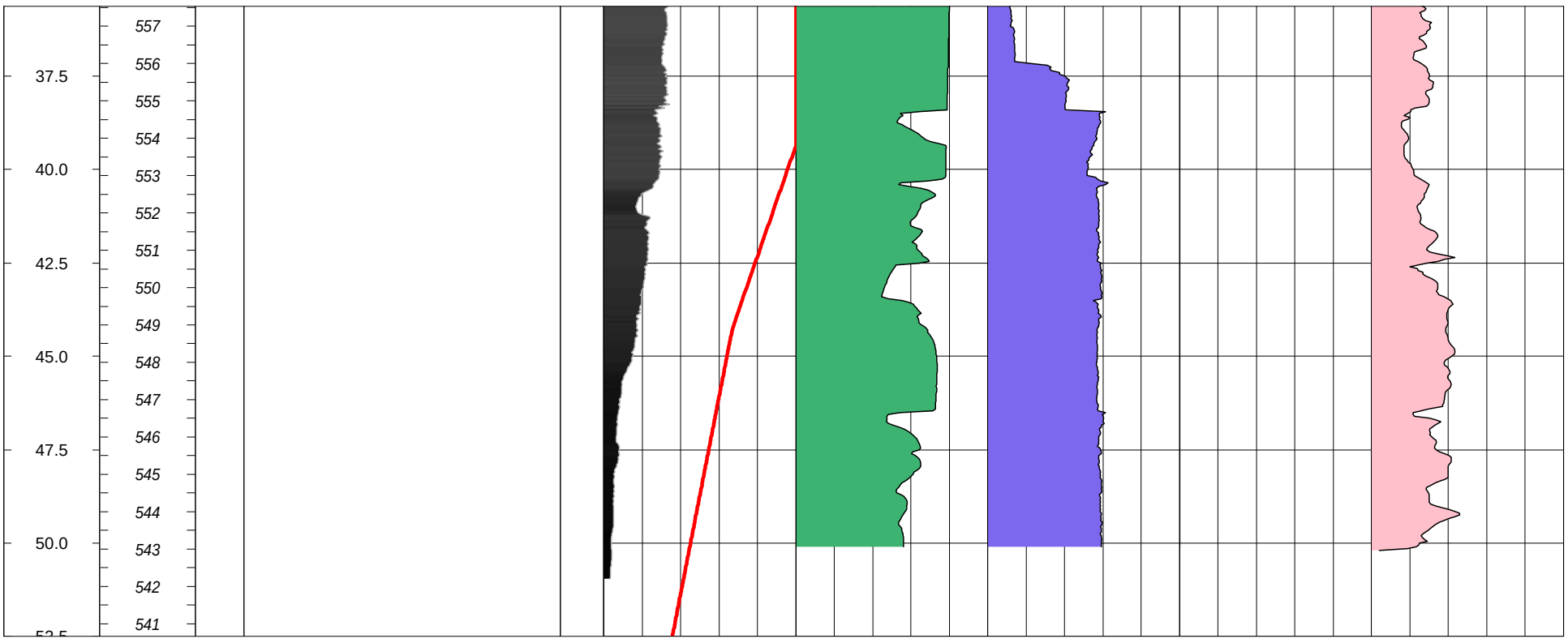
SB TOTAL DEPTH: NA

REMARKS:

Logging Methods

- [ ] Soil Description
- [ ] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E5

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/29/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322934.52
Y 4672970.93

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 581.4 ft amsl

ELEVATION DATUM: World Geodetic System 1984

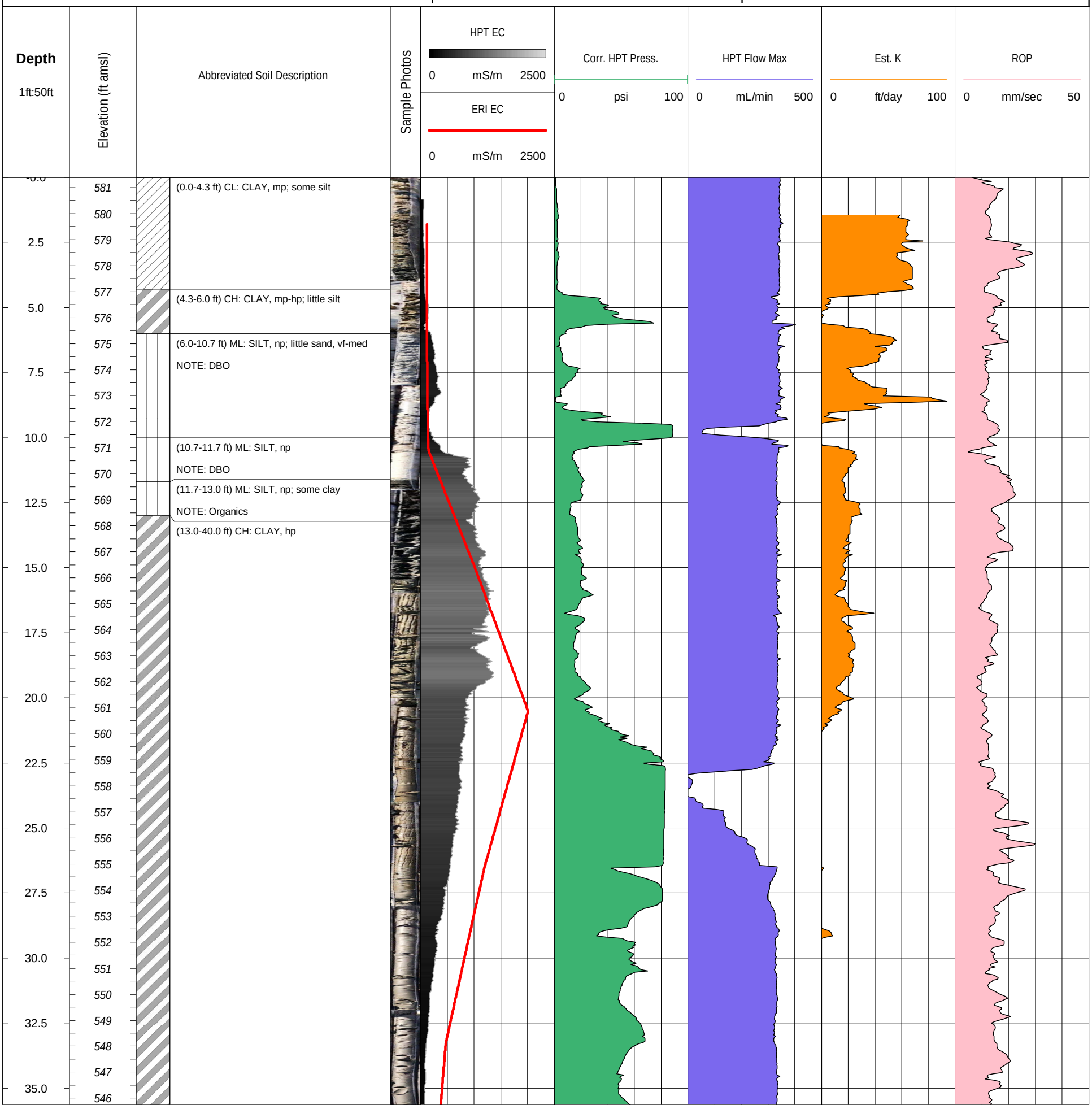
HPT TOTAL DEPTH: 41.4 ft bgs

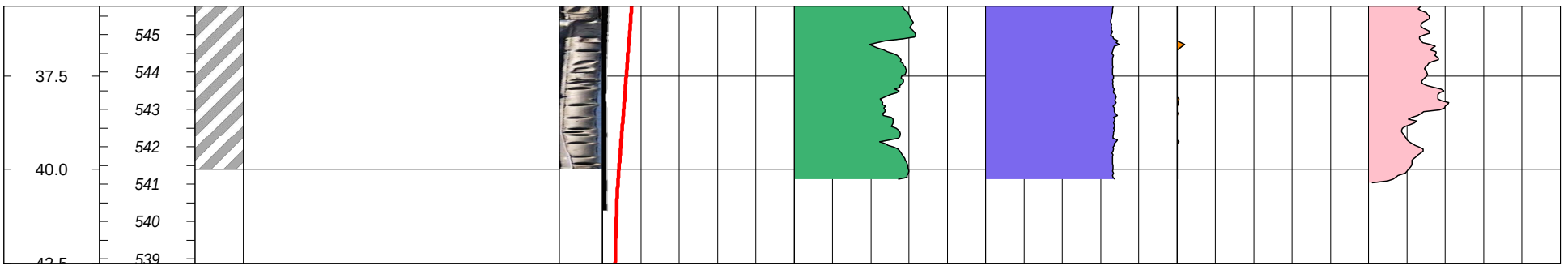
SB TOTAL DEPTH: 40 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)




37.5
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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E6

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/01/2022

LOGGED BY: Arcadis - Geophysics
Dakota - HPT

BORING COORDINATES: X 323103.42
Y 4673099.98

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.0 ft amsl

ELEVATION DATUM: World Geodetic System 1984

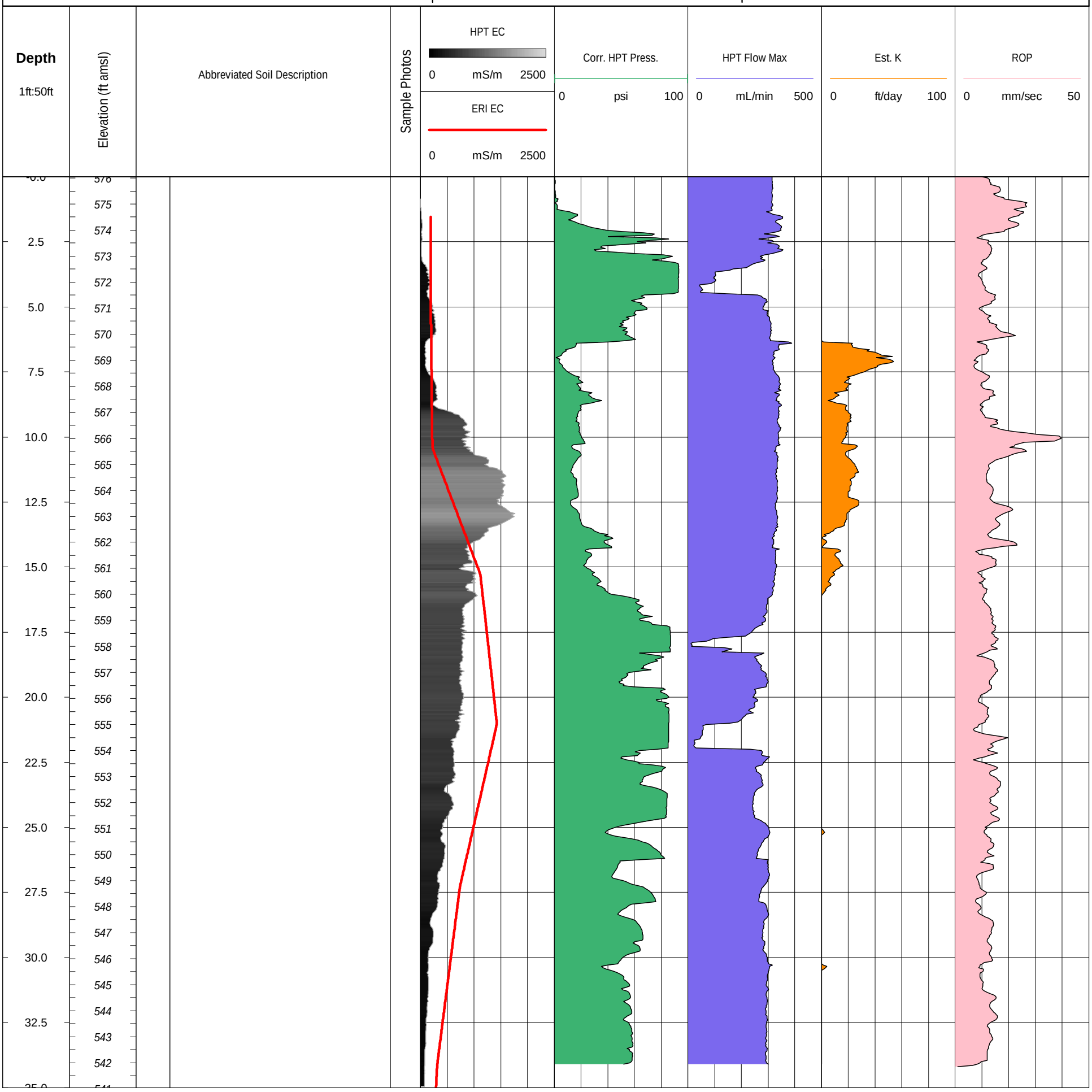
HPT TOTAL DEPTH: 35.0 ft bgs

SB TOTAL DEPTH: NA

REMARKS:

Logging Methods

- [ ] Soil Description
- [ ] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)



HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E7

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/06/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 323098.38
Y 4673354.55

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.3 ft amsl

ELEVATION DATUM: World Geodetic System 1984

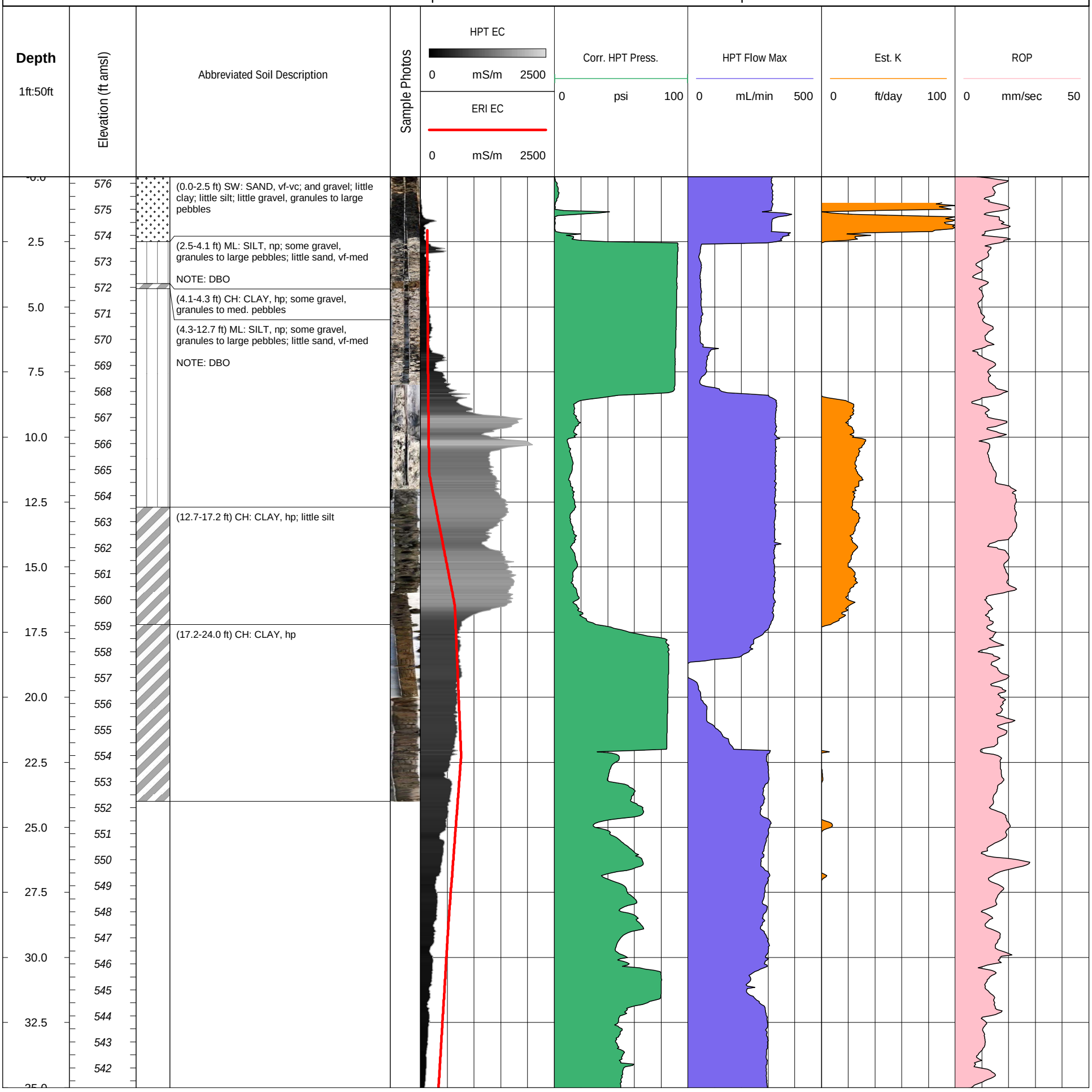
HPT TOTAL DEPTH: 35.8 ft bgs

SB TOTAL DEPTH: 24.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)



HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E8

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/28/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 323096.38
Y 4673548.70

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.4 ft amsl

ELEVATION DATUM: World Geodetic System 1984

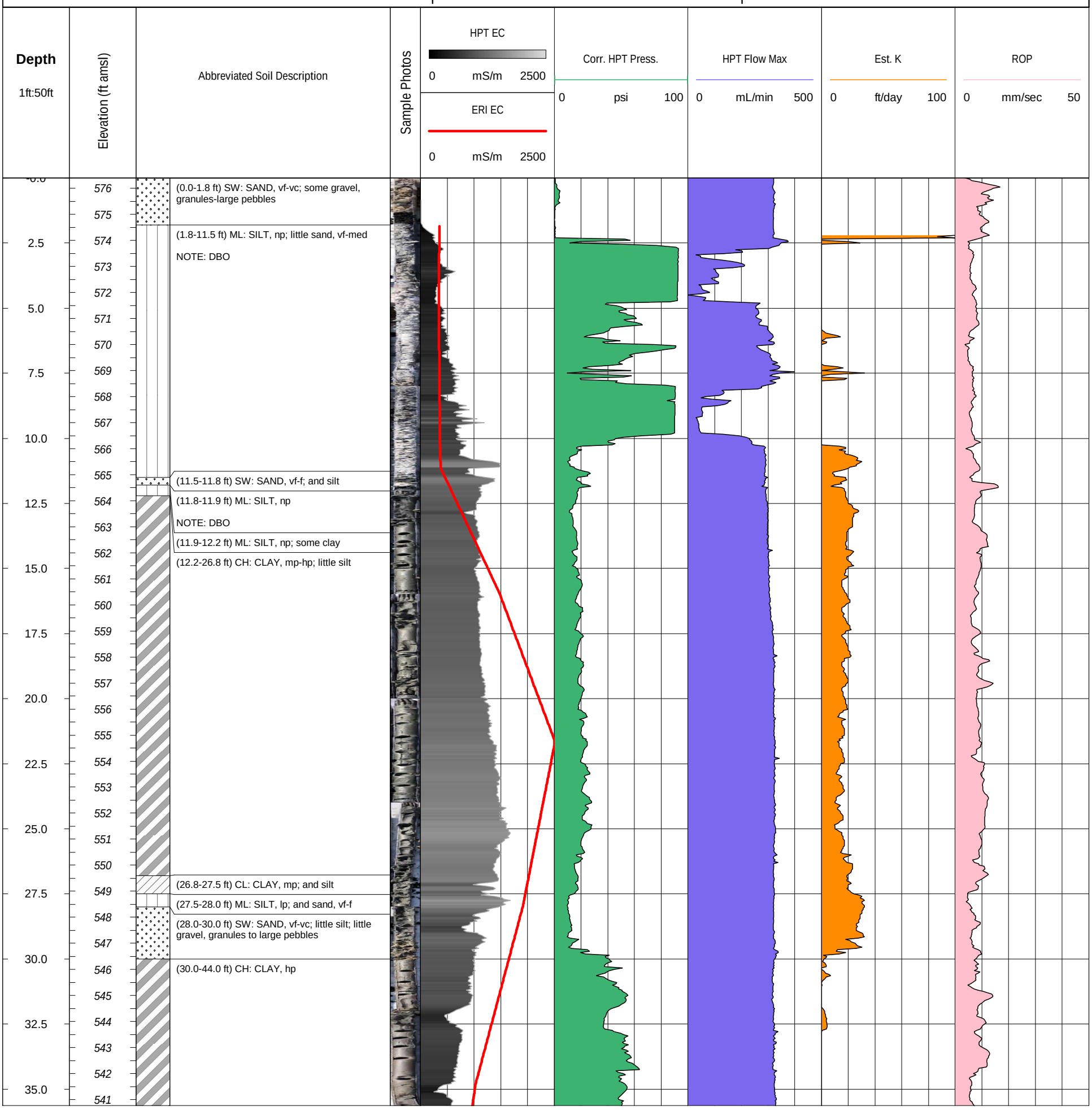
HPT TOTAL DEPTH: 45.2 ft bgs

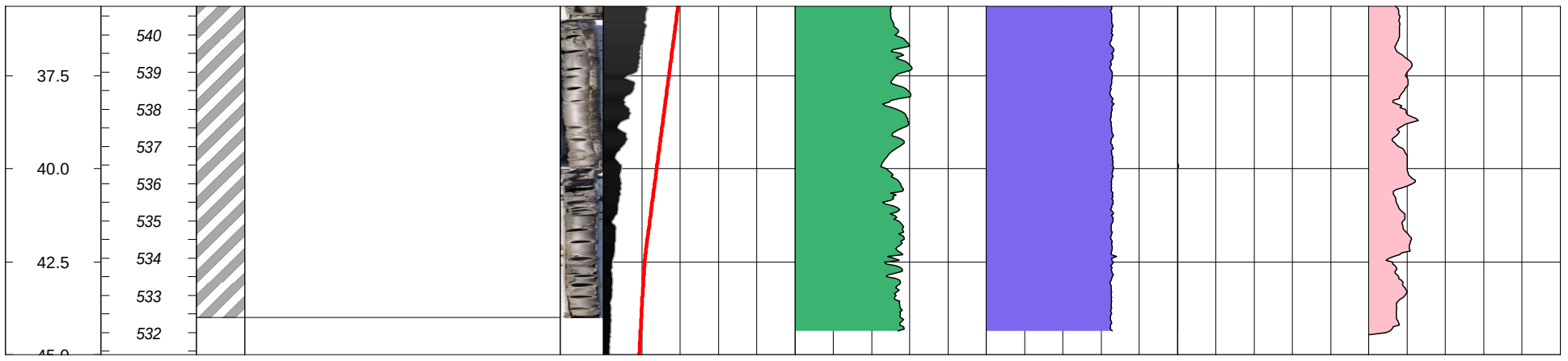
SB TOTAL DEPTH: 44.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)




37.5
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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E9

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/28/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 323119.00
Y 4673657.09

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 575.7 ft amsl

ELEVATION DATUM: World Geodetic System 1984

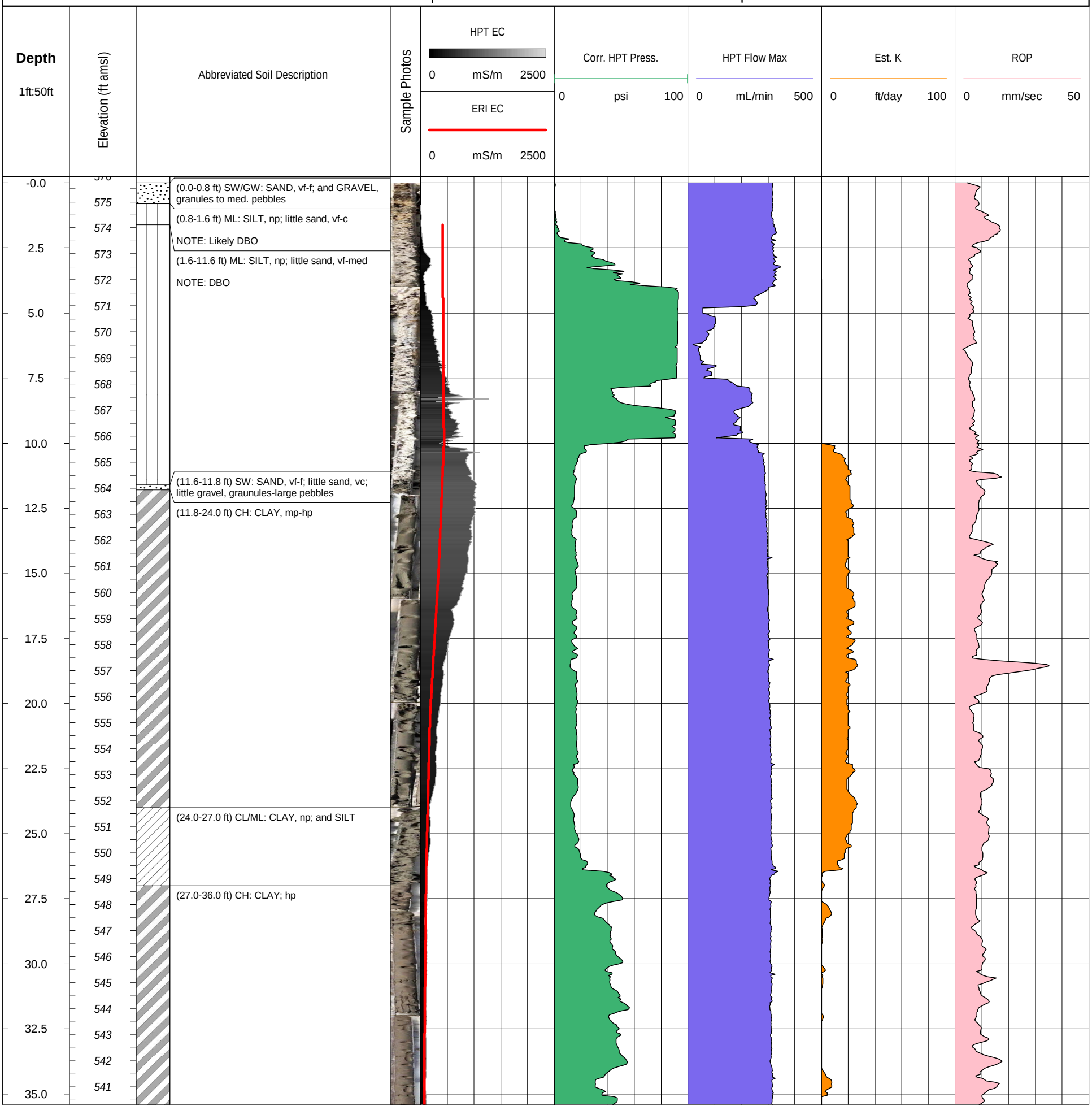
HPT TOTAL DEPTH: 37.0 ft bgs

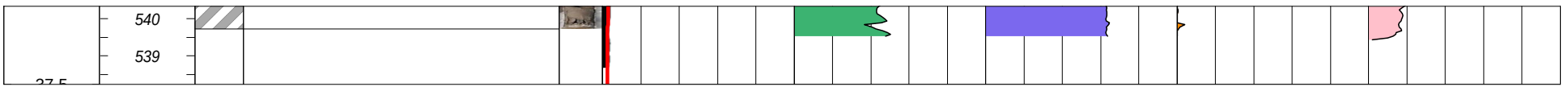
SB TOTAL DEPTH: 36.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: E11

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/28/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 323161.09
Y 4673973.88

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 580.8 ft amsl

ELEVATION DATUM: World Geodetic System 1984

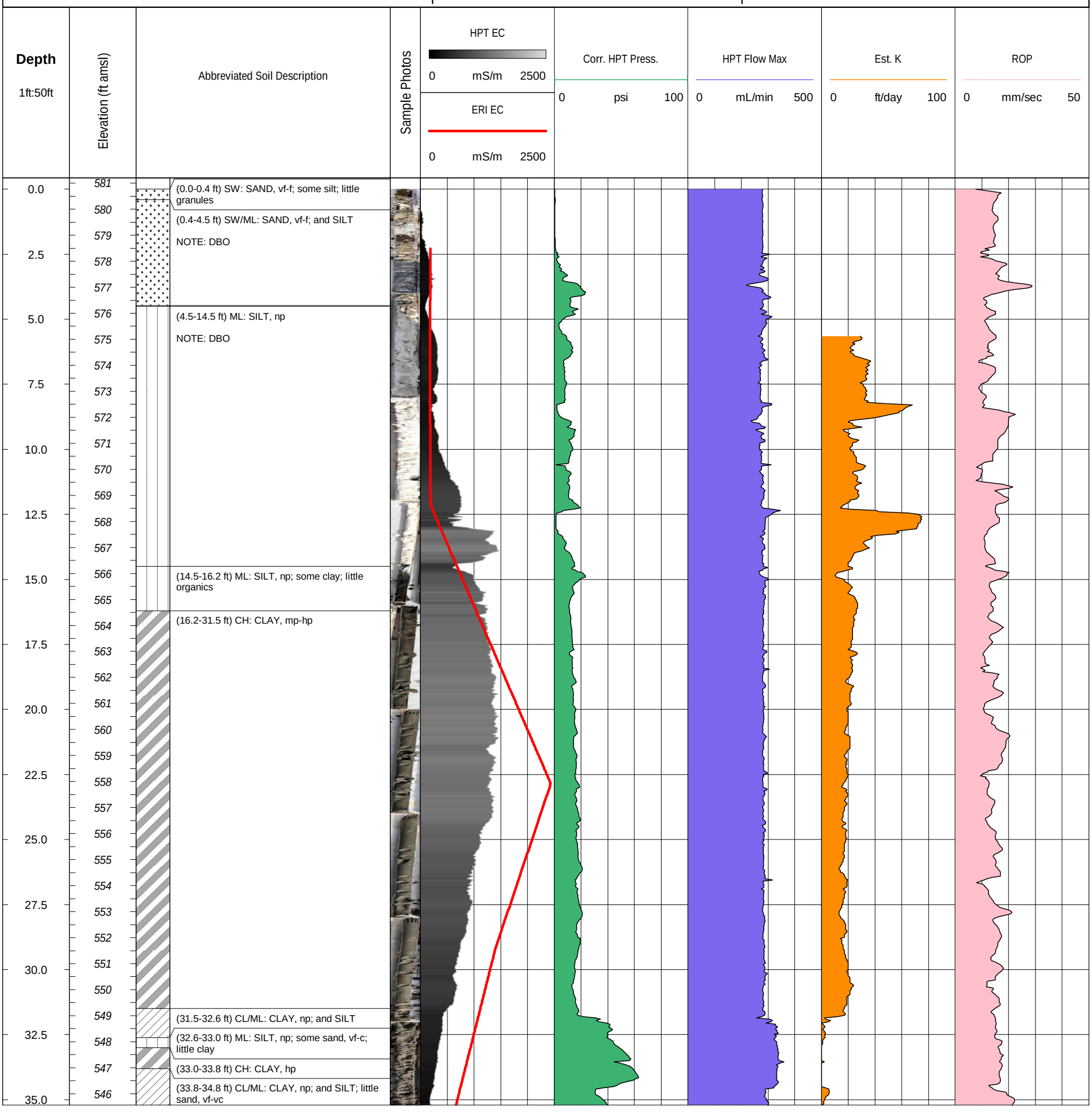
HPT TOTAL DEPTH: 39.4 ft bgs

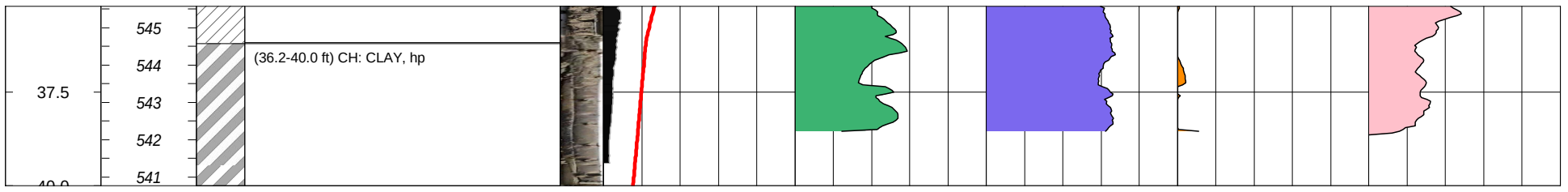
SB TOTAL DEPTH: 40.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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(36.2-40.0 ft) CH: CLAY, hp

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W2

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/24/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322468.48
Y 4672540.45

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.8 ft amsl

ELEVATION DATUM: World Geodetic System 1984

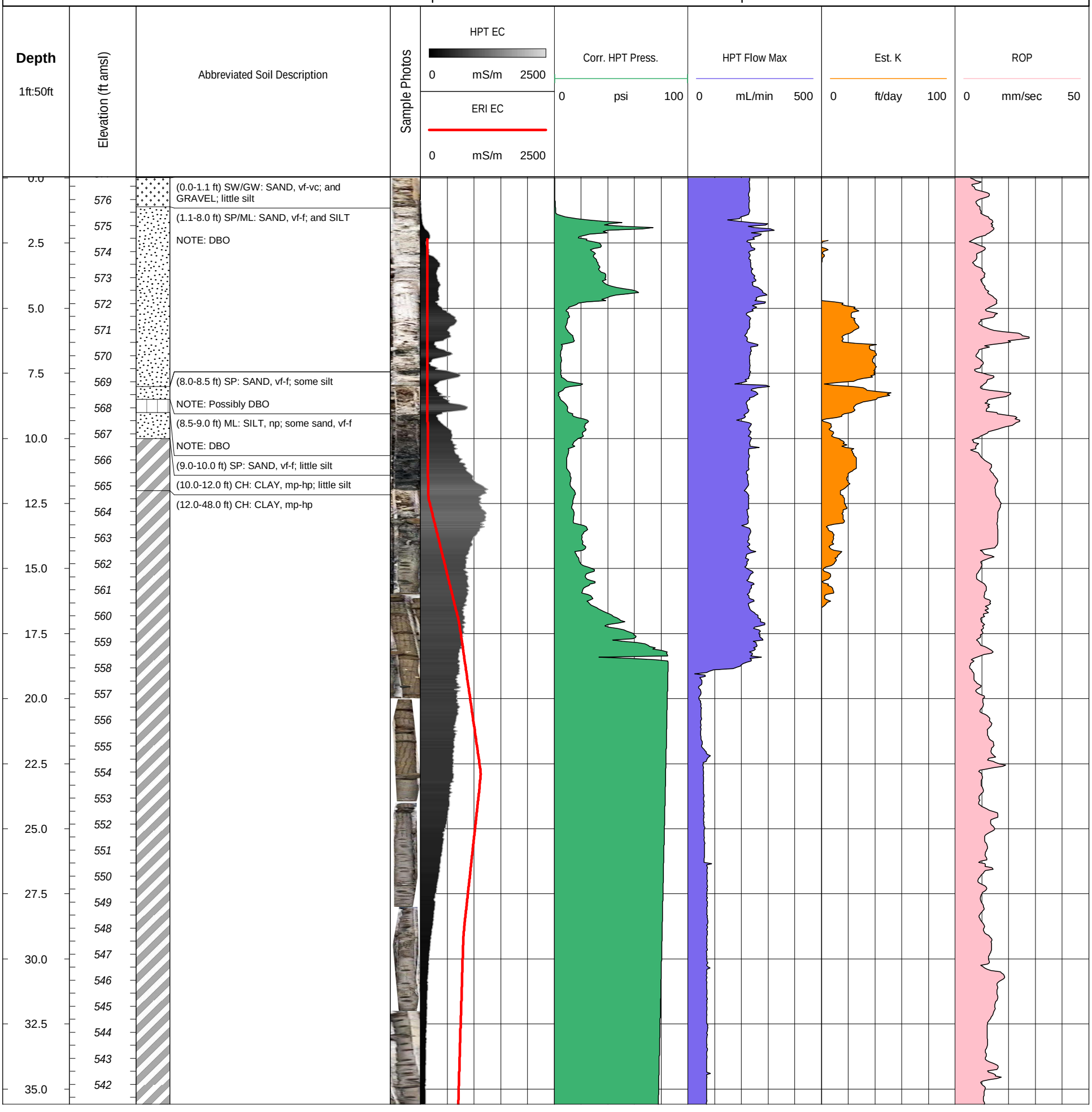
HPT TOTAL DEPTH: 62.4 ft bgs

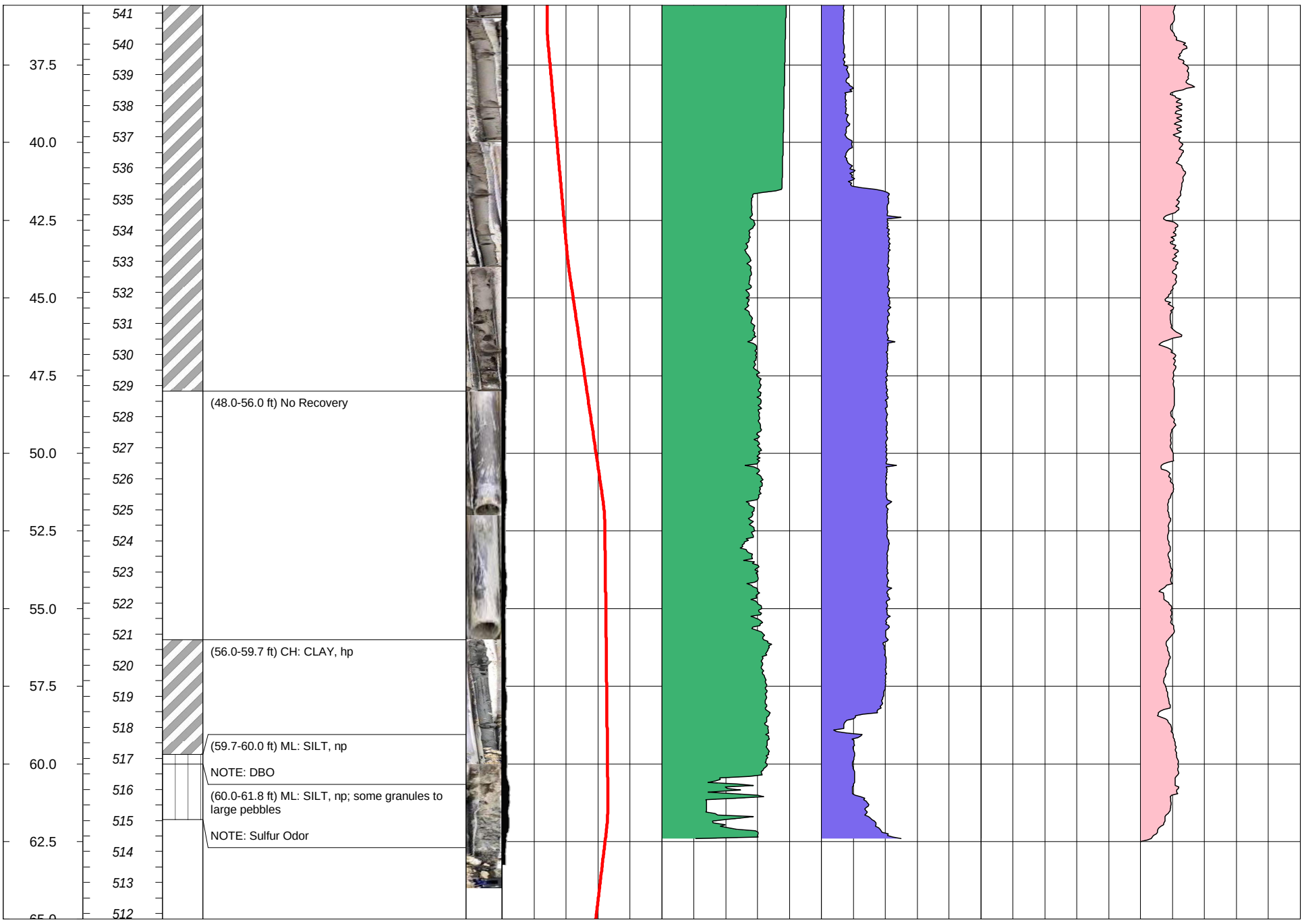
SB TOTAL DEPTH: 61.8 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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52.5
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57.5
60.0
62.5
(48.0-56.0 ft) No Recovery
(56.0-59.7 ft) CH: CLAY, hp
(59.7-60.0 ft) ML: SILT, np
NOTE: DBO
(60.0-61.8 ft) ML: SILT, np; some granules to large pebbles
NOTE: Sulfur Odor

ARCADIS

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W3

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/04/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322461.27
Y 4672614.29

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.1 ft amsl

ELEVATION DATUM: World Geodetic System 1984

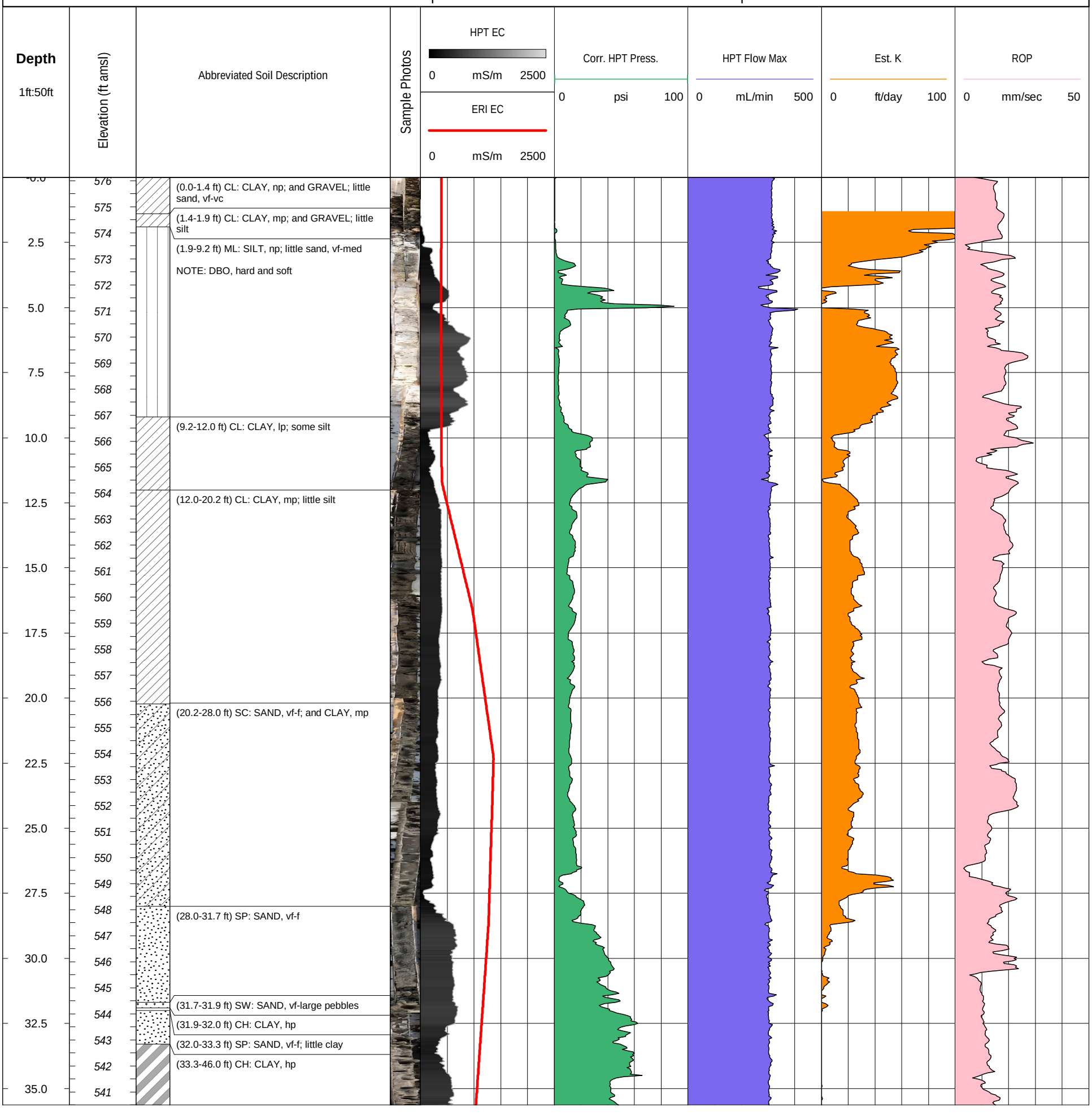
HPT TOTAL DEPTH: 45.1 ft bgs

SB TOTAL DEPTH: 46.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W4

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/24/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322532.36
Y 4672795.34

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 576.4 ft amsl

ELEVATION DATUM: World Geodetic System 1984

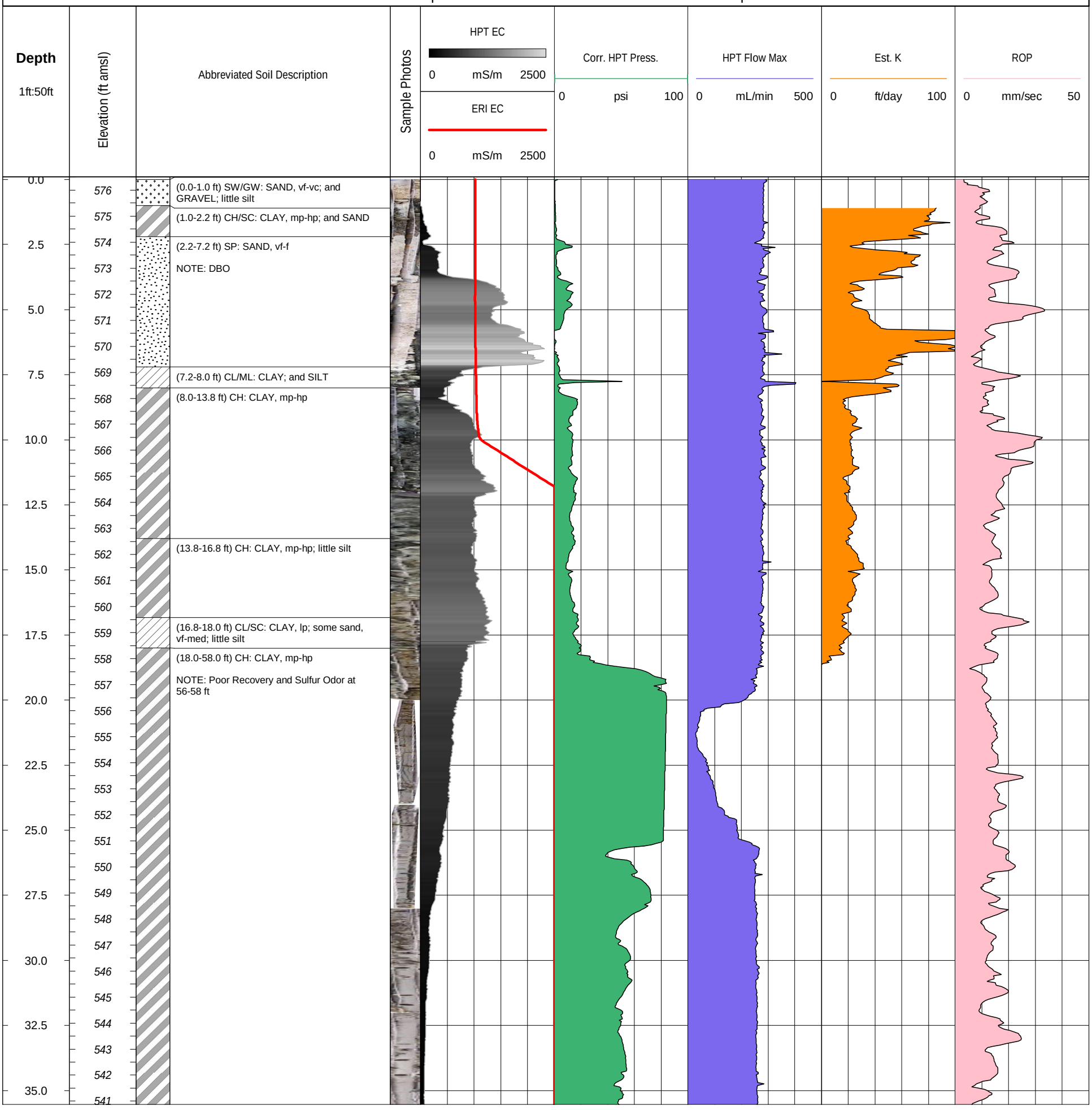
HPT TOTAL DEPTH: 59.7 ft bgs

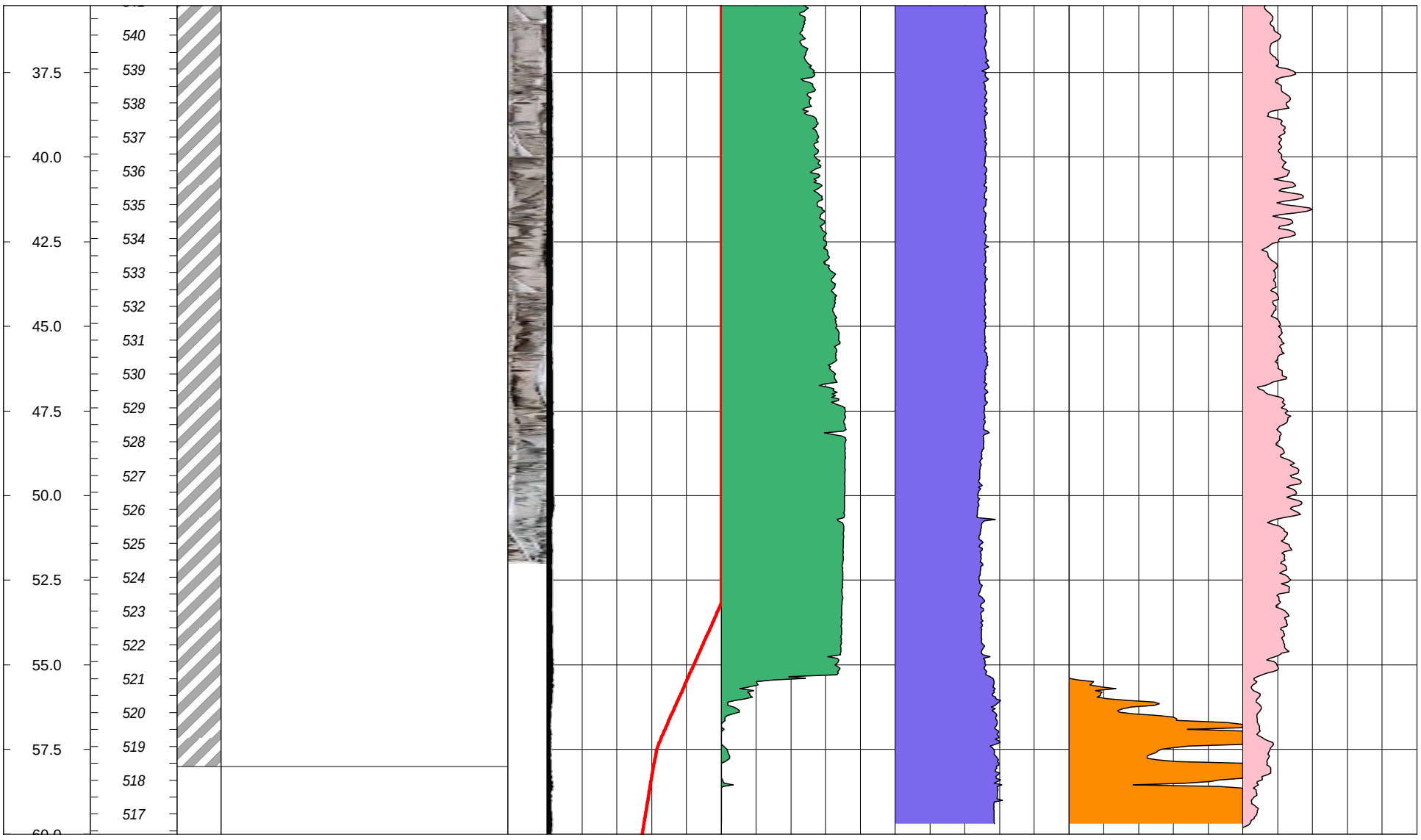
SB TOTAL DEPTH: 58.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W5

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/04/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322561.98
Y 4672888.34

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 573.9 ft amsl

ELEVATION DATUM: World Geodetic System 1984

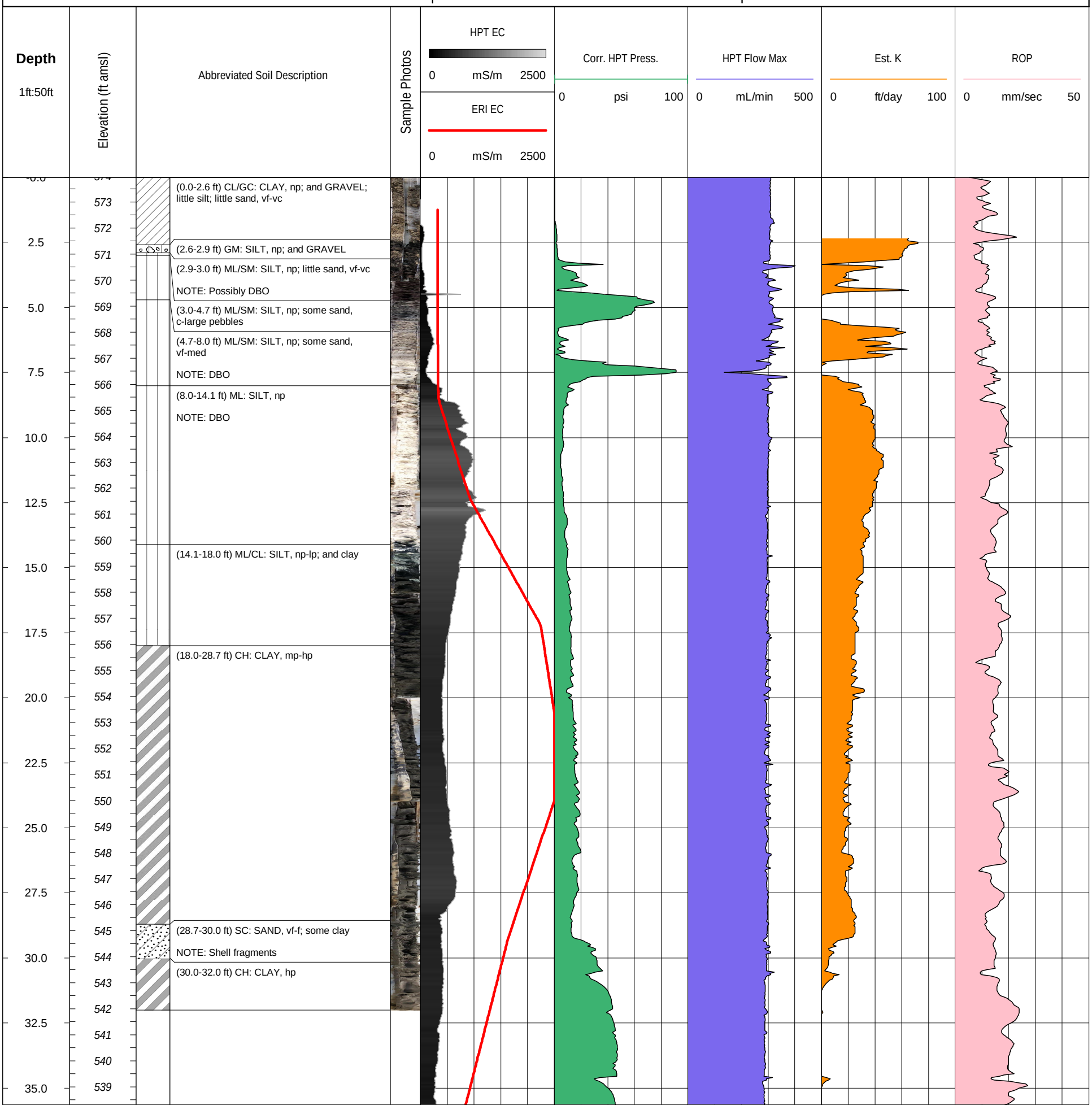
HPT TOTAL DEPTH: 40.8 ft bgs

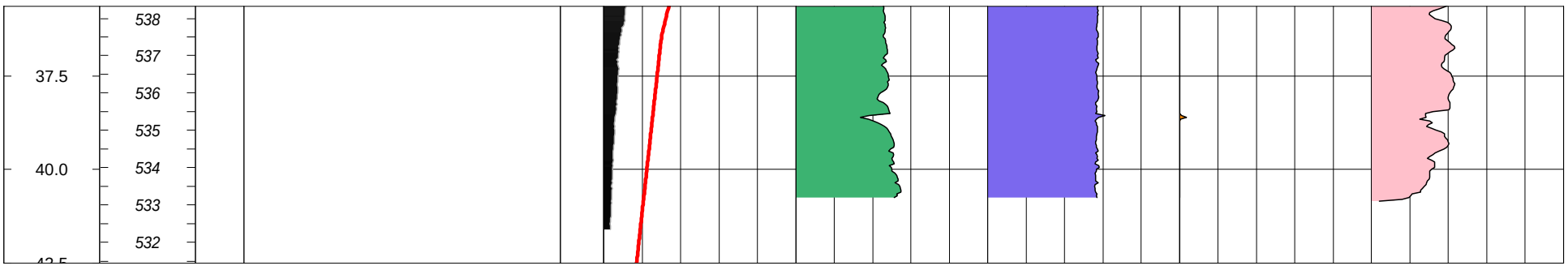
SB TOTAL DEPTH: 32.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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37.5
40.0

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W6

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/04/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322585.04
Y 4672961.39

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 574.0 ft amsl

ELEVATION DATUM: World Geodetic System 1984

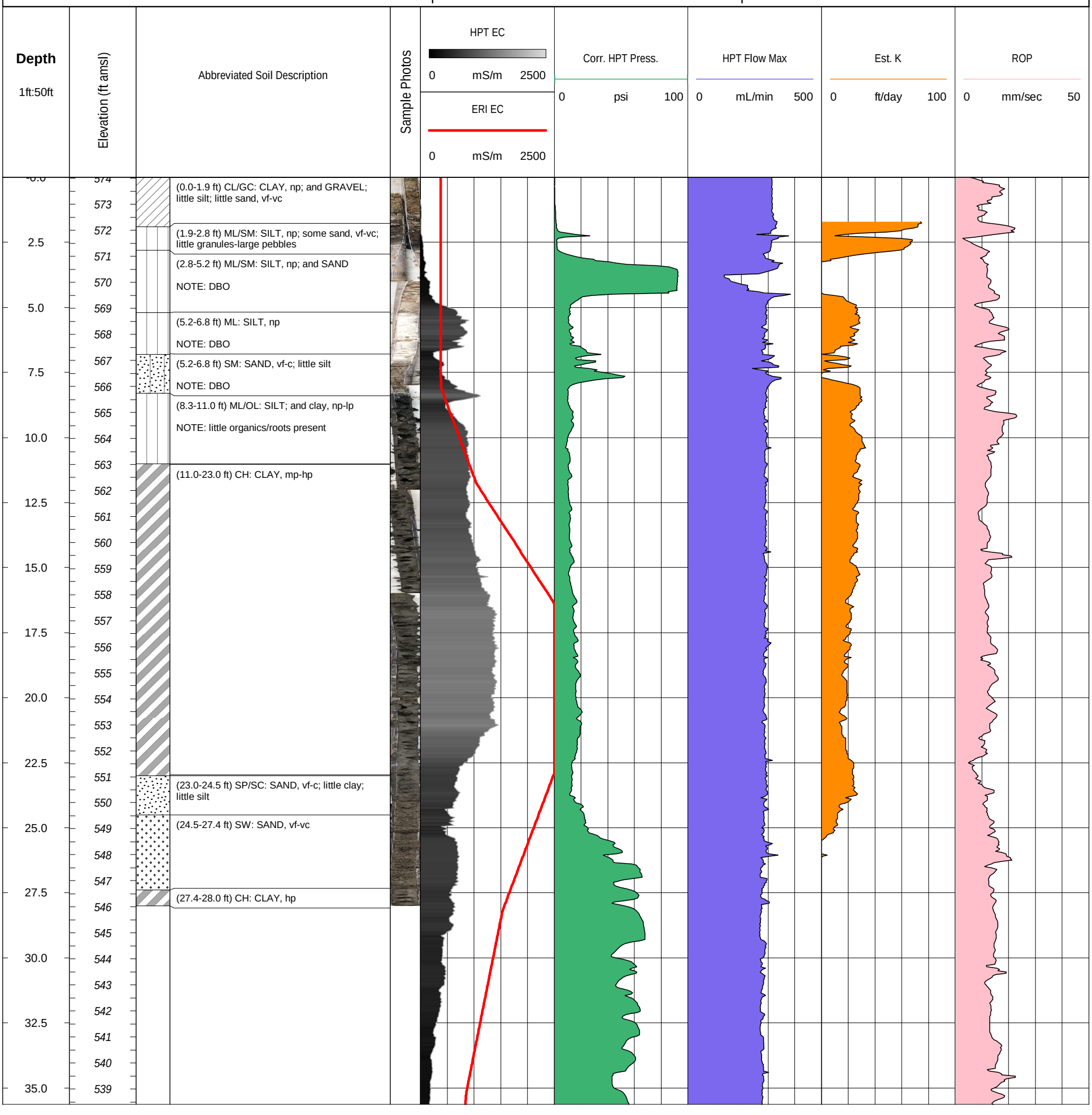
HPT TOTAL DEPTH: 38.2 ft bgs

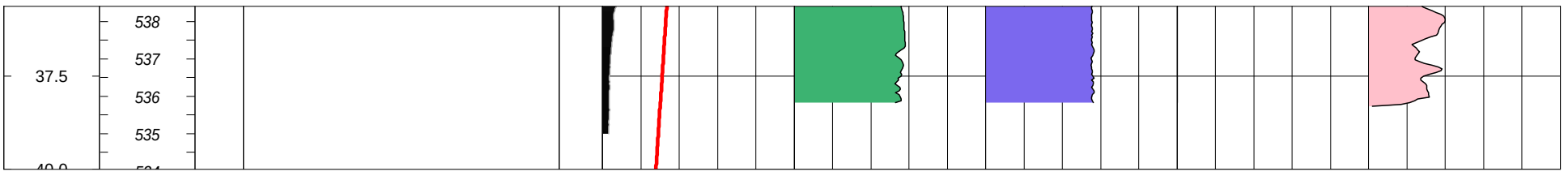
SB TOTAL DEPTH: 28.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W7

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/04/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322612.09
Y 4673046.90

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 575.9 ft amsl

ELEVATION DATUM: World Geodetic System 1984

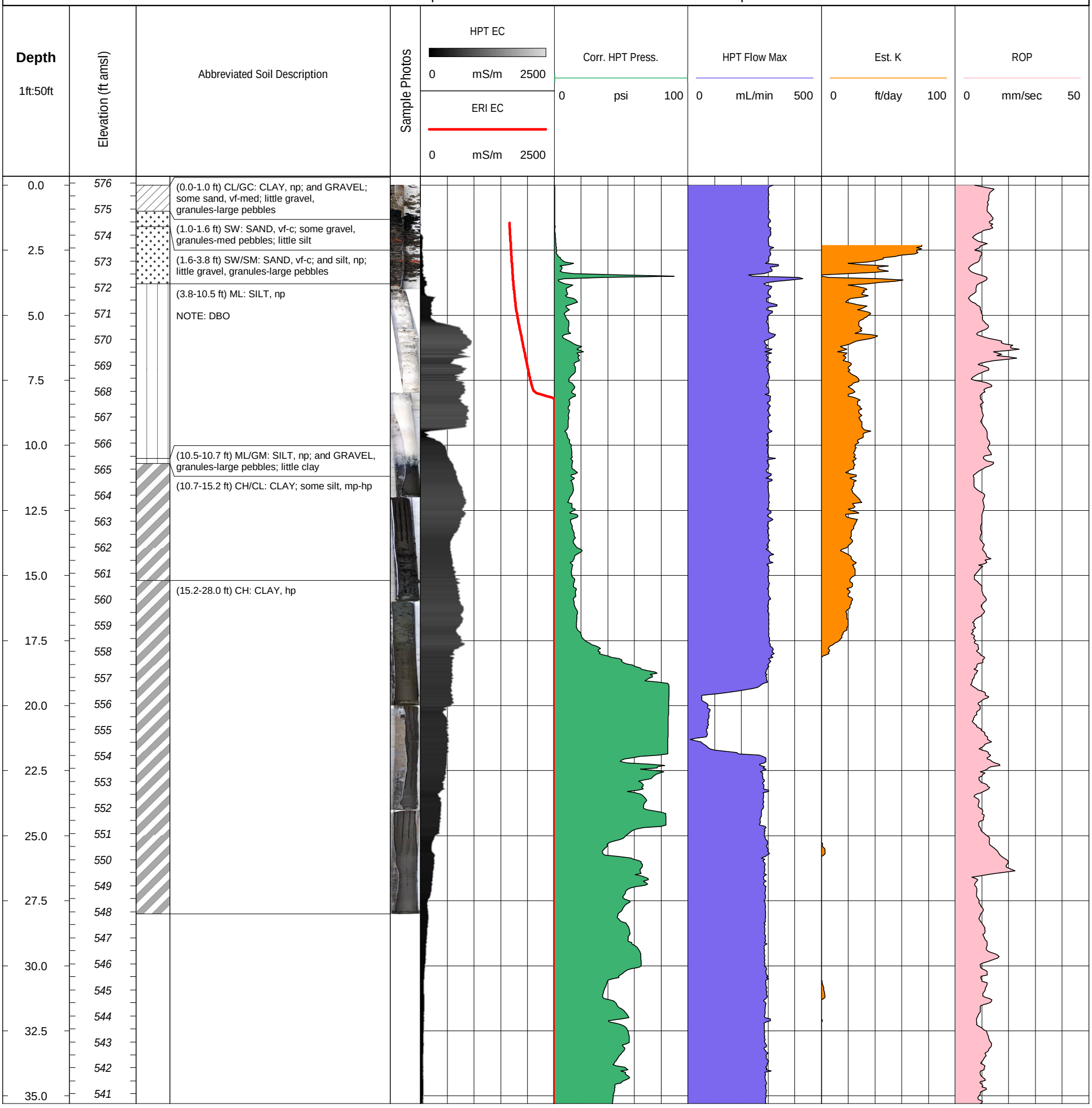
HPT TOTAL DEPTH: 45.0 ft bgs

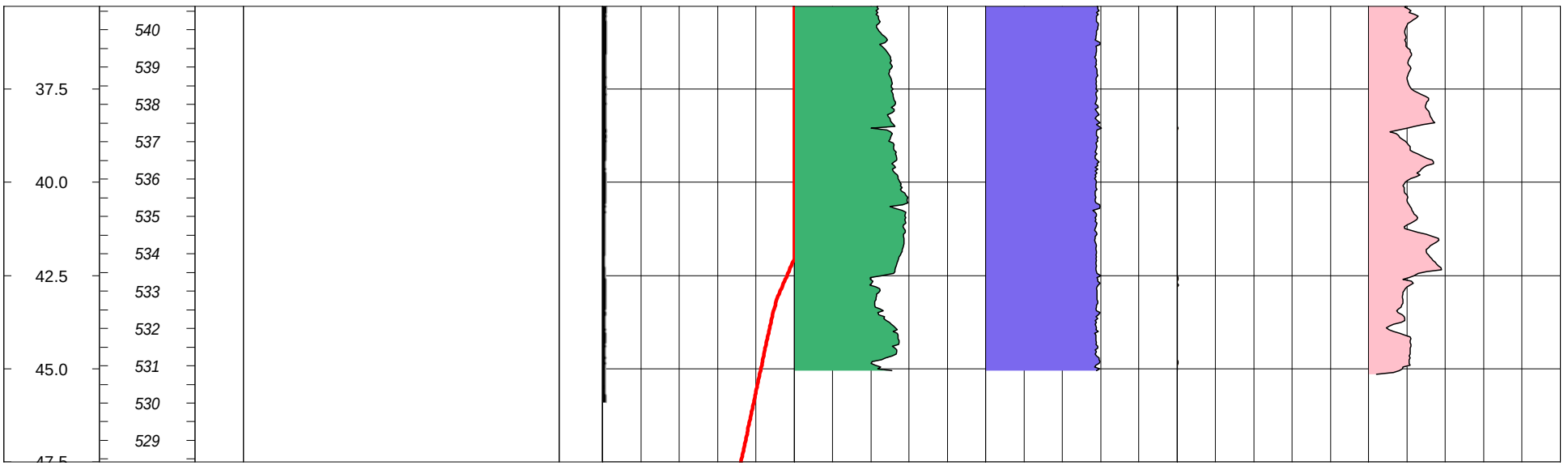
SB TOTAL DEPTH: 28.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W8

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/25/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322696.49
Y 4673278.09

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 589.3 ft amsl

ELEVATION DATUM: World Geodetic System 1984

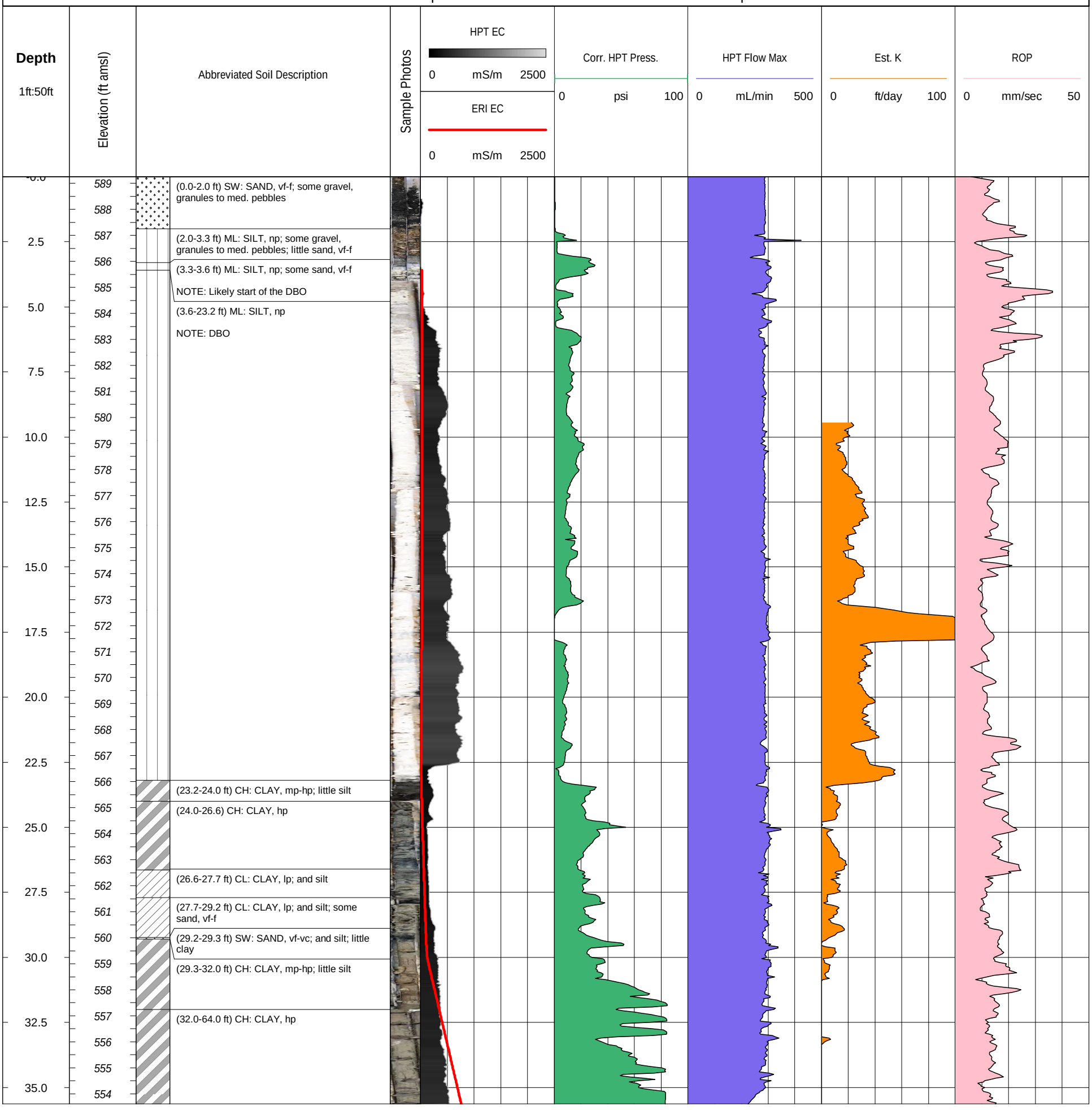
HPT TOTAL DEPTH: 62.8 ft bgs

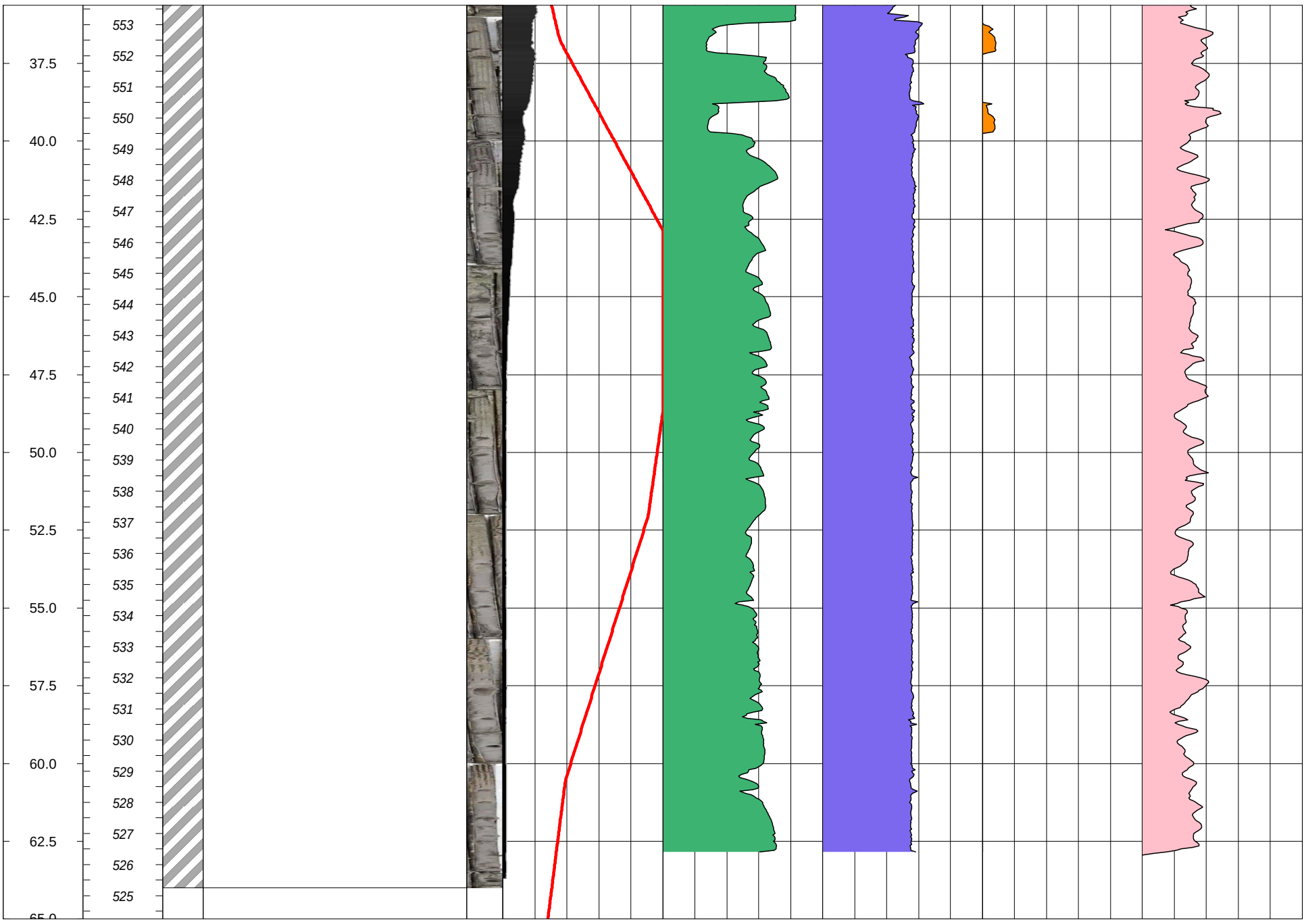
SB TOTAL DEPTH: 64.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)

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HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W9

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/30/2022

LOGGED BY: Arcadis - SB and Geophysics Dakota - HPT

BORING COORDINATES: X 322744.59
Y 4673506.84

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 582.1 ft amsl

ELEVATION DATUM: World Geodetic System 1984

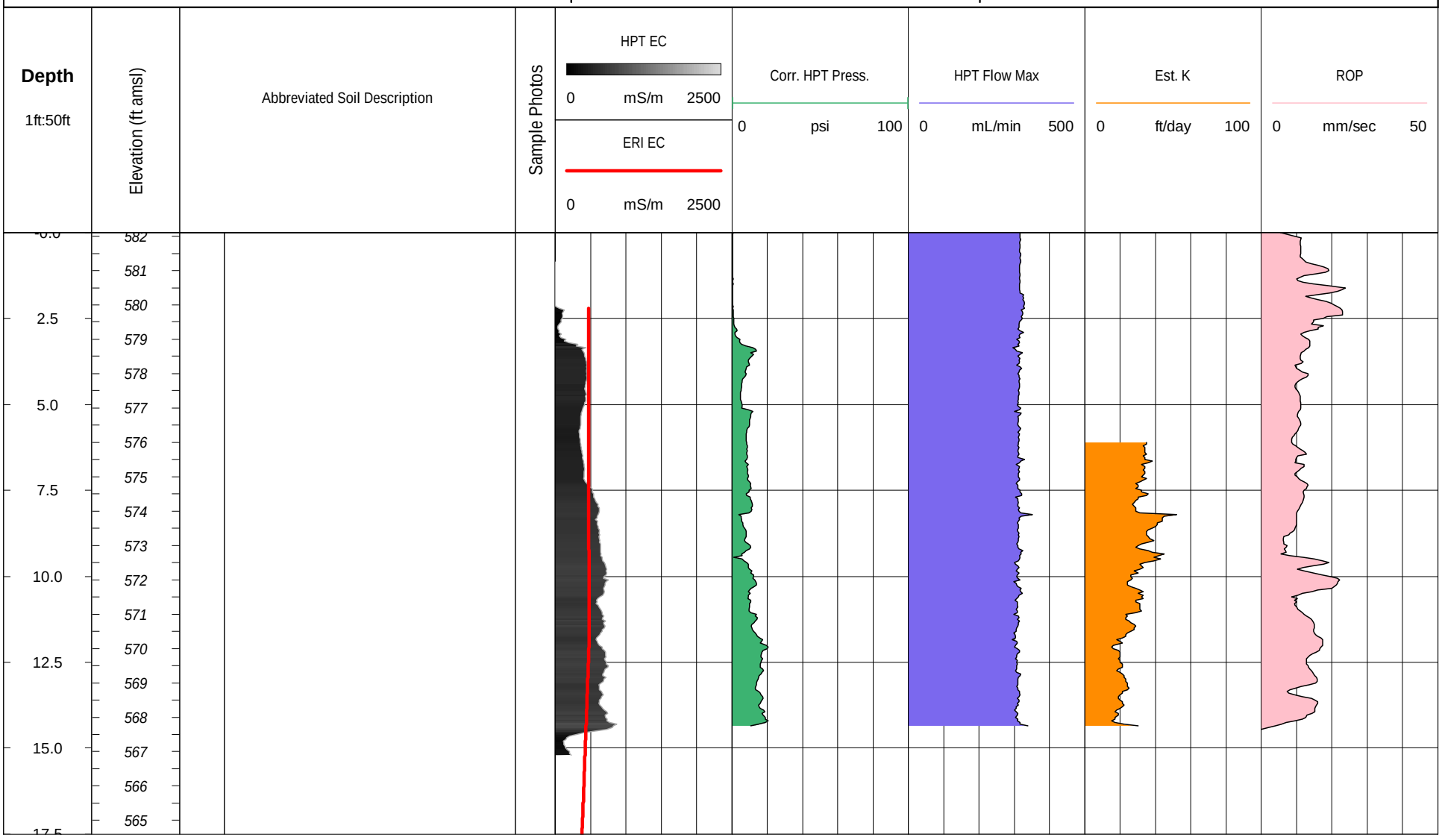
HPT TOTAL DEPTH: 14.3 ft bgs

SB TOTAL DEPTH: NA

REMARKS:

Logging Methods

- [ ] Soil Description
- [ ] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)



HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W10

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/25/2022

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

BORING COORDINATES: X 322840.99
Y 4673919.77

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 583.3 ft amsl

ELEVATION DATUM: World Geodetic System 1984

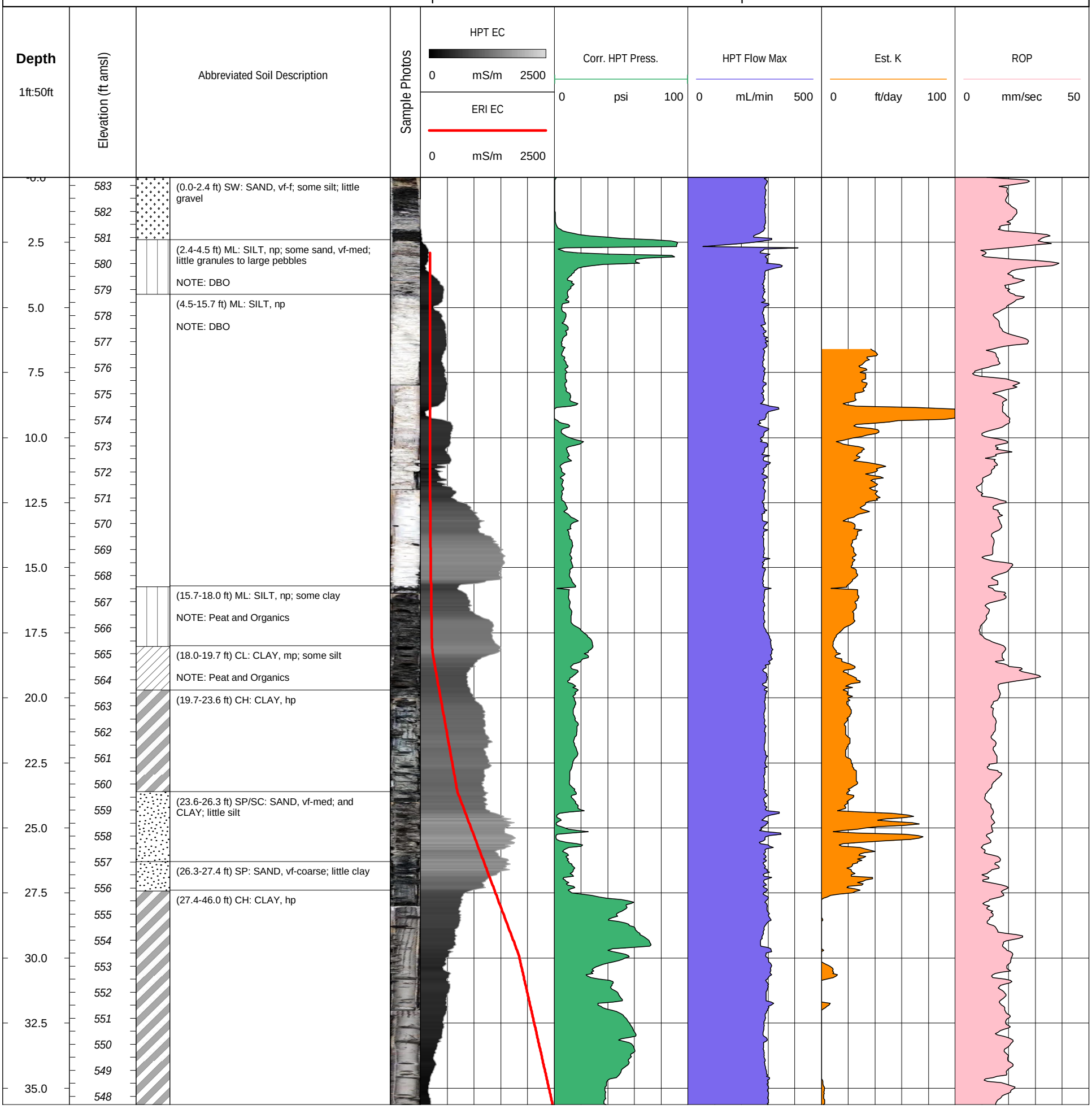
HPT TOTAL DEPTH: 55.2 ft bgs

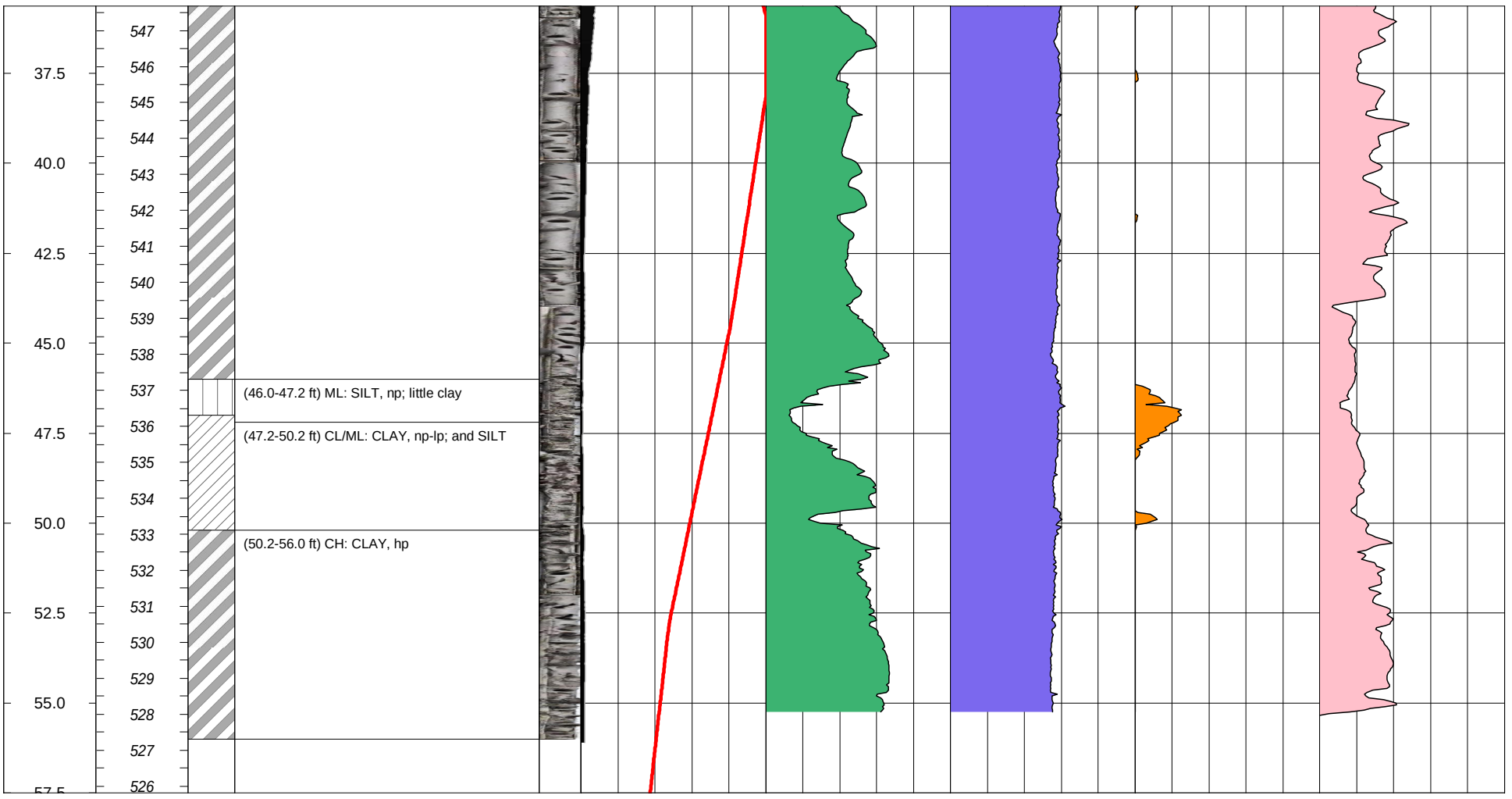
SB TOTAL DEPTH: 56.0 ft bgs

REMARKS: See Appendix A for more detailed soil description

Logging Methods

- [x] Soil Description
- [x] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)




37.5
40.0
42.5
45.0
47.5
50.0
52.5
55.0
57.5
547
546
545
544
543
542
541
540
539
538
537
536
535
534
533
532
531
530
529
528
527
526
(46.0-47.2 ft) ML: SILT, np; little clay
(47.2-50.2 ft) CL/ML: CLAY, np-lp; and SILT
(50.2-56.0 ft) CH: CLAY, hp

ARCADIS

HPT / ERI EC / Confirmation Soil Boring Log

Arcadis of Michigan, LLC
28550 Cabot Drive Suite 500
Novi, MI 48377

BORING NAME: W11

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/30/2022

LOGGED BY: Arcadis - SB and Geophysics Dakota - HPT

BORING COORDINATES: X 322893.15
Y 4674101.92

PROJECTION: Universal Transverse Mercator (UTM)

SURFACE ELEVATION: 580.9 ft amsl

ELEVATION DATUM: World Geodetic System 1984

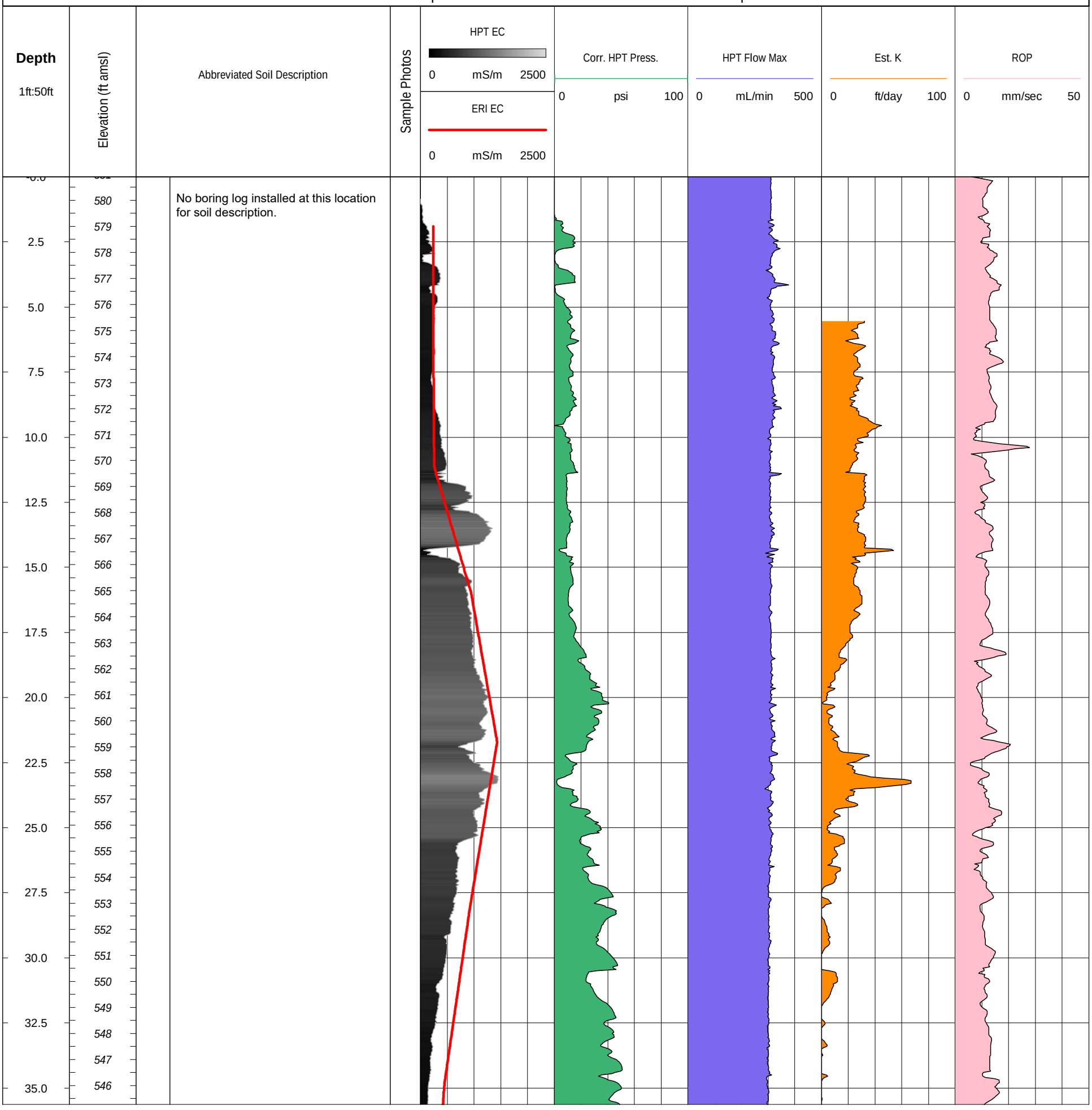
HPT TOTAL DEPTH: 39.8 ft bgs

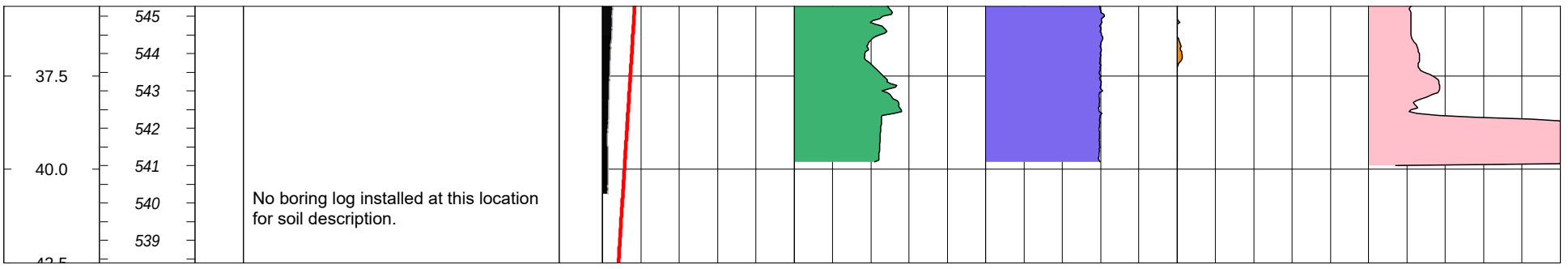
SB TOTAL DEPTH: NA

REMARKS:

Logging Methods

- [ ] Soil Description
- [ ] Sample Photo
- [x] HPT Pressure
- [x] HPT Flow Max
- [x] HPT Estimated Hydraulic Conductivity
- [x] HPT Rate of Penetration
- [x] HPT Electrical Conductivity (EC)
- [x] Electrical Resistivity Imaging (ERI)
- [ ] Electrical Conductivity (EC)




545
544
37.5
543
542
541
40.0
540
539
No boring log installed at this location
for soil description.

Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500
Novi
Michigan 48377
Phone: 248 994 2240
Fax:
www.arcadis.com